The Korean Housebuilding Industry: Aspects of Growth, Efficiency and Diversification, 1980-1995

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Abstract

The objective of this thesis is to contribute to the understanding of the development of the housebuilding industry in Korea. Starting from a description of the growth of the industry in the regulated environment, relevant theories are investigated. Based on both theory and evidence, an analytic framework is then developed from which four main research areas are drawn.

The first area is an analysis of the structure of the Korean housebuilding business. The focus is on the investigation of governance structure within the housebuilding business and determinants of that structure. The second area is an examination of efficiency in the housebuilding business. Cost structures of the housebuilding business, the input factor relationship, the extent of economies of scale, and productivity are evaluated. The third area is an analysis of the building firms' diversification strategy. The extent of diversification among housebuilding firms, the changing pattern and the motives for that diversification are examined. Finally, the fourth area brings these elements together to investigate the efficiency of the firms' diversified production structure by estimating multi-product cost functions.

Interviews and secondary data sources were used to examine the structure of the Korean housebuilding business. For the analyses of the efficiency of the business, multi-product firms, and the firms' diversification strategy, econometric modelling techniques such as Translog cost function estimation and multivariate regression estimation were employed.

The cost structure of the Korean housebuilding business was found to be price inelastic, with relatively low productivity and increasing returns to scale. Firms tended to depend on 'contracting' throughout the production process and also showed diversified production structures. Diversification was motivated by avoiding risks and uncertainty within the housebuilding business and by using retained resources efficiently. The diversification strategy was found to be economically efficient, although the estimated optimum scale suggests that the current scale of the firms may be too large.

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Chapter 1 Introduction

1.1 Background of the Study

The housebuilding industry is one of the most important sectors of the national economy: it is related to the basic human needs; the need for shelter. Everyone requires a roof over his or her head, a source of heat and physical comfort, a place to cook, and a place of refuge from the world, as well as a place to raise a family or to take care of family members: on the one hand, growth in the housebuilding industry is closely related to the economic and demographic situation of each country, on the other, the industry is influential in itself as it affects various other economic sectors; land, labour, plant, and materials. The government of each country in the world intervenes in the housing industry both because governments have social objectives in housing and because of the need to improve efficiency of production. The government's role is elemental by a range of factors: historical, demographic, economic, social and ideological. Together these factors influence land planning, housing policy and housing production.

The housebuilding industry has a number of special attributes both in the nature of its products and in the production process: completed houses are durable, the location is specific, and housing units show heterogeneity in type, size, and design. The stages of production, from acquisition of the land on which to construct housing to the sale of the completed dwelling to a customer, are complex; in particular, 'contracting' rather than integration is prevalent in the building process. In most advanced countries of the world, the housebuilding industry has grown gradually during the post-war period by continuing traditions that have had a long history. In these countries, housebuilders have generally become specialised in the housebuilding business and the large building firms produce a variety of houses all over the country.

The Korean housebuilding industry has grown rapidly over the relatively short period during the 1970s and 1980s. With high economic growth in the 1970s and the 1980s, the population became concentrated in the large cities, especially in Seoul. Rapid economic growth has increased the demand for housing in these cities during the past three decades and the higher household income has also mitigated the problem of affordability to a large extent. The result of the accumulation of these pressures through the 1970s and early 1980s was a housing shortage particularly in the large cities. The supply of housing in the mid 1980s could not meet the demand. What made the situation worse was the lack of developable land. There has been a tight limit in residential land use, as about 70 percent of the total land was 'greenery area' such as mountains, green belt area designated around large cities and only a small percent of the total land was designated as a developable area. In this circumstance, the government has tightly regulated land use for housing and even become involved in residential land development and allocation in 1980s.

Some of the major housing problems as perceived by the government over the past 30 years were: housing shortage, a short supply of residential land, and housing price inflation and speculation. One single goal that has been persistently pursued by the Korean housing policy was 'residential stability', implying that families are entitled to maintaining a stable and comfortable residential environment. The Korean government's housing policy consistently upheld three basic objectives: expansion of the housing stock, stabilisation of the housing price and equitable distribution of housing welfare.

During the 1970s and 1980s the government's policy emphasised control over the excess demand for housing and over the sale price of houses. As demand rose, so did the price and the only way to moderate the rising price seemed to be to control demand. However, the demand-control approach did not work and the government decided to directly control the sale price. To this end the government became deeply involved in the demand side of the housing market. Various policy measures for stabilisation of the housing price and demand control measure were introduced. The demand-control approach to housing problems would not work as long as there existed a significantly large amount of excess housing demand to be met. Furthermore, the approach distorted the housing demand structure. Housing demand was less sensitive to the changes in market price and income as evidenced by a number of studies. Instead, the demand turned out to be more responsive to the changes in capital gains, i.e., the difference between the purchase price and the price at which the unit was sold in market. Government policy seems to be partly responsible for the change in housing demand behaviour in the respect that housing was viewed more as an investment asset than as a consumption good.

In the 1980s, the government reckoned that a permanent and the most feasible solution would be to expand housing production in a massive scale. Such an effort appeared by the mass construction plan for housing, called 'the construction programme for two million dwellings' during 1988 and 1992. The purpose of this mass construction plan was to alleviate the chronic housing shortage in the Seoul metropolitan area. One of the key strategies to achieve its goals was the supply of a large amount of residential land. The government developed a large amount of residential land in the capital area and provided it to the private builders. Expansion of housing credit and the removal of various regulations restricting residential development were followed to achieve the plan successfully. As a result of mass construction policy, since 1988, the rate of investment in housing increased to 7-8 percent of the GNP, and the average number of new constructions to 500-600 thousand dwellings from about 200 thousand in the 1970s and 1980s. Unlike the failure of demand-control policies, the planned two million dwellings were completed successfully. During the mass construction period, the housebuilding industry experienced its highest quantitative growth, and also underwent significant restructuring. Some commentators are clear that the mass construction plan initiated by the Korean government contributed to the rapid growth of the industry. On the other hand, most housebuilding firms criticised the government intervention's negative effects on the sound development of the industry. A study of the Korean housing industry suggested that the industry exhibited a number of problems: the industry was poorly structured and disoriented, highly concentrated but poorly integrated both horizontally and vertically, with input factor industries as financial and manufacturing industries. There were also several arguments that the distortion of the production and supply sides were as critical as the demand side.

The Korean housebuilding industry has rapidly grown in line with the country's economic development. What is outstanding is that during the growth period since 1980s, the government intervened strongly in the private housebuilding industry. As a result, the Korean housebuilding industry is known as one of the industries most regulated by the government.

The primary intention of this thesis is to investigate how the Korean housebuilding industry has grown under the government's regulatory environment. This research started as there were few studies on supply side, compared to a lot of studies carried out on the demand side of the Korean housing market. This is the first detailed study on the growth and changes of the Korean housebuilding industry. Research was undertaken during the period between 1980 and 1995, encompassing the industry's first stage of growth (before 1988), its highest growth period (1988-1992), and its slow-down period (after 1992).

1.2 Objectives of the Thesis

This research aims to investigate specialities of the Korean housebuilding industry and to evaluate the efficiency of the industry. Focus will be on investigation on resultant attributes due to the government's regulations on the supply side of the housing sector. Another important intention is to show how and whether the government's pressure on house production might generate the efficiency outcome in the housebuilding business and overall industry.

In this context, a general research question is: how has the Korean housebuilding industry developed under the regulatory environment ? More relevant questions may be derived; what is the ideal type of production structure in the modern housebuilding industry and is the ideal type applicable to Korean housebuilding ? Is the current structure of the housebuilding business and of the building firms' strategy efficient ?

First, building firms' production structure will be examined. This will allow what changes have taken place in the production process and production structure. Thereafter, overall assessment of efficiency of the production structure will follow. The optimum scale in which building firms might operate under current conditions can be suggested.

The detail objectives of this thesis will be pursued in four stages. The first stage is to investigate the structure of and the changes in the Korean housebuilding industry during the 1980s and 1990s. In what follows we will examine the specific attributes of the Korean building industry and firms' behaviour during the period. The second stage consists of an analysis of the structure of the housebuilding business with a view to evaluating the efficiency of its production structure. Cost structures and their relationship to scale and productivity will be examined. These considerations may have implications for the building firms' behaviour under the regulatory circumstances that existed in 1980s and 1990s. In the third stage, the strategy of diversification adopted by housebuilding firms will be considered. The changing pattern of diversification will be examined, concentrating on the different approaches by the firms which have diversified. The motives behind their diversification will also be investigated. Finally, the fourth stage will bring together these elements to generate an overall suggestion of the housebuilding in Korea. We will investigate the problems the industry has faced and the overall efficiency of the building firms' production structure. The impact of government policy and environmental change on the growth of the industry will also be addressed.

1.3 Contents of the Thesis

Chapter 2 describes the housing situation which has prevailed over the last thirty years. This chapter also sets out the framework of government regulations and their effects on the firms' business, and then discussion moves on to the attributes of the Korean housebuilding industry and its growth, as well as the changes in its structure. In Chapter 3, the relevant theories about nature of the housebuilding industry, how building firms operate their business and what kind of strategies the firms pursue to grow will be considered. The experience of other countries will also be examined in order to provide a framework for detailed empirical analyses. Chapter 4 develops research questions and hypotheses derived from the current literatures on the structure of the housebuilding industry, the building firms' behaviour and the influence of these elements on the efficiency and success of the industry. Four research areas are developed for the further, detailed investigation in the subsequent chapters of this thesis.

Chapter 5 investigates the production process of the Korean housebuilding business from the firms' point of view. An effort is made to determine how firms made decisions about operating strategies, the range of activities they undertake, and the way they negotiate land purchasing contracts, manage their labour, and handle materials. Attention will be given to examine the governance structure observed in the production process and the determinants of that structure. Chapter 6 reviews the efficiency of the housebuilding business. An investigation is made into the way in which costs of material, labour and contracting are affected by the size of building projects and by price changes in the input factors. The relationship between paired input factors, as well as the industry's productivity and technical progress in the Korean housebuilding sector are also examined.

Chapter 7 examines the diversification strategy of the firms engaged in the housebuilding industry. The extent and type of diversification, the changing patterns of diversification and the relationship between building firms' diversity and performance are analysed. Chapter 8 attempts to explore the possible motives behind diversification in Korean housebuilding firms. Chapter 9 evaluates the efficiency of the firms' operations as a whole. The cost and profit structure of the multi-product firms will be examined first, followed by economies of scale, economies of scope and cost complementarities which are derived by estimating multi-product cost function. This chapter will conclude by suggesting the optimum scale on which building firms should operate in the current situation.

Based on the arguments made in the previous chapters, Chapter 10 will offer some conclusions about the way in which the housebuilding business has been operating and the firms' response to current circumstances. The effects of changing government policy on both the individual firm and the industry as a whole are investigated and policy changes are suggested.

Chapter 2 Growth and Changes of Korean Housing Market and Housebuilding Industry: the Nature and Specialities

This chapter aims to review the growth and changes of the Korean housing market and the housebuilding industry for last three decades. In order to provide a baseline for study, the housing situation and changes of government' housing policies are briefly reviewed. We also discuss how the housebuilding industry has grown under the regulated circumstances and what the effects of government's regulations are on the industry. Finally, the current structure of the Korean housebuilding industry is reviewed.

2.1 Overview of the Korean Housing Market

2.1.1 Changes in the Housing Situation

Korea has experienced remarkably rapid economic growth since the 1970s and per capita GNP reached US $10,000 in 1995. With the fruit of such economic growth, the housing situation also has substantially improved to such an extent that the number of housing units per one hundred households increased from 69 in 1987 to 92 in 1997. Also, the average size of a housing unit was about 85m^2 in 1997 up from 49 m^2 in 1987 (KRIHS 1998). The housing situation can be briefly reviewed by housing shortage, housing price inflation and overcrowding.

(1) Housing shortage

The salient nature of the Korean housing problems was a continuously declining housing supply ratio in urban areas. The shortage had its roots in the wartime destruction of a major portion of the existing stock and the north-to-south migration of over a million people during and after the Korean War. The large initial gap between housing units and households was further aggravated by the high population growth in the 1960s, rural-to-urban migration and changes in the family structure in the 1970s and 1980s.

The housing shortage has been measured in terms of the number of the housing stock over that of the households. Its inverse is the housing shortage rate. The changes in housing shortage situation are shown in Table 2-1. Between 1960 and 1990, the number of households expanded by 5.9 million, or 242 percent, but there was only a net addition of 3.7 million housing units to the inventory, or an increase of 207 percent. As a result, the housing shortage rate increased from 17.5 percent in 1960 to 29.6 percent in 1990 until the government launched the Construction Programme for Two Million dwellings (1988-92).

Table 2-1 Changes in population and housing(1960-95) (unit: 1,000, percent)

	1960	1970	1980	1990	1995
Population	24,982	30,882	37,436	43,411	44,609
Households(A)	4,198	5,576	7,471	10,167	11,133
Housing Units(B)	3,464	4,360	5,318	7,160	9,205
B / A (%)	82.5	78.2	71.2	70.4	82.7

Sources: National Statistical Offices (NSO), *Census of Population and Housing*, Economic Planning Board (each year)

Housing shortage affected the housing tenure pattern. Korea had long been a nation predominantly of home owners, as indicated in Table 2-2. In 1970, 91.7 percent of housing units were owner-occupied, whereas 8.3 percent were of rental status. In the last 20 years the ratio of home ownership has decreased substantially to 78.9 percent. The ratio fell even further down to 74.9 percent in 1995.

Table 2-2 Changes in home ownership (1970-1990) (unit: 1,000, percent)

	1970		1980		1990		1995	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total Units	4,360	100.0	5,318	100.0	7,160	100.0	9,205	100.0
-Owner occupied	3,996	91.7	4,621	86.9	5,653	78.9	6,893	74.9
-Renter occupied	364	8.3	697	13.1	1,507	21.1	2,312	25.1

Source: NSO, *Census of Population and Housing*, Economic Planning Board (each year)

(2) Housing price inflation

Housing price inflation was as critical as the shortage problem itself. The price of housing rose almost five times during the 13-year period of 1975-88, while the nation's GNP grew less than three times in real terms. Table 2-3 below shows how housing prices changed in the late 1980s.

There were many reasons being cited for the housing price spiral: for example, inflationary pressure and a lack of investment alternatives elsewhere, yielding a return comparable with that of housing investment. These reasons were certainly plausible, but more a fundamental reason seemed to be excess demand, combined with skewed distribution of income and wealth.

The fear of speculation existed all the time whenever high rate of profit was foreseen on short-term transactions. The speculative fever, once started, almost instantaneously spread out to the upper-middle class and an expectation that the price would rise even higher led to the 'pent-up demand' (KRIHS 1998).

Table 2-3 Changes in housing prices(1987-1990) (unit: percent)

	1987	1988	1989	1990
All cities (apartment)	7.2 (10.0)	13.2 (20.1)	14.6 (20.2)	5.9 (6.4)
Seoul (apartment)	2.1 (4.7)	9.1 (18.4)	16.2 (19.0)	7.5 (8.6)

Source : Korea Research Institute for Human Settlement (KRIHS)

(3) Overcrowding

Overcrowding was another important indicator of substandard housing. It is not a property of housing quality *per se*, but the 'fit' between the size of the unit and the number of occupants. The degree of overcrowding is generally measured in two ways: the ratio of persons per room and per capita floor space. The former is a better indicator of function and privacy to determine over- and under-occupied dwellings.

Table 2-4 Average persons per room and per capita floor space

	1960	1970	1980	1990	1995
Persons per Room	2.5	2.3	2.0	1.5	1.1
Per capita floor space(m^2)	n.a.	6.6	9.9	13.9	17.6

n.a.: Not available
Source: Ministry of Construction and Transportation,
An Assessment of Korea Housing Policy and Future Policy Direction, 1995

The Table 2-4 shows that living conditions had been substantially improved in the last three decades. The average number of persons per room decreased from 2.5 in 1960 to 1.1 in 1995, and per capita floor space increased from 6.6m^2 in 1970 to 17.6 m^2 in 1995. This is quite high as compared with the world standards. The United Nations recommended room occupancy density is 1.5 persons per room and per capita floor space is 13.2 m^2. It should be noted, however, that the improvement in room occupancy density and floor space has been attributable to the decrease in household size as much as to the improvement in housing size *per se*.

There were a lot of obstacles that Korea had to overcome to improve the housing situation. In the following section government's efforts to achieve an ultimate housing goal, 'residential stability' will be reviewed in chronological order.

2.1.2 Changes of the Government's Housing Policies

Some of the major housing problems as perceived by the government were housing shortage, housing price inflation and speculation, and a short supply of residential land. Other related problems included overcrowding, inadequate quality of housing services, squatters etc. Obviously these problems were all interconnected; there was a short supply of housing resulting from that of residential land, which in turn caused the housing price to inflate. And persistently the rising price of housing invited speculators into the housing market. Housing policies as government's effort to solve these problems and the changes are briefly discussed by time (KRIHS 1998).

(1) the 1960s: institution building period

The five-year economic development plan started in 1962, but housing issues were only marginally dealt with. The government borrowed funds from overseas to finance site and services projects yet the government's actual investment was negligible. Most funds being secured were invested in the basic infrastructure and only insignificant amounts of resources were set aside for housing from the government budget. The housing supply ratio was almost 80 percent and the housing shortage was not considered as a priority problem and thus, the government did not feel the pressure to allocate budgetary funds for the housing sector.

However, in the latter part of the 1960s one should note that various housing delivery organisations came into being, including the Korea National Housing Corporation (1968) and Korea Housing Bank (1967). The Housing Policy Division was established at the Ministry of Construction and relevant laws and regulations were either newly enacted or substantially modified. Furthermore, the government revised the housing bank law to set up a house mortgage system. It should be pointed out that most of the institution building works were completed in this period, which helped formulate more effective housing policies in the ensuing years. In the late 60s house prices rose seriously and a special law was adopted to discourage the speculative activities, which was the predecessor of the anti-speculation measure introduced later.

During the period 1962-1971 a total of 866,000 units of housing were constructed; 326,000 units during the first five years and 540,000 units during the next five years. The public sector's share was only 12.5 percent.

(2) the 1970s: period of policy experimentation

The country went through rapid industrialisation and urbanisation throughout the 1970s, and consequently, household income rose quite rapidly, which pushed housing demand up to the extent that it increased by almost 10 percent a year. Housing shortage became critical, particularly in large metropolitan areas like Seoul and Pusan. The housing supply ratio fell drastically even to below 60 percent in large cities down from 80 percent in the 1960s.

The government enacted the Housing Construction Promotion Law in 1972 in order to meet the increasing demand for housing. It mandated the government to develop the massive housing construction plan and to draw upon a set of regulations for effectively implementing the plan and promoting the housing industry. The plan was intended to produce up to 2.5 million housing units over a ten-year period 1972-81. However, the plan did not move forward; for one thing, the government did not make any investment into housing while most of its investment funds were put into developing the heavy industries. The other reason was housing speculation. As the price of housing rose tremendously, the government's immediate concern at that time was to stabilise it. Housing speculation was particularly rampant in the period 1978-79 and the situation was very serious. Various anti-speculation measures were devised to discourage purchasers from speculative profits, including a land transaction permit system and a standard land value announcement system. Criminal charges were made against the illegal transfer of properties to avoid taxes.

Private developers were not allowed to engage in residential land development and instead, the Korea Land Development Corporation was established to carry out them on government's behalf. A price ceiling system was another device that discouraged housebuilders from speculative profits, being applied only to newly constructed apartment houses. The government set the sale price by which private developers had to abide.

With these measures strongly enforced, housing demand suddenly subsided and house price dropped overnight. The housing market became almost frozen; a large number of newly developed houses remained unsold and many housebuilders went out of business.

(3) the 1980s: the fight against housing speculation

The housing business cycle had a ten-year peak in the late 1970s, but it suddenly receded as a result of strong anti-speculation measures. The industry suffered from severe recession. Thus, housing policy of the early 1980s started with various incentive measures to promote housing construction business. The government also relaxed the anti-speculation measures, e.g., lowering the real estate transfer income tax rate. These measures, combined with the recovery of overall economy, ignited another round of housebuilding business cycle. The market became heated up a few months later, but the government had to cool it down again by reinstating strong anti-speculation measures.

In order to solve the absolute shortage problem the government initiated the Construction Plan for Five Million Houses between 1982 and 1991, but the military government at that time did not push it through because government's economic officials advocated that the plan was too costly to implement. Instead, it took legislative actions to help consumers and tenants secure housing rights: for example, the Tenant Protection Law was revised to reinforce the tenants' rights to adequate living accommodation.

Additionally, the government introduced the 'bond-bidding' system in 1983 as a device to discourage speculative motives in housing purchase on the one hand, and to 'tax away' a large portion of the windfall gains from both real and potential speculators on the other. A house buyer had to participate in the competitive bidding process when purchasing a newly built condominium unit. The highest bidder won the unit and was obliged to purchase government bonds in an amount as pledged in the bid before the sale was officially executed.

Some measures were administrative in nature. For example, the government modified regulations on apartment sales to disqualify some people from apartment purchase. Previously one was allowed to bid for the second newly built apartment unit three years after purchasing the first one. But the new regulation extended the period to five years, and thus it helped reduce the number of market participants substantially. At the same time, the Office of National Tax Administration occasionally investigated 'professional speculators' for tax evasions and the source of funds when purchasing real estates and announced their names in public.

The other important measure was the sale price ceiling system. This was basically designed to control the sale price of the newly built condominium unit and thus, to stabilise the housing price. Housebuilders could not set the sale price on their own. They had to abide by the price as 'uniformly' set forth by the government. This scheme was initiated in 1983 as a temporary device to put a lid on the escalating sale price of the newly constructed apartment units. No attempt was made, however, on the part of the government to do away with the measure until very recently, although it was recognised that such a device had adverse effects on the housing market. It controlled only the sale price and thus, indirectly the costs of housing production, and had nothing to do with the market price.

(4) a period of mass production:1988-1992

Government attitude toward the housing sector changed overnight in 1988. It developed the construction programme for two million dwellings in 1988-1992 and virtually poured the nation's resources -financial and otherwise- into the housing sector to facilitate mass production. It also relaxed planning and land use regulations to allow for more intensive residential development. The plan was successful because it served as an effective vehicle to provide investment funds and residential land, the two most essential ingredients of the massive housing construction.

However, the plan necessitated other types of government intervention into the housing market. Almost all the housebuilding activities were regulated one way or the other, including procurement, pricing and particularly the sale. Besides, the plan's success depended largely on housing speculative motives: people purchased houses to earn capital gains. Thus, a price spiral was inevitable to sustain the housing market. This led to the bubble economy and the country is still suffering from it.

For successful achievement of the construction programme for two million dwellings, the key strategies were: supply of a large amount of residential land, expansion of housing credit, and removal of various regulations restricting residential developments.

First, the government designated close to 68 million pyong of land for residential development purpose throughout the country in accordance with the National Land Use and Management Law. They were mostly located in large urban areas, some within the developed area, but mostly in peripheral areas currently zoned as 'greenery space'. The quasi-governmental bodies such as the Korea Land Development Corporation (KLDC) and the municipalities were authorised to purchase a large amount of cheap land, mostly agricultural and greenery lands, and to convert them into residential uses with some improvements thereupon. The serviced lands were sold either to such public entities as the Korea National Housing Corporation (KNHC) at cost or to private builders at the market equivalent prices. In order to expand housing construction in the capital region the government announced the construction of five new towns in 1989. There was lack of developable land in Seoul. This forced the government to move outside of the Greenbelt Zone.

Second, with this measure, the government relaxed land use regulations. In particular, density control was substantially eased to allow for more intensive housing development. Deregulation of land use control was followed by relaxation of design standards in certain districts of large cities. Land use conversion was also made easier for housing developments. The primary intent of these measures was obviously to build more housing units, given the limited amount of residential land in urban areas.

Table 2-5 Provision of housing funds (unit: in 100 million won, %)

	1987	1988	1989	1990	1991	1992
NHF 1)	5,914 (45.4)	6,311 (38.4)	11,739 (38.6)	31,481 (50.6)	29,129 (48.5)	27,639
KHB 2)	5,219 (40.0)	7,725 (47.0)	15,535 (51.1)	18,542 (34.9)	19,389 (36.9)	25,494
CNB 3)	1,530	1,941	1,485	3,298	5,000	n.a.
Other Banks	348	214	268	206	500	n.a.
Life Ins.com.	26	252	1,363	4,253	2,000	n.a.
Total	13,037	16,443	30,390	57,780	56,018	

Source : The Korea Housing Bank

1) NHF : National Housing Fund

2) NHB : Korea Housing Bank

3) CNB : Citizens National Bank

Lastly, the government supplied a large amount of housing funds. Table 2-5 compares the amount of housing funds supplied by financial institutions before and after the plan was actually implemented in 1988. The supply of the housing funds quadrupled in less than four years from 1.3 trillion won in 1987 to 5.32 trillion won in 1990. Note also the way in which the government controlled National Housing Funds (NHF) had grown during the period.

The plan was very successful in promoting housing construction on a massive scale. As shown in Table 2-6, the first year saw new construction of 317,000 dwelling units (on the basis of building permits issued). The figure represented an increase of 31.2 percent over that of 1987.

Table 2-6 Annual construction of housing units (1988-92) (unit: 1,000)

	1988	1989	1990	1991	1992	1988 -1991	1988 -1992
Permit Based							
Total	317	462	750	648	600	2,177	2,777
- Public	115	161	270	220	250	766	1,016
- Private	202	301	480	428	350	1,411	1,761
Completion Based							
Total	287	353	572	695	631	1,907	2,538

Source: Ministry of Construction and Transportation, Economic Planning Board

From the second year on, the number of residential building permits issued accelerated to a maximum level of 750,000 units in 1990. The 1989 figure represented an increase of 40 percent over that of 1988. Even in 1991 over 648 thousand units of building permits were issued, and the four-year aggregate amounted to over 2.17 million by the end of 1991. In other words, the two million unit construction target was achieved a year ahead of the scheduled time period. The year of 1992 issued over 600,000 units of building permits, implying that over 2.77 million units were supplied for the entire five-year planning period, approximately 35 percent more than the initially-targeted two million units. Over-achievement was also foreseen even on the basis of housing completion. Housing completions doubled within a two-year period from 287,000 units in 1988 to 572,000 in 1990. This was quite substantial, given the fact that the total number of housing units produced up until 1987 averaged less than 240,000 a year. The housing completion rate peaked at 695,000 units in 1992.

Expansion of the housing stock obviously helped reduce the housing shortage ratio. The housing supply ratio reached 79.1 percent by the end of 1994, up by almost 10 percent from 69 percent in 1987 when the plan was drawn up. Massive housing construction also helped stabilise house prices and rents. In fact, house prices have gradually declined at a rate of 0.3 to 1 percentage point per month since May 1991 according to a monthly housing market survey conducted by the Korea Housing Bank. The same survey found the rent falling between 0.7 percent and 1.6 percent over the same period. Further declines in both house prices and rents were recorded in ensuing months.

2.2 Growth and Changes of the Korean Housebuilding Industry

2.2.1 Physical Growth of the Industry

As a result of the mass construction plan, the housing supply ratio, which means the ratio of the number of existing houses to the number of households requiring independent houses, continuously increased. It reached up to 82.4 percent in 1995. Most of the new dwellings were built in Seoul, capital region and large cities as shown in Table 2-7. Since 1985, about 50 % of new dwellings were built in Seoul and capital regions and the other 20 % were built in major large cities. The reason may be that the urban population rapidly increased due to the concentration of economic power in these areas and the situation led naturally to high housing demand in the urban areas.

Table 2-7 Output of new construction (unit: dwellings in start basis, %)

	Average '72-'76	1980	1985	**1989**	**1990**	**1992**	1994
Total	152,118 (100)	211,537	227,362	**462,159**	**750,378**	**575,492**	622,854
Seoul	30,790 (20.3)	53,375 (25.2)	52,529 (23.1)	**76,273 (16.50)**	**120,371 (16.0)**	**106,441 (18.50)**	86,220 (13.8)
Capital Region[1]	14,412 (9.5)	40,413 (19.1)	69,551 (30.6)	**133,015 (27.78)**	**258,426 (34.4)**	**176,542 (30.67)**	185,186 (29.3)
Four large cities[2]	13,592 (8.9)	30,350 (14.3)	30,996 (13.6)	**90,406 (19.56)**	**142,738 (19.0)**	**123,105 (21.39)**	135,157 (21.7)

Source: Ministry of Construction and Transportation.
1: Incheon city is included in the capital region.
2: Four Cities: Pusan, Daegu, Kwangju, Daejeon

Although new houses have been built mainly in these areas, the housing supply ratios in Seoul and large cities appeared still lower than average (68-71 percent) as shown in Table 2-8. The reason is that the increase of households in those areas was much higher than the increase of houses. This explains why the shortage of houses is still a major problem in Seoul and large cities.

Table 2-8 The housing supply ratio in large cities

(unit: %)

	Seoul	Capital regions		Four large cities			
		Inchon	Other capital region	Pusan	Daegu	Kwangju	Daejon
1993	67.85	69.56	67.45	61.12	71.66	79.16	72.53
1994	66.96	76.31	68.29	67.01	68.73	76.02	82.33
1995	68.00	89.90	87.80	71.00	71.20	81.00	90.70

Source: Municipal Yearbook of Korea, 1995, Ministry of Home Affairs

These facts imply that more houses should be constructed in Korea in view of the fact that many other advanced countries achieved 100 % of the housing supply ratio in the 1970s. Housing shortage, especially in Seoul metropolitan area and other large cities, is more severe. Furthermore, with the increase of household income, housing demand has also been changed towards preference for more spacious and diverse types of houses, high-technique houses and well-located etc. The Korean housebuilding industry needs to be more developed both on the quantitative and qualitative sides.

2.2.2 Effects on National Economy

Housing and the national economy are connected in a number of ways. Housing construction generates jobs and income. Its employment impact is significant because the construction industry is basically labour-intensive. The industry is also an integral part of the national economy in terms of its share in national output and fixed capital formation. It also affects the cyclical component in GNP, and therefore, it has been used as a macro-economic tool in adjusting and moderating the economic cycle. The effects of the massive housing construction upon the national economy are not easy to assess, but they ought to be substantial.

There are several ways in which the size of the industry can be measured and expressed. The value of housing production has also been expressed as a proportion of the gross national product (GNP). Table 2-9 shows housing investment ratio in Korea. The value of work done by the housebuilding industry was 2,724 billion won in 1975 and 3,951 billion won in 1980. When expressed in relation to the total value of goods and services produced in Korea (GNP), they were 5.1 percent and 5.4 percent of the total in each year. Since the end of the 1980s when 'the construction programme for two million dwellings' started, housing investment had increased to 14,577 billion won in 1990 and 15,373 billion won in 1992. The housing investment ratio of GNP have increased to 8.2 percent of GNP in 1990 and 7.5 percent in 1992.

Table 2-9 Housing investment (unit: dwelling, billion won in 1990 fixed price)

	1975	1980	1985	**1989**	**1990**	**1992**	'95
Number of Houses built	175,951	211,337	227,362	**462,159**	**750,378**	**575,492**	619,057
Housing Investment(A)	2,724	3,951	4,865	**9,050**	**14,577**	**15,373**	18,570
GNP (B)	53,109	73,418	108,130	**162,634**	**178,262**	**204,231**	254,705
Ratio (A/B)	5.1	5.4	4.5	**5.6**	**8.2**	**7.5**	7.1

Source: The Bank of Korea

The attribute of the Korean housebuilding investment is different from those of many other advanced countries. The investment trend of the advanced countries remained at 4-5 % during the 19th century and in the 1950s and 1960s remained at between 6 and 7 % (Ball, 1996 B). Housebuilding investment in Korea did not happen until 20 years later. In fact, the Korean housebuilding industry started to develop in the late 1970s. Since the mid 1980s, the investment ratios increased to 7-8 % which is a similar level to those of industrialised countries 30 years ago.

Another measure of the vital role of the housebuilding industry in the economy is industry's contribution to investment measured by gross fixed capital formation. The construction kept constantly about 60 percent of the gross fixed capital formation, whereas housebuilding was only 2.3 percent in 1975 and it rapidly increased to 15 percent in 1985 and 21.5 percent in 1995.

Table 2-10 Fixed capital formation of housing investment

(unit: billion won in current price)

	1975	1980	1985	1990	1995
Gross fixed capital formation	2,745	12,230	23,435	66,569	128,664
Construction (%)	1,548 (56.39)	6,811 (55.69)	13,202 (56.33)	39,605 (59.49)	76,666 (59.58)
Housebuilding (%)	621 (2.3)	2,190 (17.9)	3,521 (15.0)	14,577 (21.9)	27,619 (21.5)

Source: The Bank of Korea, ' National Accounts', 1994.

The house has been commonly regarded as an 'end product'; however, the housebuilding industry has greatly influenced other industries such as land, labour and material industries, which are important input factors of the housebuilding industry. Housebuilding necessitates other construction works such as streets, sewers, utilities, stores and other commercial facilities, schools and other public buildings. The volume of such works, of course, depends not only on the scale of housebuilding projects, but also on their location. Substantial consumer goods such as furniture, floor coverings, washing machines and other mechanical household equipment are necessary for housing production. Besides, the investment in housebuilding promotes employment and increases the demand of building materials.

There are several approaches to measuring the multiplier effects, such as the employment generated in the manufacturing industry, distribution of building materials and equipment, and building workers employed at the construction site, or the value of orders for materials placed per amount of residential construction. Such studies have been undertaken since the 1930s in the USA. These studies need to be brought up to date and refined to indicate variations in multiplier effects among different countries and over the different times. For comparison among several countries, the multiplier effects of expenditures for housing production warrant more investigation.

Table 2-11 The estimate of induced effect of housebuilding investment (1990)
(unit: billion won, 1000 men)

	Induced production	Induced value added	Induced Import	Induced employment
Induced effect of housing investment	29,573	13,203	1,906	801
Ratio of national economy	16.59 % /GNP	7.30 % /GNP	3.38 % /total import	5.04 % /total employment

Source: A Study on Korean Housebuilding Industry, KRIHS, 1996.

As an example, a Korea Research Institute for Human Settlement's study (KRIHS 1996) estimated the induced effect of housebuilding investment. In 1990, 14,577 billion won (about 11.2 thousand million pounds) housebuilding investment resulted in 29,573 billion won (about 22.7 thousand million pound) production effect which was 16.59 % of GNP (about 178,262 billion won). The induced value-added amount was 13,203 billion won (about 10.16 thousand million pounds) consisting of 7.3 % of GNP and the induced import amount was 1,906 billion won (about 1.47 thousand million pounds), 3.38 % of the total import. The number of employed induced directly and indirectly was 801 thousand men which represented 5.04 % of total employment. The number of labourers directly employed by housing investment was 327 thousand people.

Another recent study (KRIHS 1998) by macro-economic model using 1990 real figures shows that a 10 % increase in housing investment contributed to a 1 % increase in GNP, a 1.4 % increase in money supply (M2), a 0.5 % increase in employment, and a 2 % increase in fixed capital formation. The same study also pointed out that a 10 % increase in housing investment induced a 0.6 % increase in imports and increased the overall balance of payment deficit by 93 million US dollars. It also affected overall price levels as it raised the GNP deflator by 0.5 %. The estimated effect of the housebuilding investment suggests the importance of housebuilding as an identifiable industry.

2.3 Government Intervention in the Housebuilding Industry

2.3.1 Government Intervention in the Production Stage

The Korean government's housing policies have been directly influential in the housebuilding industry. Especially during the mass construction period in the late 1980s and in the beginning of the 1990s, the government intervened in the whole production process, using several supporting tools and regulations. Many scholars argued that the government's involvement in the industry contributed to the rapid growth of the Korean housebuilding industry and the growth of the firms.

Figure 2-1 shows the contents of the government intervention in the housebuilding process. The government's major regulation in the housebuilding process can be summarised as four categories; entry regulation, intervention in two input factors; capital input and land input, regulation on production process, and regulation on the product. Appendix 1 shows each regulation's objectives, starting year and influences on the housebuilding business. In the following section, the details of government intervention and the influences on the building firms' behaviour will be discussed.

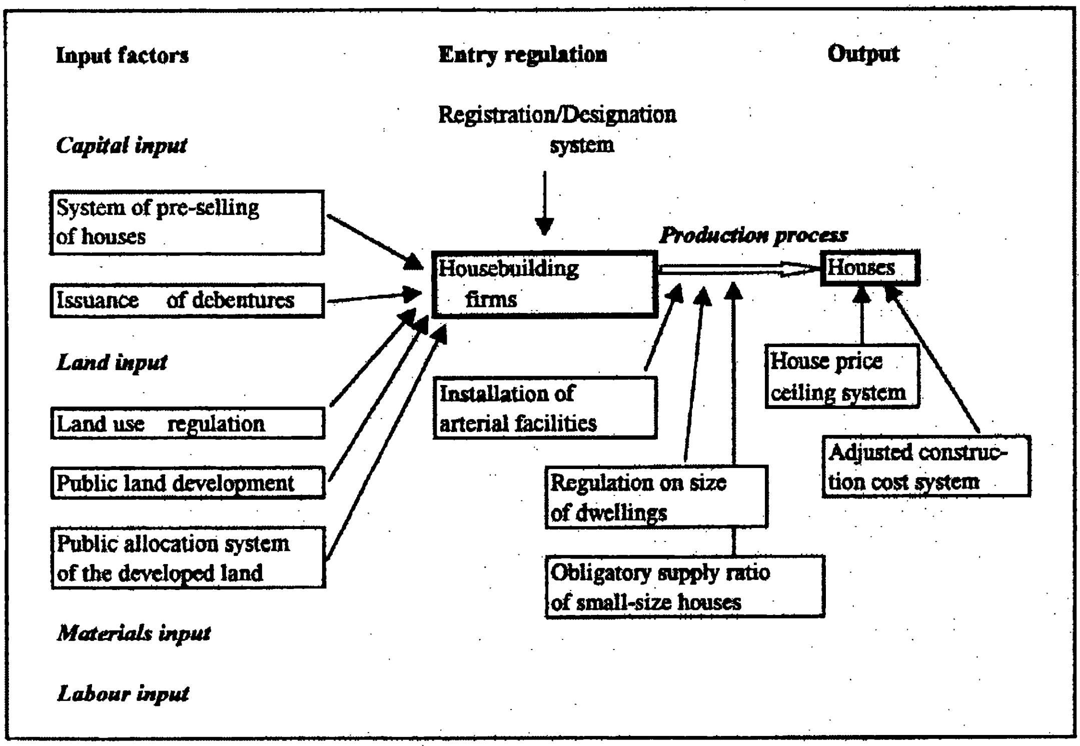

Figure 2-1 The government intervention in the housebuilding process

(1) Regulation on qualification of the housebuilding firms

The Korean government has regulated the entry into the industry by a registration system and a designation system. The registration system is a qualification system of the housebuilding business and was activated in 1979. The registration system was regarded as a kind of supporting system rather than a regulation in the housebuilding industry. This was because it was an alternative licence in order to encourage private construction firms to enter into the housebuilding industry when the government did not issue new construction licences from 1975 to 1988. Moreover, the conditions of qualification were not so strict.

This system was strengthened by the designation system in 1981 and the government strictly limited the number of designated firms. The government treated the designated firms distinctively from the registered firms by selling time of house, allowance on issuance of debentures and allocation of public land. The discriminative treatments had an influence on expanding firms' size. Most of the registered firms made a strong effort to be designated firms. They tried to enlarge their scale of business and size of firm to be designated by the government.

(2) Intervention on input factors

Regulation on land factor

Land use regulation, public land development and the public allocation system of the developed land are included in the government's intervention in land factor. These policy measures retain characteristics as a regulation.

❒ *Land use regulation*

Since the early 1970s when the land use regulation system was established in Korea, the system has become increasingly stringent. This means that the more strengthened the land use regulations are, the more restricted the private sector development becomes. The Korean government designated the possible area for residential housing as urban planning area by 'the Land Use and Management Law'. According to the law, only 2 percent of the total land was designated as a developable area for building and about 70 percent within that area was designated additionally as green belt. The facts tell us about the rigidity of land use in itself. If a private housebuilding firm retained some land in the residential zone in an urban area, there would be no great difficulty in performing the housebuilding business. Otherwise, the land use regulation was operated as an entry barrier into the business.

However, since 1993 the government has revised 'the Land Use and Management Law' to enlarge the residential developable area and to improve the efficiency of land use. The major change in the law was to rearrange ten usage areas into five areas and to heighten the possibility of land development. According to the revised law, 'semi-urban areas' and 'semi-agriculture and forestry areas' were included in the developable area, if the areas fulfilled certain conditions[1]. As a result, private builders could develop residential land only if the development size was less than 30,000m^2. This means that the

[1] In a semi-urban area, if the area retained a population of more than 250 or more than 50 households, residential land development was allowed within the area. In order to develop residential land, the area should be designated as a settlement district first and then should be classified into a residential area by the 'the Urban Planning Law'.

semi-agriculture and forestry area around the capital region and large cities became a new residential land source.

❐ *Residential land development regulation (public land development)*

The residential land development method has changed over time in Korea. In fact, since the beginning 1980s private developers were not allowed to engage in residential land development. The government has intervened in land development and even in the allocation process of the developed land. The government encouraged large-scale land development methods and strongly limited private building firms' participation in the development. The objective of public land development was to make it easier to develop a large-scale residential land in the circumstances of residential land shortage. Particularly in a case which a large plot of land was owned by multi-owners, it would be very difficult to buy in an adequate time. Only the government's expropriation right made it easy to proceed with a large development programme.

After 1980, more than 60 percent of total residential land was developed by the government. Particularly since 1988, when the mass construction plan for houses started, nearly all the residential land in the capital region was provided by the public land development method. Public land development was regarded as a supporting tool with the view that the central government developed large-scale residential land using the expropriation right and provided the prepared plot to building firms in a circumstance in which developable land was absolutely limited.

❐ *Public allocation system of the developed land*

Furthermore, since 1989 the Korean government has been involved in the allocation of publicly developed land. The public allocation system of developed land was operated as a subsequent policy measure of 'the public land development'. According to this system, the 'Minister of Construction and Transportation' was directly involved in the allocation of the developed land to housebuilding firms. First, the government allocates the developed land to two housebuilding firms' associations (those of designated firms and registered firms) and thereafter, the associations usually distribute the pre-allocated land to their membership firms, according to their own decision rule (known as the random method).

The possibility that firms get the chance to participate in the building project depends on the number of membership firms applying for the project every time. However, even though these firms were selected as participants of the building project, they could not choose the plot which they wanted as the land was distributed by a kind of random method. In a case where the distributed plot was not in a good location, the success of the project would not be guaranteed.

Considering that land is one of the important factors in the housebuilding business, the government-initiated land development and allocation policies are regarded as an important regulation against private housebuilding.

Intervention into capital input

Among the intervention into input factors, pre-selling system of houses and issuance of debentures are relative to the capital input factor. These are regarded as a 'supporting tool' rather than as a 'regulation'.

❒ *system of pre-selling of houses*

A system of pre-selling of houses was first introduced in 1978 for apartment housebuilding. Once building firms started the construction process, the firms could pre-sell the uncompleted apartment houses, according to the extent of the progress of the on-site building work. The timing by which the firm can sell houses is different between registered and designated firms[2]. For housebuilding firms, the timing by which to sell the unfinished house was very important. It was directly related to the inflow of money.

Table 2-12 shows the money flow in the apartment building business. In building apartment houses, the flow of money occurred by the following process. About 30-35 percent cost to total cost was necessary for purchasing the residential land and development. At this stage, most firms depend on either their own capital or private financing. Once the firms sold the apartment houses to 'the would be buyers', the firm could get some money from the buyers in advance. At first, the would-be buyers have to make an advance payment (20 % of total house price) when they contract with the building firms to buy the house. After that, about 60 % of the total price has to be paid at regular intervals. As soon as the building works are completed, the buyer has to pay the

[2] In case of designated firms, if they have finished more than 10 % of the whole building works, they could sell the houses. The registered firms have to finish more than 20 % of the whole building works in order to announce the sale of houses.

remaining 20 % as a final payment. Once the building firms selected the would-be buyers, the firms' financial burden would be lessened.

Table 2-12 Money flow in the apartment housebuilding

Production stage	Outflow	Inflow	
Acquisition of land and development stage	30-35 % to total cost		
Construction stage	65-70 % to total cost	payment from the would-be buyers	
		20% to total price	Advanced payment
		30% "	Midway payment
		30% "	Midway payment
		20% "	Final payment

To the firms that were suffering from chronic lack of capital, the system of pre-selling of houses played an influential role to mitigate the firms' financial difficulty. The advanced payment is utilised as the operating fund of firms. It is known that the advanced payment from the buyers consists of 30-50 percent of the total operating fund of the building firms.

❒ *Issuance of debentures*

The Korean government allowed the issuance of debentures in 1989 in order to encourage building firms to participate in the housebuilding business. The building firms have been able to issue debentures redeemable with houses since then. The building firms which issued the debentures had to construct houses in accordance with the issue conditions and redeem the debentures to those holding the right when the house was completed. The debenture redemption period may not exceed three years. The paid-in money of debentures is normally used for the purchase and preparation of residential sites, purchase of housing materials, and construction expense etc.

In the introduction period (1990 and 1991), most building firms issued debentures and they contributed to mitigate the firms' financial difficulty. The issuing conditions were very different between designated and registered firms. For designated firms, there was no limit in the condition and the size of issuing debentures, whereas there were some limitations for the registered firms[3]. However, since 1992, most of the housebuilding firms

[3]The registered firms should retain more than 500 million wons capital and hold a licence for the construction business. Moreover, their performance of housing construction should exceed two hundred dwellings per year for previous three years. The issuing scale of the debentures is also limited as less than average number of houses constructed for recent three years. Moreover, the registered firms should issue the debentures with a guarantee from 'a financial institution' or 'the Korea Housing Financial Co-operative'.

were rather less interested in issuance of debentures and the amount has decreased. The reason found was that the issuing condition of the debentures was not good enough to invest money, except for purchasing houses. There were some arguments (KRIHS 1995A) that in order to activate the issue of debentures, it was necessary to add the characteristics of convertible bonds to the debentures so that the bond holder could have the right to convert the bond with 'cash' or 'house purchasing' under certain conditions.

(3) Regulation on production process

❒ *Installation of arterial facilities*

One of the outstanding regulations in the production process is that any building firm which constructs more than one hundred houses per project or develops a residential site area larger than 16,500 m^2 should build several arterial facilities with the building project according to 'the Housing Construction Promotion Act'. Leading road, water supplies, drainage, electricity supply, gas supply or regional heating, and communication are included in the facilities. The government required installation of the facilities as a condition of the approval of the project.

❒ *Regulation on size of dwellings*

As a regulation in the production process, there is size regulation of dwelling. Since 1973, the limitation on size per dwelling had been applied only for 'the national houses' (houses less than 85 m^2) for low-income households. The background was that the public sector mainly constructed and supplied the small sized houses whereas the private builders may control the size of houses as their own decision. This means if housebuilders wanted to build large sized houses for medium-or high-income households, there would be no limitation in the size of houses.

However, since 1988 the limitation on size per dwelling has been applied on all the houses built by an approval of 'the Minister of Construction and Transportation'. The background was that housebuilding firms wanted to build only large sized houses because they could get higher profit due to the existence of scale economy in the production process. According to this regulation, any housebuilding firm cannot build houses larger than the size designated by 'the Housing Construction Promotion Act' since 1988.

❐ *Obligatory supply ratio of small-size dwelling*

There is another regulation related to size of houses, that is, 'obligatory supply ratio by small-size dwellings'. According to 'the Housing Construction Promotion Act', if it is considered necessary for balance between housing demand and supply, the Minister of Construction and Transportation may determine the building proportion of national houses (houses less than 85 m^2) within a 75 percent range of total floor area. Housebuilding firms should build some proportion of small size dwellings in every project, regardless of the regional condition and the location's situation. Before 1979, the proportion was more than 40 % of the total floor area. The proportion has been adjusted according to the demand or supply condition of houses as time changes[4].

Under this regulation, the firm could not reflect specific characteristics of housing demand in certain areas or regions to the housebuilding project. In the 1990s many firms experienced an imbalance between housing demand and supply. That is, a lot of small sized dwellings were produced in a certain area where demand was concentrated on large sized houses. It became a major reason to increase the number of unsold houses[5]. The unsold house was a main problem for the firms' financial situation and due to the financial burden, many firms have bankrupted since 1993.

(4) Regulation on the product

There is a regulation on the product itself. The house price control of the completed house has been considered as a most important regulation.

❐ *House price ceiling system*

Price control of houses is one of the major regulations in the housebuilding industry. The Korean government has regulated the sale price of newly built apartment houses since 1977. 'The house price ceiling system' aimed basically to stabilise housing prices by controlling the sale price of newly built apartment houses.

[4] After November 1979, the proportion was changed to more than 50 %. In 1981, the proportion was revised to 50 percent area to total area as the government tried to give more autonomy to private housebuilding firms. In 1993 the proportion was again strengthened into more than 75 percent from 50 percent.

[5] Actually since 1993 the number of unsold houses increased and there was a report that the 32.3 percent of total unsold houses were small-size houses (less than 18 pyong) and the ratio was increased (32.3% in 1993, 45.1 % in 1995). Ministry of Construction and Transportation, 1995.

At that time, the background of the house price control was explained as follows; since the mid 1970s the imbalance of housing demand and supply has led to an increase of house prices. Customers were not able to afford the high prices. Therefore, the government started to intervene in the housebuilding industry in order to protect the customers. From 1977 till 1981, the sale price per unit was controlled at a constant level, irrelevant to size of dwellings. The ceiling price was adjusted every year between 14.7 percent and 23.6 percent as shown in Table 2-13. During this period the social concern about the house price control was not so serious.

Table 2-13 Trend of house price ceiling system

(unit: ten thousand won per pyong)

	1977	1978	1979	1980	1981	1982	1985	1988
-less than 85 m^2 (25.7 pyong) -over 85 m^2	55	68	78	90	105	105 134	115 134	126.8 134
Increasing ratio per year(%)	-	23.6 %	14.7 %	15.4 %	16.7 %	0 % 27.6 %	3.1 % 0 %	3.3 % 0 %

Source: Ministry of Construction and Transportation
1 pyong = 3.3 m^2

After 1982, the price for large dwellings (over 85 m^2) was controlled constantly, whereas the price for small dwellings (less than 85 m^2) was sometimes adjusted. At that time, policy makers thought the house price ceiling system of newly built houses could lead to a fall in existing house prices. However, the regulation was not effective to stabilise the market price of existing houses. Instead, it brought about some side-effects such as concentration of demand on the newly built apartment houses by customers expecting capital gain and higher financial burden for the housebuilding firms etc.

❒ *Adjusted construction cost system*

Upon implementing the mass construction plan the government modified the price ceiling system in such a way that firms could reflect into price decision the cost increases in land, labour, and building materials. The government pronounced 'the adjusted construction cost system' in order to persuade housebuilding firms to participate in the construction plan. The important characteristic was that it recognised not only direct costs such as materials, labour, overheads, advertisements, design and inspection costs, but also interest cost of debts and even normal profit. The construction cost per pyong has been adjusted every year between 5 and 15 percent points against previous years as shown in Table 2-14.

Table 2-14 Adjusted construction cost (unit: ten thousand won per pyong)

Size	Floor	1989	1990	1991	1992	1993	1994	1995	1996
Less than 18 pyong	Less than 15 floors	98	113 (15.3)	123 (8.8)	131 (6.5)	138 (5.3)	146 (5.8)	153 (4.8)	168 (9.8)
	More than 16 floors	110	127 (15.4)	138 (8.7)	147 (6.5)	155 (5.4)	164 (5.8)	172 (4.9)	187 (8.7)
18-25.7 pyong	Less than 15 floors	98	113 (15.3)	127 (12.4)	135 (6.3)	142 (5.2)	150 (5.6)	158 (5.3)	168 (6.7)
	More than 16 floors	110	127 (15.4)	143 (12.6)	152 (6.3)	160 (5.3)	169 (5.6)	177 (4.7)	187 (5.6)
More than 25.7 pyong	Less than 15 floors	101	116 (14.8)	131 (12.9)	139 (6.1)	146 (5.0)	154 (5.4)	162 (5.2)	175 (8.0)
	More than 16 floors	113	130 (15.0)	147 (13.0)	157 (6.8)	165 (5.1)	174 (5.4)	183 (5.2)	196 (7.1)

Source: Ministry of Construction and Transportation

The adjusted construction cost system was considered as 'an improved method' from the point of view that it reflected an increase in input-factor price and land price and the cost could be adjusted every year. By this system housebuilders were able to differentiate the sale prices among houses within the total sale price of the building project, considering size of house or customers' preference. In fact, the adjusted construction cost system accelerated the building firms' participation in the housing production in the late 1980s. However, this was considered as only a short-term alternative and various problems associated with the house price ceiling system still remained intact.

2.3.2 Influences on the Housebuilding Business

So far, the government's regulation framework on the housebuilding industry has been explained. The government regulated firms' entry into the industry by a registration system. Especially since 1988 when the mass construction plan started, the government encouraged large construction firms to enter into the housebuilding industry. It treated large firms distinctively from the medium and small firms within this designated system. The government also introduced some supporting policy measures such as supply of housing funds, the system of pre-selling of houses, and issuance of debentures. The prepaid money from the would-be buyers of apartment houses and the paid-in money of debentures played a role in mitigating the building firms' financial problems. The public land development was regarded as another supporting tool in a view that the central government developed large-scale residential land using the expropriation right and provided the prepared plot for the building firms in a circumstance in which developable land was absolutely limited. Simultaneous with the government's supporting measures, the participation of the large building firms having capacity contributed to rapid growth of the housebuilding industry in the mid 1980s.

However, we cannot ignore the other effects of the government's intervention. Two types of regulation were of particular concern; one, land development regulation and the other, sale price regulation. Especially during the mass construction plan period, strict land use regulation, residential land development regulation, and public allocation system of the developed land influenced firms' business in various ways. The fact that the government is involved in land development means that building firms cannot expect any profit in the land development stage. Profit may be realised only in the building process. It is directly related to the firm's profitability. The fact that the government is involved in the allocation process of developed land also means that it intervenes in firms' business opportunity. The question whether the firms buy public land or develop the land by themselves is a very important decision and may influence the pattern of the firms' production process. If building firms purchased the developed and prepared land from the government, they would not need to carry out the site preparation and foundation works. Considering that land is one of the most important input factors, the rigid regulation on land has played a role as an entry barrier into the business.

Regulation on installation of arterial facilities resulted in an increase in costs and may affect the profits of the project. The regulation has been operated as another entry barrier to the housebuilding business. If the firms did not have enough capital to afford the facilities, they could not even participate in the building project. In the circumstances that the government encouraged large-scale development projects, the installation of arterial facilities gave much more burden to building firms and small firms without enough capital finally gave up participation in building projects. We found more regulations in the production process such as regulation on size of dwellings and regulation on obligatory supply ratio of small-size dwellings. Housebuilders wanted to build as large dwellings as possible, because they could earn more profit from them due to economy of scale. The regulation on dwelling size influenced negatively on the cost and even on the profitability of the project. In a case where the small sized dwellings were not matched to housing demand, the completed houses were not sold. Those regulations prohibited the firms' autonomy in the decision making process and affected marketability of the completed houses and even the project's profitability.

The sale price regulation has been considered as a major regulation to intervene in the building firms' business, because it controlled the firm's cost of housing production, thus adversely affecting its financial position. With the price control there was no incentive for housebuilding firms to improve the quality of housing because they did not need to compete with each other. It is somehow possible for large firms having high technique and enough capital to reduce costs through production innovation or process innovation. Some small firms having poor capital, low skill and little experience tried to reduce costs by using disqualified materials or by involving illegal processes or depending on low-cost contractors.

The sale price regulation has been criticised in that the house price regulation resulted in the deterioration of the industry by discouraging building firms from constructing high quality houses and by giving up the innovation efforts and R&D investment in housebuilding. Price control was also responsible for 'uniformity' in housing developments, lacking variety.

The various regulations made an important impact on building firms' behaviour. Land use and development regulations influenced accessibility to land, density of housing projects, and eventually both numbers of dwellings and land costs per unit. The regulations in the production process e.g. housing standard, housing type, and housing size influenced the quality and quantity of houses built. Sale price regulation controlled the price of houses. Housebuilding firms would have two options to increase profits: one was to stay in business by reducing costs of housebuilding and the other option was to avoid the regulation, that is, to divert into the other business. The latter option resulted in acceleration of the building firms' diversification. In the 1980s, it was observed that many housebuilding firms either gave up their business or diversified into other business.

2.4 Structure of the Industry

Simultaneous with physical growth of the industry, the industry has been restructured internally during the mass construction plan period. This section discusses major points of the restructuring.

2.4.1 Main Builders: the Nature of the Firms

The main builders of houses in Korea are classified into two categories. The first one is small builders who were predominant over the industry by the beginning of the 1980s. There are thousands of small builders and it is difficult to estimate the exact number, as the entry in and exit out of the industry are easy. Those who own residential land can start a housebuilding business only by employing a technician as required in 'the Architectural Act'. They normally build single detached houses or row houses on a small scale, less than 10 single detached houses or less than 20 row houses per year[6].

The other category includes designated and registered firms. The Korean government has regulated entry into large-scale housebuilding[7] by a registration and designation system. That is, only the firms certified by the government can participate in large-scale housebuilding. The registration system was regarded as a kind of supporting system rather than a regulation. The entry in and exit out of the industry were rather easy, as the qualifications of the registered firms were not so strict[8]. This system was strengthened by the designation system in 1980[9]. In order to pursue specialisation and expansion of housebuilding, the government designated a few leading firms retaining qualified technicians, capital and performance among registered firms. The objectives of the designation system were to extend house construction by fully supporting the firms with excellent achievement in the housebuilding area and to protect housing quality from careless building by small builders and to heighten reliability of the housebuilding firms.

Table 2-15 Number of housebuilding firms

Types of firms	1980	1985	**1989**	**1990**	**1992**	1995
Designated firms	54	55	**71**	**117**	**117**	115
Registered firms	1,301	2,079	**4,043**	**6,260**	**7,819**	4,144

Source: Ministry of Construction and Transportation.

6 1996 small builders' interview

7 Large-scale housebuilding means construction of more than 20 dwellings or residential land development of more than 10,000m^2

8 They should retain more than 3 hundred million won capital and more than one technician in the architectural work.

9 The qualifications of the designated firms are stricter. According to 'the Housing Construction Promotion Act', they should retain more than 5 thousand million won capital and more than 10 technicians in the building fields and have more than 300 houses annual performance for the recent 3 years.

Table 2-15 shows the numbers of the designated and registered firms. There were 54 designated firms and 1,031 registered firms in 1980. The government strictly limited the entry into the designated firm through the designation system. The number of designated firms was only 55 in 1985 and it increased into 71 in 1989 when 'the construction programme for two million dwellings' started. The numbers of designated firms increased into 117 in 1990 and then remained 115 firms without any increase as the government stopped designation after 1990. The numbers of registered firms has rapidly increased since 1989. Many firms entered into the business during the mass construction period between 1988 and 1992. In fact, the mass construction plan played an influential role in the increase of the firms' entry into the industry.

Figure 2-2 shows the increasing trend of the designated and registered firms. The designated firms keep rather stable trends whereas the registered firms show outstanding changes in number. The number of registered firms was as large as 9,050 in 1991 and it was more than 3.4 times the number than that of in 1988. Since 1992 when the mass construction plan finished, the business cycle of housebuilding has gone downward and nearly half of the registered firms exited out of the business or became bankrupt. Only 4,122 firms remained in 1995. Another reason for the decrease of registered firms was that in 1992, the government changed the size of capital required as a registered firm into three hundred million won from a previous amount of one hundred million won by revising 'the Housing Construction Promotion Act'.

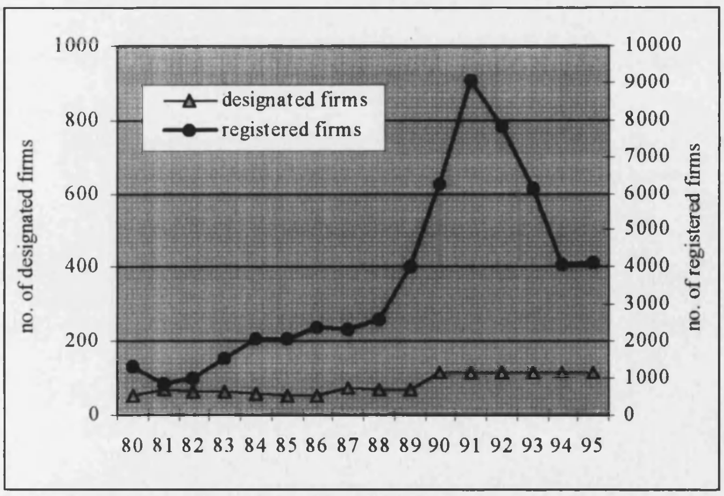

Figure 2-2 Increasing trend of the housebuilding firms

Here, the nature of housebuilding firms is examined in more detail. There were a total of 115 designated firms in 1995. 44 firms (38 %) among these belonged to big business groups, that is, the firms were subsidiaries of each big business group. The other 71 firms (62 %) were independent firms. Classifying the firms by number of employees, about 76.8 percent of the firms belonged to the large-scale group having more than 200 employees. Among them, 22 firms are extra large firms having more than 1000 employees. The other 27 firms (23.2 percent) were medium-size firms having between 20 and 200 employees.

Table 2-16 Characteristics of housebuilding firms in 1995

	Classification	Designated firms (115) Number (%)	Registered firms (4144) number (%)
Type of firm	Subsidiary of business group	44 (38.1 %)	
	independent firm	71 (61.9 %)	NA
Size of employees	large (more than 200 employees)	88 (76.8 %)*	755 (18.2 %)
	medium (21-200 employees)	27 (23.2 %)	3,240 (78.2 %)
	small (less than 20 employees)	-	149 (3.6 %)

* 22 building firms (19.1 %) among them have more than 1,000 employees.
Source: Association of designated firms, Association of registered firms

Most registered firms retained less than 200 employees, therefore, they belonged to the medium and small size group. Some of them were large firms having a general construction licence and more than 200 employees, but the share was rather small (18.2 %), compared with that of designated firms. The large firms having more than one billion won capital were just 2.2 percent of the total. Medium and small registered firms mainly constructed residential houses only, therefore, their business was strongly dependent on the housebuilding business cycle[10].

We may observe that the main builder has changed in the Korean housebuilding industry. Small builders were main builders by the beginning of the 1980s; however, since the mid 1980s when the government directly intervened in the industry, the designated firms and registered firms have predominated the industry.

[10] Interview survey with the Korea Housebuilding Firms' Association

2.4.2 Output of the Firms

The output produced by the designated and registered firms consisted of about 60 percent of total output since the mid 1980s. Table 2-17 shows the proportions of public and private sectors. The public output consists of those of central government, local government and the Korea National Housing Corporation (KNHC) and the Korea Housing Bank (KHB). They mainly built the public houses for low-income households. The size of houses was limited to small dwellings less than 18 pyong(60 m^2) by 'the Housing Construction Promotion Act'.

Table 2-17 Public and private output (unit: dwellings, start basis)

	1975	1980	1985	1990	1995
Public (%)	62,700 (36)	106,187 (50)	132,070 (58)	269,421 (36)	228,232 (37)
Private (%)	117,251 (64)	105,350 (50)	95,292 (42)	480,957 (64)	390,825 (63)
Total (%)	175,951 (100)	211,537	227,362	750,378	619,057

Source: Ministry of Construction and Transportation.

When we consider the output of the private sector in detail, we may find some changes by time as shown in Table 2-18. About 60 percent of the total private output had been built by small builders up to the beginning of 1980s. After that, the proportions decreased and those of the designated and registered firms have increased since the mid 1980s. Their output reached up to 80 percent or so to total output since 1985. This tells us that the certified housebuilding firms have led the industry since the mid 1980s. It is outstanding that the output of the registered firms has greatly increased since 1985.

Table 2-18 Private output (unit: dwellings, start basis)

	1980	1985	1990	1995
Designated firms (%)	17,583 (16.7)	19,377 (20.3)	146,468 (30.5)	142,832* (34.6)
Registered firms (%)	24,350 (23.1)	57,078 (59.9)	219,086 (45.6)	269,362* (65.4)
Housing co-operation & small builders (%)	63,417 (60.2)	18,839 (19.8)	115,403 (23.9)	NA
Total (%)	105,350 (100)	95,292 (100)	480,957 (100)	390,825 (100)

Source: Ministry of Construction and Transportation. *:permission basis only in 1995

Houses can be produced in numerous different ways, showing a great variety in types and sizes. In Korea, there are four types of houses; single family detached houses, high-rise apartment houses, row houses and multi-family unit houses. The single family detached house was a most popular type by the beginning of the 1980s. Since the mid 1980s, common house types such as high-rise apartment houses, row houses and multi-family units in a single house have been increasingly produced in the urban areas.

Table 2-19 Types of houses (unit: dwellings, start basis)

		1980	1985	1990	1995
Common house	Apartment houses (%)	76,889 (36.3)	132,114 (58.1)	501,036 (66.8)	494,410 (79.9)
	Row houses (%)	11,965 (5.7)	45,038 (19.8)	18,314 (2.4)	17,502 (2.8)
	Multi-family units in a single house (%)	-	-	125,158 (16.7)	50,470 (8.2)
	Single detached houses (%)	122,683 (58.0)	50,210 (22.1)	105,445 (14.1)	56,675 (9.1)
Total		211,537	227,362	750,378	619,057

Source: Ministry of Construction and Transportation.

An apartment house is defined as a high-storey standardised house (normally 10-20 stories) and it is normally built on a large-scale (between 300 and 1000 dwellings). A row house is a low-rise common house (normally less than 5 stories) and it is built on a small-scale (less than 20 dwellings). The multi-family unit is a new house type[11] introduced in 1988 in urban areas. This type of house has usually been built on sites where old and deteriorated single-detached houses were evacuated. The increase of the multi-family units has allegedly contributed to relieving the housing shortage for low-income households, but it has its own weakness. Some researchers argued that the expansion of this type of house in urban areas made the residential environments deteriorate. The careless construction of the houses in a small residential lot brought about problems such as limitation of neighbour's right to sunshine, shortage of water supply, sewerage, and parking lots etc.

[11] The multi-family units in a single house comprises 8-9 dwellings having individual kitchen, bath and outdoor openings occupied and owned by each dwelling household. The purpose of this type of house is to raise the efficiency of residential land use and to increase the number of new houses in urban areas. The Korean government revised 'the Building Act' in 1985 to encourage building the multi-family unit and it was designated as a formal type of common house under 'the Housing Construction Promotion Act' in 1988.

In America and the U.K., the most popular type of house is the single-family house, whereas the most popular and large portion of newly built houses in Korea is the high-rise apartment house. The proportion of the apartment house has rapidly increased (up to 80 % of total new dwellings) since the mid 1980s. We may find that the housebuilding industry has been divided into two segments throughout the high growth period, according to the type of houses built and the type of builders involved. The first one is 'the apartment house industry' built by designated and registered firms certified by the government. The other one is 'the single-detached house and row-house industry' built by small builders. Most of the designated and registered firms participated in the apartment house segment. Three reasons for this may be considered as follows; first, the government encouraged building firms to build apartment houses as they used the residential land efficiently. Second, the private firms preferred this type of house as it is possible to expect economy of scale from the mass construction of standardised apartment houses. Third, the demand for apartment houses increased greatly as the houses had led the housing price rise since the end 1970s.

2.4.3 Market Share

Most of the building firms competed in the same segmented industry, that is, in the apartment house industry, even though the firms' size, nature and original characteristics were different. Sometimes, they built row houses and high-quality single detached houses; however, the proportion is very small.

When we considered the output level of the firms, there were some differences between two types of firm. It is known when the housebuilding business was in a good condition, especially between 1988 and 1992, active large designated firms built more than 30,000 dwellings per year and active registered firms about 5,000-10,000 dwellings per year[12]. These are very high levels of output, even compared with those of one of the largest builders in USA in a high growth period[13].

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[12] Interview survey in June 1996 with the Korea Housebuilding Firm Association

[13] In 1948 when Levitt built Levittown in Long Island near New York City, it completed more than 35 houses per day and 150 houses per week. It finally built more that 17,000 standardised houses in that year. During the boom period between 1960 and 1964, in the San Fernando Valley area, new housing averaged 16,500 per year.

Table 2-20 Average output per firm

(unit: dwellings per year)

	1985	1988	1990	1992	1994
Designated builders	352	533	1,252	1,220	1,139
Registered builders	13	38	35	228	61

Sources: Designated firms' association
Registered firms' association

Table 2-20 shows the firms' average output level and the trend. The average output of the designated firms was 300-500 dwellings in the 1980s and it has increased to 1,200 dwellings since 1988. In the case of registered firms, the average output was more or less 50 dwellings in 1980s and even in 1990; however, they show an exceptionally high output of 228 in 1992. The registered firms' output kept at a rather low level, compared with those of designated firms. This is because when business conditions were good, many firms joined the business, therefore, their competition became higher. There is another study (KRIHS 1996) to show the output level by different size of firms. In 1995 the average output of large housebuilding firms was estimated to be as 2,300 dwellings per year, that of medium firms was 422 dwellings and of small firms was 55 dwellings.

There is no previous study which examines the market share of the housebuilding industry. Table 2-21 shows the market share of the Korean housebuilding industry. The market shares of the top 5 firms were 5.05 % in 1993, 9.31 % in 1994 and 6.31 % in 1995. Those of the top 10 firms were respectively 8.9, 14.15 and 9.0 % in each year as shown in Table 2-21.

Table 2-21 Market share of housebuilding firms

	1993	1994	1995
Top 5 firms [1] (%)	5.05	9.31	6.31
Top 10 firms [2] (%)	8.90	14.15	9.00
Total private construction (dwellings)	468,604	364,444	390,825

1: Hyundai Sanup, Booyoung, Donga, Hyundai construction, Keumho.
2: Hyundai Sanup, Booyoung, Donga, Hyundai construction, Keumho, Samsung, Daewoo, Woobang, LG, Daelim
Source: the Korea Housebuilding Firm Association

There is a similar study (KRIHS,1995) which shows the market share of the construction industry. The market share of the top 10 firms in 1995 was 30 % in the general construction industry. These results tell us that the degree of competition in the housebuilding industry is higher than in the general construction industry. As the reasons for this, we may consider 'the easy entry' and 'the capital-intensiveness and labour-intensiveness' of the housebuilding industry. The entry barrier into the housebuilding industry is not so strict in comparison with that of the construction industry. The housebuilding business mainly depends on capital and labour. The firms which are interested in housebuilding can easily enter the industry if they satisfy the qualifications as a registered firm.

2.4.4 Growth Strategy

Another noticeable attribute of Korean housebuilding firms was multi-production structure. Their main business was housebuilding and/or construction, however, they also diversified into various different business. Diversification is considered as a growth strategy which the firms pursue. Most Korean housebuilding firms diversified into other businesses related to their core business such as the contracting business and property development and management. However, in the last decade or so there has been a diversification into businesses very different from the building work such as mining, materials manufacturing and merchandising, operating hotels and restaurants, operating financial institutes, foreign trade, retail and wholesale and transportation.

According to 'the Annual Report' of the building firms, the firms were involved in about 7-8 business at the same time. Some of them were operating 20 businesses within the firm's boundary. It was noteworthy that some housebuilding firms were involved in totally unrelated businesses such as forestry and logging, sales of motor vehicles, operating broadcasting businesses and financial institutions within the firm boundary. The involvement in the businesses such as manufacturing of building materials, site preparation, labour recruitment (personal supply service), storage and warehousing, rental and subdividing real estate, real estate appraisal and management and advertising business means that the firms were operating vertically integrated business as well.

We may classify the building firms into three categories, based on direction of diversification. The first category is those which had long experience in the construction and civil engineering business and diversified into the housebuilding business. They were originally general contractors, that is, they had started their business in construction and entered into housebuilding at the beginning of the 1980s. Most of them are large-scale. The second category is those which had started their business in housebuilding and expanded into general construction area and other business. Most of them firstly entered into housebuilding as a registered firm and their scales were rather small. There were some successful firms which originally started their business in housebuilding and grew into a big business group. The third category is those which had started their business in other (unrelated) businesses and then diversified into housebuilding and construction in the mid 1980s. Most of them were large-scale and now they are all designated as housebuilding firms. They usually diverted their main business into housebuilding and construction after the mid 1980s when the housebuilding business was in a good cycle and 'the construction programme for two million dwellings' started.

The direction of the firms' diversification can be summarised as follows. The large construction firms and other large firms were diversified into the housebuilding business since 1980 mainly in the high growth period (since the mid 1980s). We may say that government's intervention has had the effect of pushing the large firms' entry into the housebuilding business. However, outstanding attribute is that the firms which had started their business in housebuilding also diversified into the other related and/or unrelated business.

We may summarise some outstanding attributes observed in the Korean housebuilding industry during the last three decades. First, housing output greatly increased especially during the mass construction period between 1988 and 1992. Second, large-scale firms, i.e. designated and registered firms, have dominated the industry. Third, mainly apartment houses have been built. Therefore, the current Korean housebuilding industry is characterised as an apartment house industry dominated by large-scale firms. Lastly, the housebuilding firms show diversified production structure. Here, issues on efficiency of the diversified production structure need to be considered. A study on the Korean housebuilding industry (Kim and Cho, 1990) suggested that the Korean housebuilding industry exhibited a number of problems; the industry was poorly structured and disoriented. It was highly concentrated and also poorly integrated, both horizontally and vertically. A large number of housebuilding firms revealed a weak asset structure. The management did not adequately respond to changes in the price of production inputs. In conclusion, they commented that the government intervention in the industry seems to be largely responsible for market failure. Now, we need to investigate the efficiency of the government-intervened building business and the industry from various points of view.

2.5 Findings and Discussion

Since the Korean war in the 1950's, the problems of the Korean housing market can be summarised: housing shortage, housing price inflation and speculation, and short supply of residential land. To solve these problems, the Korean government has been deeply involved in the housing market. By the beginning of the 1980s, the government's housing policy was focused on the demand-side, however, the government recognised that a demand-control policy would not work properly when demand for housing was high. Since the 1980s, government policy has been directed to mass construction of housing, that is, supply-side of housing. In fact, the government's mass construction plan of 1988-1992 played an important role in the growth of the Korean housebuilding industry. The 'construction programme for two million dwellings' provided a good business opportunity to the housebuilding firms. The investment ratio on housing has increased to 7-8 percent of GNP which is on a similar level with those of the advanced countries. About 5,000 firms entered into the industry during the period (1988-1992) and they enjoyed a high boom in housebuilding.

The mass construction period is considered to be a prosperous period of the industry as the government guaranteed a certain amount of sales to the building firms; on the other hand, it is considered as a period when the government introduced the strictest regulations in the industry. Particularly during the mass construction period, the government introduced some strict regulations in the newly built apartment house sector: residential land development regulation, public allocation system of the developed land, and several regulations in the production process. In the mid 1980s when residential land was lacking and the price of land was high, the problem of house shortage was a keen social issue. This was one reason why the government directly intervened in the industry. Only the government could develop large-scale residential land using expropriation power. The government even involved itself in allocation of the land. Considering that land is one of the most important input factors, the rigid land development regulation played a role as an entry barrier in the business. The regulation also prohibited the firms' autonomy in the decision making process and therefore, building firms' profitability.

House price regulation was considered to be one of the strictest regulation on firms' business. The price regulation was rather pervasive as it controlled the firms' cost of housing production, thus, adversely affecting its financial position. Moreover, in the circumstance where the prices of newly built houses were lower than the market prices, once the firms built apartment houses, sales of the completed dwellings was guaranteed, therefore, all the building firms, designated firms or registered firms, wanted to build apartment houses. The price regulation also resulted in distortion of demand structure of housing.

Two types of regulations i.e. land development regulation and house price regulation, were considered as of particular concern in the supply side of housing. The possible strategy the building firms pursue was either cost reduction strategy or diversification strategy. There was no incentive for the housebuilding firms to improve the quality of housing. This resulted in slowing down sound development of industry by discouraging the building firms to make further effort to build high quality houses and by making the building firms give up innovation efforts and R&D investment in housebuilding.

As well as the physical growth of the industry, the industry was restructured internally during the mass construction period. First, large building firms dominated the industry; about 70 percent or so to total private output were built by the large building firms. Second, the most prevalent type of house is not single-family dwelling as in most western industrialised countries, but apartment houses. More than 80 % of new dwellings built during the mass construction period were apartment houses. As a result, the industry was segmented into 'apartment houses industry' built by large building firms and 'single-detached house industry' built by small builders. The current structure of the Korean housebuilding industry is characterised as an apartment house industry dominated by large building firms. Another attribute of the Korean housebuilding industry is a trend for firms to diversify their businesses. Most of the housebuilding firms have become involved in other businesses in addition to housebuilding. The outstanding attribute is that even small building firms which started their business in housebuilding diversified into other business, even before they specialised in housebuilding.

In the following chapter, we investigate the current structure of the building business and the industry dominated by large building firms and examine the efficiency of the structures from various points of view.

Chapter 3 The Structure of the Housebuilding Industry

The objective of this chapter is to understand the attributes of the modern housebuilding industry. First, inherent attributes of housebuilding observed in the product and in the production process are investigated. The governance structure which prevailed in the production process and the business strategies the modern building firms have pursued are explored from the relevant literatures. From the evidence, 'ideal' production pattern for modern housebuilding firms can be set out and how the 'ideal' pattern is modified by countries' institutional framework and policy framework can be investigated.

3.1 Nature of the Housebuilding Industry

3.1.1 Attributes of the Product and Production Process

The special attributes of the house as a product are, as Grebler (1950) pointed out, bulk, weight, spatial fixity, durability, complexity and heterogeneity of the completed products and the requirements of a large amount of outlay. The bulk, weight and spatial fixity are associated with localism of housing demand. The localism is emphasised by the fact that public regulations such as building codes, subdivision requirements and zoning ordinances are local and show great diversity between regions. Builders operating outside their region should not only appraise local market prospects and direction of city growth in potential territory, but also understand the local regulations. Variations in these regulations mean that housebuilders may not easily be able to transfer their pattern of land development, design and layout, use of materials, labour practice and operational methods, from one place to another. Housebuilders operating their business outside their home area have often met with failure. This is why most of the housebuilders are operating their business in their home city or adjoining area.

Durability is an important attribute in view of, not only the dwellings' physical structures, but also of users' and producers' interests of desired degree of the dwellings. The durability of the product indicates the importance of the unique relationship between the number of new units and the total housing stock in any given year. Housebuilders have to consider the quantity of existing stock in the area when they plan a new development project. The complexity as a product results from the multiple function that it must perform. Almost all other finished goods for customers' use have a single function to perform, whereas houses are expected to provide for the collective activities of the family, such as cooking, eating, washing and sleeping etc. Houses are also produced in various types, design and size. Heterogeneity of houses results not only from the variety but also from location and neighbourhood. Besides, houses require substantial and continuous outlays for purchasing, renting, and maintenance and repair during the lifetime. The purchase of a house requires an unusually large amount of funds in relation to family income and typically involves a long-term commitment to repay a mortgage loan or rent which represents a large portion of a family's budget. Therefore, the demand for houses may be deferred and this affects the planning scheme of new housing. Figure 3-1 shows the attributes of the product and the attributes in the production process.

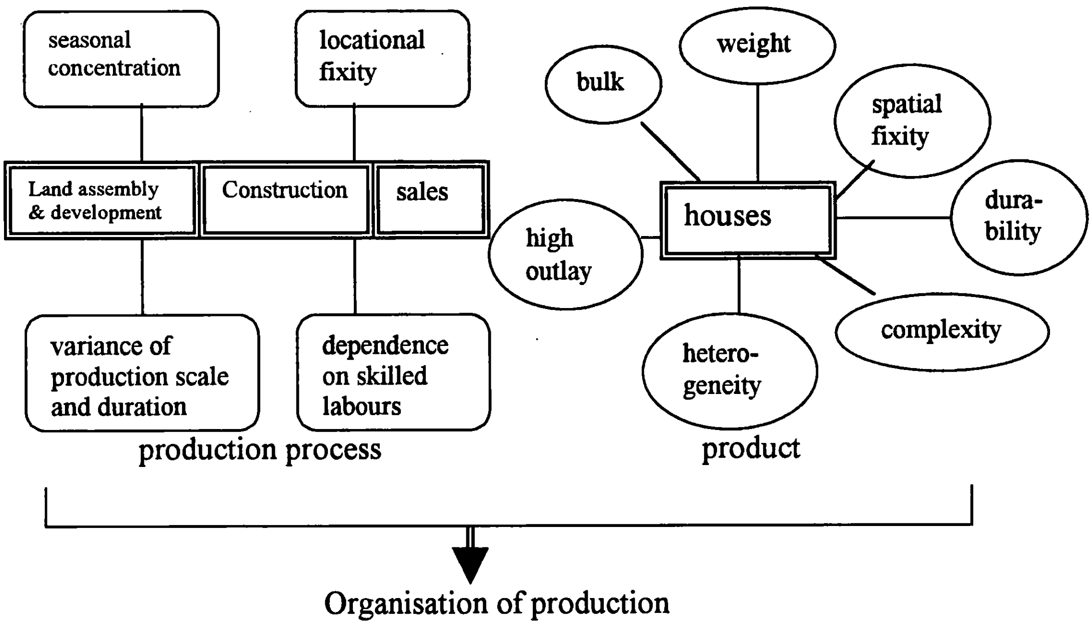

Figure 3-1 Attributes of the product and production process

The attributes of the product are reflected in the production process of that product. The four distinctive attributes in the production process are summarised as follows. First, the place on which houses are produced is the very place where they will be consumed and the site is not changeable. Most of the production functions are performed in the location of the projects. Second, there is seasonal concentration in housebuilding work as the production process is outdoors and is exposed to the vagaries of the weather. This involves forced interruptions and seasonal concentration of activity. The seasonal concentration has been minimised by transferring on-site work to off-site work and by devices that make construction possible in inclement weather. Third, the production scale and duration are variable. The production scale affects the extent of repetitive processes and mechanised production. It is associated with the size of the market and differentiation in buyers' tastes and preferences. Variation in buyer's taste and preference also influences the production process by limiting the degree of standardisation. The production duration may vary between several months in the case of conventional construction and a few days in the case of fully prefabricated houses with factory-installed plumbing and heating. Fourth, the dependency on skilled labour is high and various kinds of labour and materials are required in the production process. Hundreds of unstandardised works have to be carried out and management skills based on a stable and inter-locking relationship among various jobs is very important.

The unique attributes as a product and the specialities in the production process affect the industrial structure of housebuilding. The pattern of industrial progress has often been described as a development from manual labour, through organisation of repetitive processes, the application of tools and machines, and the use of mechanisation. This pattern is applicable to house building. Maisel (1953) explained that the production methods of housebuilding have changed a great deal; mechanisation in tools, shifts from on-site work to off-site work, changes in the scale of production, and usage of new materials. Ball, Harloe and Martens (1988) pointed out a tendency towards greater flexibility and technical development in the UK building process. The organisation and planning of the labour forces may be one aspect and the prefabricated and concrete technology may be another aspect of process innovation. More advanced management strategies were adopted in the organisation of production. More flexible incentive schemes and growing reliance on subcontracting in 1950s and 1960s and 'just-in-time' materials, equipment and specialist workers in 1970s and 1980s may be considered as the examples.

3.1.2 Stage of the Housebuilding

The housebuilding process includes a number of interrelated but temporarily separate activities. Generally, housebuilding is divided into sections such as planning of housing schemes, acquisition and assembly of land sites, construction, and sales of the completed in terms of major functions for housebuilding. Golland (1998) explained the development process as supply of land, supply of infrastructure and construction.

The housebuilding stage may be divided into three stages; the pre-construction stage, the construction stage, and after-construction stage as shown in Figure 3-2. Planning and programming of the development project, land acquisition and development, and installation of infrastructure are carried out in the pre-construction stage.

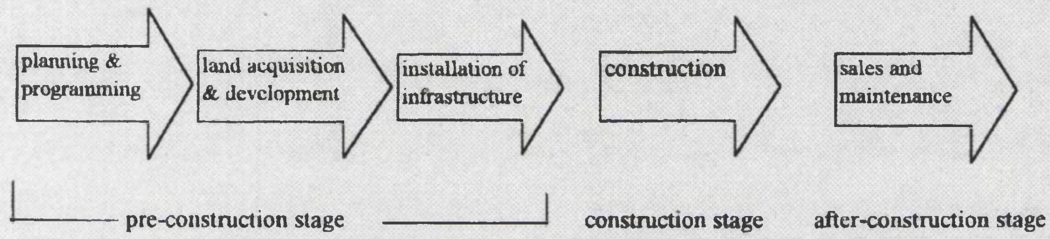

Figure 3-2 Stages in housebuilding

The planning and programming stage of the developed project means a preliminary stage to define the feasibility of the building project. In this stage, relevant law, government's urban planning procedure, and the dynamic nature of demand side should be investigated. This stage, sometimes, takes a very long time to prepare as a proper condition before construction.

The land acquisition and development issue in housebuilding is associated with land ownership, land pricing and taxation of development land. The source of land supply is basically related to the extent to which development land is owned 'publicly' or 'privately'. The way land is supplied is very much dependent on land and planning policies. Land ownership pattern is also influential to the housing production method.

Installation of infrastructure is an important stage in the house development process raising a number of important questions; who provides it and who pays for it ? Infrastructure can be considered to be about the provision of 'public' goods and 'externalities' in economic theory. As there must be roads, sewers, electricity cables and so on for housebuilding, infrastructure provision is also applicable within a 'state-market framework'. These may be considered 'public goods'. The grant of planning permission, moreover, may have the effect of creating some adverse and some beneficial consequences. The planning process can be argued to be a 'non-market decision' and hence decisions on planning matters are decisions which can lead to both harmful and beneficial externalities. However, the costs of infrastructure are borne ultimately by the housing consumer. The issue of installation of infrastructure automatically depends on the source of the land and ownership of the development land.

The construction might be expected to be the main stage in the whole development process. The issues of purchasing labour and materials, using building plant and equipment are relevant in the construction stage. Ball (1999) outlined the market contexts faced by housebuilders as housing market and five input factor markets; land, labour, materials, plant and equipment. He explained that housebuilders have to deal with the five specific types of input markets as well as the housing market in which their products are sold.

The construction stage in housebuilding cannot be understood without reference to the organisation of the entire construction industry, comprising general contractors, special trade contractors, dealers and manufacturers of materials as well as miscellaneous labours. Housebuilders may carry out all building operations using their own employees. However, 'contracting' has been a prevalent characteristic in housebuilding. In virtually all countries, there has been a shift away from the direct employment of workers to the hiring of them on a contract basis. The change from 'internal operation' to 'contracting' which were made by the housebuilders was rather evolutionary than revolutionary. This issue is basically related to choice of governance structure; 'contracting' or 'direct employment' or 'in-house production'. The relationships consequently affect the efficiency of the housebuilding process and the potentials for innovation.

The construction stage might be expected to be a final stage in a development process. However, lastly, exchange of ownership and after service function are followed by sales of the completed dwellings.

Housebuilding is normally carried out throughout the five stages as we discussed. Normally, home builders or housebuilding firms in most of the industrialized countries were involved in the wide range of building works from planning of the housing scheme, land acquisition and development, purchasing input factors, building works, and to marketing and sales of the products. They are, to a significant extent, active both in land development and housebuilding, buying greenfield or redevelopment land, conceiving developments and selling completed houses. They are normally called speculative builders. The speculative builders need a large amount of capital to invest in land in advance of building work. Profits come from both in the land development process and the building process. Therefore, one of the objectives of speculative builders is to minimise the conversion of the potential profits which happen in the development process into 'land rent' as presented by the land price paid to the landowner. The speculative builders have to consider appropriate residential schemes for the sites and careful and judicious purchase of land. Timing in land purchase is obviously important. As a result, speculative housebuilders tend to hold a 'land bank'. Stocks of development land enable them to produce at the best time. Land banks give builders a degree of market power, as they are not forced to buy land at a specific time or at a specific location in order to build houses. The merchandising function related to purchasing of building inputs and the sale of completed houses is also significant for the speculative builders. This is one reason why housebuilders are considered to be a type of commercial merchant, buying cheap and selling dear (Ball 1988). Moreover, a series of entrepreneurial functions involved in market forecasting, assembly of financial packages, and marketing and sales of completed houses are also important.

On the other hand, housebuilding firms can become involved only in the construction stage as shown in Figure 3-2 by contracting a relationship with a client (main developer). In this case, the client may be a government or local government. We may find examples in western European countries where social or public housing is an important housing sector and the governments' policy has been focused on the public sector. The Netherlands and Sweden are outstanding examples that the operation of housebuilding is strongly reliant upon the government. Control of land supply in the Netherlands was lined with planning and infrastructure control and design (Golland 1998). Dutch housebuilding firms became involved only in the construction stage by the contracting relationship with the state. It says that housing policy in each country provides a regulatory framework of the industry and affects business behaviour of building firms. Various policies such as housing policy, land policy and planning systems consist of a regulatory framework and the regulation has been operated in various ways, according to whether the housing sector is 'public' or 'private'.

Sometimes in the private sector we can find an example of this. Where a building project is massive, therefore, the main developer contracts some of the works to other building firms, the building firms participate only in actual building works in construction stage. That is, in the private sector, housebuilding firms are either the owner of the project or are contractor by contract with the project owner.

In these cases, private housebuilding firms involved themselves in only construction stage by a contracting relationship with the owner or main developer. Profit is made by keeping costs below the revenue received from the developer through payment of the tender price. Competition between the building firm and developers (clients) usually takes place at the tendering stage. Most of the building firms' profits depend on taking full advantage of the contemporary institutional structures, rules and practices of the various markets in which they deal. Profit may increase through minimising working capital and overheads. This means that profit from housebuilding comes from a rapid turnover of working capital. Therefore building firms make efficient use of working capital and more emphasis is focused on technical skill and production management. In this case, the building firms provide a pre-decided customer 'construction service' according to a contract, whereas former, the building firms as a speculative builder, provide uncertain customers 'completed dwellings'.

In this section, we investigated nature of the housebuilding industry. Housebuilding is inherently project-orientated and skill-intensive. It requires a project management form of organisation to cope with the complexity and uncertainty of the various labour skills and with the requirements for adaptability. Since characteristics of building technology require labour specialisation but also component balancing problems of labour specialisation, building firms may rely on contractors in sequential stage. According to whether the housing sector is 'public' or 'private', the behaviour of the building firms participating in the building project are affected or restricted by various regulatory or industrial circumstances. It means that the relationship between the building firms and the environment are close and varied and the building firms should always perceive the regulatory or industrial circumstances especially when considering fundamental issues as project procurement systems and contracting.

3.2 Organisation of Production

3.2.1 Contracting as a Governance Structure in the Production Process

The unique attributes as a product and the specialities in the production process require a specific type of organisational structure in housebuilding. The site-specific nature of the project means that each project has a high number of unique features which need to be resolved through the project life cycle. Skill complexity required in the building process means that building firms cannot retain whole task information. As the starting point for considering these issues, the transaction cost approach proposed by Williamson (1975) is often cited. This approach is commonly referred to as markets and hierarchies. This considers the total cost of purchase of goods or service to be the sum of the cost of production and the cost of transaction. Subsequently, it considers how different types of organisational arrangement can affect the costs of both production and transaction. One particularly powerful illustration of the approach is given by consideration of contracting practices. The issue is at what stage does it make sense for an organisation to contract work rather than to undertake that work directly (Lansely 1994).

'Contracting' has been an institutional device in the building industry which defines the relationships between the various members of the project coalition (Bowley 1966). It therefore provided the context for the organisation of construction projects (Lawrence and Dyer, 1983). 'Contracting' is considered to be response to uncertainty arising from complexity, given bounded rationality of the firm (Williamson, 1975). Housebuilding generates considerable levels of uncertainty from the early stages due to factors such as the interaction of the building project with existing facilities, regulation through urban planning procedures, and the dynamic nature of the customer's requirements.

This issue can be considered as a 'governance structure' of transactions in housebuilding. Here, the governance structure means the specific set of institutional arrangements that minimize total costs of conducting the relative transactions and it means a most efficient institutional arrangement. 'Contracting' has been used as an organisational device in the construction stage and it is also related with an issue of efficient boundary of the building firms. It means that when most of transactions relevant to housebuilding are governed by the contracting system, building firms can maximise the efficiency of operation. Firms may move from one governance structure to another in the process of adaptation to the changing institutional environment.

Even though building firms rely on contractors to obtain the required skills, in conditions of bounded rationality, housebuilding firms are responsible for the entire project. They are normally the owner of the project. However, sometimes, they become the main contractor by a contract with the owner. In this case, the building firms complete the project for a fixed sum of money or a fixed price per unit of work, sometimes with cost and time incentives. In any case, however, they do not directly hire all the labour trades needed for a project. Building firms are typically hire carpenters, and sometimes painters and bricklayers directly; however, other trades are hired under contract. Special trade contractors are commonly subcontractors to the building firms, furnishing a particular set of labour skills. Special trade contractors contract for plumbing and heating, painting, electrical work, masonry, plastering, roofing, and structural steel erection. Special trade contractors serve as resource pools for the building firms and are responsible for recruiting, training (especially in non-union construction), allocating, and controlling labour resources. In this context, the building firm is known as a market trader. It acts as a broker for projects and as an intermediary acquiring materials, human resources, equipment and finance to undertake those projects.

Prevalence of contracting in housebuilding has been found in many studies. Grebler (1950) and Maisel (1953)'s examination showed that a complex contracting relationship may appear in housebuilding for the 1950-1960 period. Project managers, professionals, special trade contractors and self-employed workers (Labour-only contractors) are related to each other through some form of contract. Herzog's study (1963) also shows that US housebuilding firms were highly dependent on contracting during the 1950s and 1960s.

In fact, full-scale vertical integration of housebuilding is difficult to manage in the given product, technology and market condition. Maisel's examination (1953) explains the difficulty of vertical integration in housebuilding for the 1950-1960 period. Typically the large firms in the USA have their own crews handling rough and finished carpentry and general construction labour, whereas they generally assigned all other works to other contractors on a competitive bid basis. Nearly three-quarters of the builders among the interviewed firms attempted to integrate one or more of the building functions, but in the majority of cases their own labourers were unable to do the job as efficiently as the trade contractors. Among the 25 percent of the firms who didn't try integration in the 1950s, a considerable number had already made an attempt at some earlier period without success.

It was difficult to find a consistent tendency for housebuilders to integrate vertically and thus do away with contracting. Levittown[1] is one of the typically successful

[1] In 1947, Levitt acquired 1400 acres of Long Island farmland about 30 miles away from New York City and revolutionalised the housebuilding industry, adapting assembly line techniques to the mass production of housing.

examples of the US large builders' vertical integration. Levittown was the largest housing development ever built by a single builder. Levitt applied vertical integration in the housebuilding. However, many other firms realised that by integrating a number of different activities, they were actually losing focus, developing rigidities and finding it more difficult to co-ordinate at one time. Its many problems have prompted a strong move toward the alternative market-based form.

Eccles (1981 A) has shown that contracting in housebuilding is better suited to efficient production than is vertical integration. He emphasised that contracting can be explained as a response to uncertainty. He emphasised that most very large housebuilding firms reply heavily on contracted labour. Lawrence and Dyre (1983) indicate that the use of contracting actually increases with the size of the firm. A survey by the National Association of Home Builders found that 55.6 % of freshly formed housebuilding firms that produce more than five hundred units per year contracted 100 % of their labour in 1976. Large and giant firm contract nearly 80 % of their construction labour while small and medium firms contract 57 % and 72 %.

Hillebrandt's research (1971) showed that contracting in the UK construction industry increased from 16.6 % in 1958 to 20.1 % in 1963 as a percentage of the value of all works done. This trend has continued since then. Leopold (1982) suggested that subcontracting has increased substantially since the late 1960s onwards in the UK building industry. Data in Housing and Construction Statistics 1970-1980 show that almost half of the output (48%) of firms was subcontracted in 1980.

Recent studies (Winch 1986, Bresnen *et. al,* 1986) supports the trend. From a sample of 43 large construction sites, small firms were more likely than large firms to employ workers directly rather than use subcontract labour, and to transfer them between sites. Ball (1988) explained that virtually all building workers came on site as part of a subcontract, either labour-only contractor or supply-and-fix contractor, or as the operative of hired machinery and the large firms depended more on subcontracting.

More recent studies also emphasises the use of labour-only trend to be more common in large firms rather than small firms, in the main trades rather than specialist trades, and in building rather than civil engineering. Also it is largely confined to skilled workers. Labourers in the casual sector of the labour market tend to be directly employed (Winch, 1998). Even though direct labour was still prevalent by the late 1980s in Scotland (Gibb, 1999), since 1990 the subcontracting ratio has greatly increased in Scottish housebuilding (Munro and Gibb, 1995).

3.2.2 Changes in the Governance Structure

One of the outstanding attributes of the modern housebuilding industry is that the industry has been led by large firms since 1970s. Ball, Harloe and Martens (1988) emphasized the emergence of the large-scale builder as the most dominant force among all the changes which occurred within the housebuilding industry. Large firms still continue to expand their scale, either merging with other similar scale firms or taking over or acquiring other firms.

In the USA, the importance of the large builder has been outstanding since the 1950s (Maisel 1953, Herzog 1963) In the U.K., since the 1970s new forms of productive enterprise came to dominate private housing production. (Ball 1986, Cough 1988, Ball 1996 B). In several European countries, large housebuilding firms in private housebuilding have developed since the 1960s. In the Netherlands, Denmark and Sweden, large and all-purpose housebuilders have emerged in the industry since the 1960s and have been active in all spheres of housing production (Ball *et al*, 1988, ch.5). Despite the industry's scale, however, the governance structure in housebuilding has changed little over the centuries (Lawrence and Dyer,1983).

During the last two decades, more advanced production devices were observed in housebuilding. There are a few studies showing the changing pattern of the governance structure in the housebuilding industry. It was observed that 'contracting' in modern large building firms is different from that prevailing among small builders and building firms. As a proof of the prevalence of this organisational arrangement, Eccles (1981 B) found the 'quasi-firm' in housebuilding. Building firms tend to rely on a few subcontractors in each trade, to perform long-term associations with those in the skilled trades especially, and to employ a high percentage of 'labour-only subcontractors' (workers whose tools and equipment are supplied by the general contractor). In turn, these subcontractors seldom work for a single employer but rather a small set of building firms with whom they establish long-term flexible relationships. He emphasised that the 'quasi-firm' is a more efficient organisational device than simple 'contracting' in housebuilding industry.

Miles and Snow (1986) have called the situation where project coordinators act as brokers of the services of skill containers as 'dynamic networks'. They emphasise that the international construction project is a prime example of elaborate networks designed to handle complex situation where all the main elements of the production process - product design, the supply of components, the manufacture of the product, and its final distribution- are all carried out by separate firms integrated through brokers. In the construction context this broker is called the construction manager. The construction manager is a project manager who acts, essentially, as a merchant, purchasing in a co-ordinated manner all the construction services required to fulfil the client's requirements (Winch 1994).

Winch (1996) explained about the intermediate contractual relationships such as consortium, joint venture, coalition, and quasi-firms and added that firms may move from one governance structure to another in the process of adaptation to the changing institutional environment. He commented that Eccles' quasi-firm is also common in British housebuilding, that is, British speculative housebuilders work with a fairly stable network of subcontractors.

As a similar study, Bartlett and Meusen (1995) showed a new relationship between main contractors and subcontractors in UK building industry. Most of the main contractors in the housebuilding industry maintained a long-term relationship with their subcontractors. The main advantages of the long-term relationship were that the quality of work done by the subcontractors was known and the adoption of repeated relationships built up trust and reliability. In the study, they encouraged the adoption of long-term relationships between housebuilders and contractors and the technique adopted to sustain such long-term relationship were referred to as 'partnering'.

Barlow (1999) introduced a new concept explaining the relationship between building firm and subcontractor; 'networking relationship' whereby in-house competence is complemented by occasional or regular collaboration with outside contractors. This can involve vertical or horizontal collaboration. Vertical collaboration between firms at different levels in the production chain can be fundamentally important in generating and refining new ideas. Firms may be more decent about engaging in horizontal collaboration with potential competitors, although this can help reduce unnecessary duplication of research efforts. Successful commercialisation of technology often requires collaboration among horizontal competitors that have different capabilities. Ball (1999) also explained the advantages of the 'networking relationship or collaboration' between developers and subcontractors as follows: these could include bolstering subcontractors' training programmes, sharing mutual problems and facilitating forward planning and enforcing innovation and the development of skills to cope with it.

A range of intermediate contractual relationships such as 'quasi-firm', 'partnering', and 'networking or collaboration' are much more complex than those in the neo-classical contracting relationship. The core ideal is that housebuilding firms establish ongoing relationships with selected subcontractors and by the fairly stable contracting network, building firms achieve several useful organisational goals at once; flexibility and productivity. The building firms might shift fixed costs for technical investment to variable costs and minimise the transaction costs incurred through employing labour which, at times, may be unproductive. This perspective also implies that risk sharing and economies of scale might be other effects found in the intermediate contracting relationship between the building firms and subcontractors (Lansely, 1994)

In this section, we learnt 'contracting' has long been a prevalent governance structure in housebuilding. In the modern housebuilding industry which has been dominated by large-scale firms, a more advanced type of contracting relationship with subcontractors has emerged, that is, a change was introduced in governance structure of housebuilding. This means that one facet of behavioural attributes of large firms pursuing efficiency has been observed in housebuilding firms, that is, a more integrated relationship between building firms and contractors was observed. The concepts such as the emergence of more appropriated production organisation and the changing pattern of them in housebuilding give a good basis to understand the current structure of the Korean housebuilding industry.

3.3 Growth Strategy of Housebuilding Firms

3.3.1 Business Strategies of the Building firms

Many institutional economic theories start their arguments by explaining why firms may rationally choose to employ workers rather than perpetually reconstruct with staff agencies or why firms will integrate with suppliers or distributors. In the context of housebuilding, these theories offer an explanation of the governance structure in the production process. However, there is another point of view. Langlois and Robertson (1995) explain in their recent work that corporate strategy has something to do with the relationship between firm and market or organisation of production. They argued that the boundary of the firm in a market context may change over time. The firm and relative organisations alter their relationships related to contract behaviours as the relative circumstances change. It is, therefore, reasonable to think that the building firm's business behaviour and its relationship to contractors (suppliers and customers) might alter over the long run. Their argument is that the boundaries of the firms may reduce or expand over time according to the strategy building firms are pursuing.

Here, we may consider the business strategy of large building firms. Housebuilding firms have grown primarily by acquiring smaller contractors and operative builders. Merger and acquisition are the conventional paths to expand their business scale. The growth strategy of building firms is generally divided into two basic approaches; generalisation and specialisation.

Specialisation means the building firms focus on some strong specialised business. This is a specialisation approach. The strategy compels each firm to allocate limited resources to selective and advantageous business areas. For example, some building firms focus on residential housing. The firms become successful through the specialisation approach in the construction industry. Some of them are well known for the construction and sales of high-rise condominiums. However, the specialised building firms may easily stumble if the market stops growing. Thus, most of the large building firms want to operate various business simultaneously.

The generalisation approach means the firms pursue growth by expanding the areas of construction operation. Most of the building firms in advanced countries operate this approach. As a result, leading building firms operate in the entire rage of construction and civil engineering fields from residential houses, office buildings, atomic power facilities and underground structures to marine development projects. Today, some building firms are further expanding their operations into the engineering and urban redevelopment fields. Although the generalisation approach worked well during the period of rapid market expansion, it may cause all the firms to operate in a similar way and the industry has become very competitive. Furthermore, it is impossible for any building firm to increase its financial and human resources to meet all the diversifying market needs. Indeed, it is difficult for large building firms to remain good all-round firms in the whole construction market.

In fact, housebuilding firms were traditionally small-scale and they were very specialised and concentrated on housebuilding by 1960s. Starting with the emergence of large firms in the industry, building firms' strategy has changed into a generalisation approach. By either merging with other similar scale firms or taking over or acquiring other firms or by internal expansion strategy, they expanded their business boundaries. Since 1960 large building firms were increasingly shifting from housing to non-housing construction and vice versa, depending on market conditions. Recently building firms showed extensive business areas with the increase of business scale. New forms of productive enterprise dominated private housebuilding.

We may find an example in the UK housebuilding industry. The housebuilding industry was transformed from its small-firm characteristic of the 1960s to high market share by large firms. After the intensive housing boom of the beginning of 1970s, volume builders involved in social housebuilding started to enter into speculative housebuilding. The shift into housebuilding was easier because enough cash was generated from contracting which could be invested in land banks. The merging of the two spheres could have become easier because traditional production management skills in contracting can be used in project management in housebuilding. In the mid 1980s, private housebuilding experienced another major boom. The sector was becoming an increasingly important proportion of total new building work and an area in which good profits could be made. Large construction firms virtually all diversified into the housebuilding sector and now nearly all firms have a housebuilding division. Throughout the 1980s, concentration in the housebuilding industry continued by mergers between large firms, and take-over of medium sized firms. This helped the building firms to minimise risks by diversifying production over more regions and other business (Bramley *et al,* 1995).

A trend of generalisation can be observed in the US building industry. The industry was dominated by small firms by the 1950s. During the suburban development period from the 1950s to 1970s, building firms continued to expand their business scale in multi-areas, that is, they operated the housebuilding business simultaneously in the same or several metropolitan areas. Multi-area activities have become a common rule in the US housebuilding industry. Leading builders were engaged in fifty to sixty projects in ten or more separate housing markets (Grebler 1973). In 1970s, substantial numbers of builders, especially large builders, reported their new business as an apparent unrelated business such as manufacture of forest products and/or other building materials, financing, and manufacture of unrelated goods. As in the UK industry, large building firms in the USA have continued to grow into a big business group through merger or take-over.

3.3.2 Diversification Pattern of Building Firms and Motives of the Diversification

One of the outstanding attributes of the modern housebuilding industry is a trend of diversification. A recent study (Hillebrandt, 1990) explains that large contracting firms have diversified out of contracting into housebuilding and property development in the 1980s. The study shows that many contracting firms diversified into related activities in the 1980s and recently, some of them diversified into quite separate industries such as materials production, manufacture of temporary buildings, plant merchandising and so on. The growing pattern of the UK housebuilding firms may be classified into several groups. The first group consists of those which have grown by amalgamation or take-over of a series of smaller firms in the housebuilding business. The second group consists of those which were previously small or medium sized housebuilders, but became big firms in the 1980s, through internal growth. The third group is made up of those large contracting firms which have expanded into housebuilding to offset deficiencies in the contracting business. The fourth group represents those which were large firms in other industries and expanded their business into housebuilding (Ball, 1988).

A similar pattern can be observed in the US housebuilding industry. During the suburban development period from the 1950s to 1970s, building firms continued to expand their business scale in multi-areas. Gillies and Mittelbach (1962) observed that large building firms in Southern California were increasingly shifting from housing to non-housing construction and vice versa, depending on market conditions. Grebler (1973) analysed the acquisition process in the US housebuilding industry between 1963 and 1972 and argued that large building firms have continued to expand business areas through merger or take-over.

Here, we may analyse the building firms' diversification strategy more specifically. The business areas of the large building firms can be considered with some different dimensions. According to Hasegawa *et al* (1988), the market in which the large building firms operate can be defined in terms of three axes; product, region and business field. Figure 3-3 shows the three dimensions of diversification.

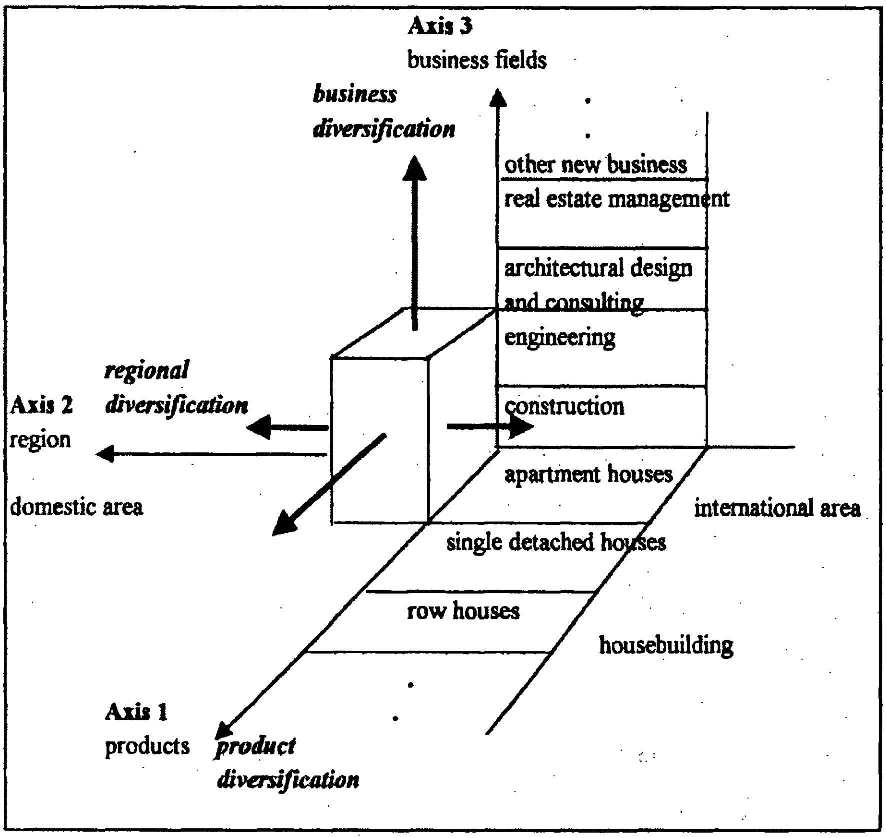

Figure 3-3 Three dimensions of market
Revised from Hasegawa and the Shimizu group FS, 'Built by Japan', 1988, p.31, Figure 2.1

The first axis means 'product diversification' within the housebuilding business. This parameter is segmented into subcategories such as single detached houses, high rise apartment houses for family. It may be segmented into further sub-categories such as houses for special demand level, for example, houses for elderly people, houses for urban young households, or rental houses *etc.* The second axis indicates the geographical locations of markets. Limited market areas such as villages, towns and cities in domestic regions may be expanded to international markets on the right. Each firm has to decide the exact part of the axis the firm should target. Large building firms can expand the market internationally. The third axis extends into the direction of business diversification, beginning with construction businesses and related business such as engineering, architectural design and consulting, and real estate management. Business diversification attempts by the large building firms are also directed toward the areas not closely linked with construction such as sports, leisure, information, leasing and other services. The combination of the three axes provides for many areas of operation. Each firm may extend its operation into any direction.

Considering the case of large building firms in the US and the UK, the building firms are diversified into all three dimensions. They are normally producing all types of houses, that is, they show product diversification. They cover a nation-wide market and some of the leading firms are diversified into international regions. We may say that they are specialised in the housebulding business covering all types of houses in whole domestic regions and sometimes in international regions. They are also diversified into other related and unrelated business.

Then now, we may think about motives of building firms' diversification, in more specific words, benefits and costs of diversification strategy. There are various views to explain why the building firms expand their business areas. A number of individual points can be synthesised by some comprehensive perspectives; market-power view, resource view, transaction cost view, and risk avoidance view. Market power view explains that market power can give the firms monopoly position to achieve more profit than regular profit. Montgomery (1994) emphasised three ways in which a conglomerate may yield power such as cross subsidisation, mutual forbearance and reciprocal buying. The resource view suggests that a firm's profit and breadth of diversification are a function of the firm's resource stock. According to this approach, if a firm had enough resources, they might diversify in order to use the resources efficiently in the market or in the other market. That is, unused or sufficient resources may be the rationale for diversification. Caves (1971), Gorecki (1975), Teece (1982) also used excess capacity of productive factors as a motive of diversification.

Firms may diversify to reduce transaction cost, that is, transaction cost may be a motive of the firms' diversification. This view has mainly developed, focusing on the motives of vertical integration and has provided a theoretical base on the motives of diversification. The other view is a risk-reducing view that firms' diversification is primarily undertaken to reduce risk associated with firm's business. Jensen (1986), Shleifer and Vishny (1989) and others explained that managers (agents of firms) pursued value-reducing strategies to further their own interests at the expense of the firms' owners. That is, managers may pursue diversified expansion as a mean of reducing total firm risk, thus improving their personal position.

The UK and US housebuilding firms' diversification can be explained by various points of view. Through take-over or merger, the building firms expanded their firms' scale and their business in the related business such as contracting and property development and management etc. Ball (1988) investigated the take-over of UK construction and housebuilding firms in the 1970s. The reasons for the take-over may be divided into four categories. Three among them are related to land (its cheapness, speed, and scale of development) and the other is an attempt to diversify out of housebuilding. These are explained by the transaction cost view. To enter into the new housing market, much time and cost would be taken up in surveying the housing market and searching for adequate land and getting planning permission for the site. The acquiring firms could reduce transaction costs by take-over of similar firms with land banks. The firms could enter into other local housing markets easily and cheaply expand their market shares. Building firms can reduce transaction costs by transferring surplus funds of contracting to housebuilding operations.

Punwani (1997) showed that intra-group financing is a main reason to diversify into other business in a study of UK construction group's portfolio of business activities. This is another example of transaction cost view explaining the motive of the building firms' diversification. With high growth in contracting activities, large levels of surplus funds were generated in the construction firms. These funds were either held as cash reserves or diverted into 'cash hungry' business. Speculative housebuilding required high levels of capital investment. The transfer of surplus funds within construction groups in the form of 'inter-divisional loans' was the principle source of financing for the housebuilding division. In this way, the large diversified construction groups removed the financial constraint that may have restricted growth in their contracting and housebuilding operations.

Grebler (1973) investigated the wave of acquisition of US housebuilding firms in the latter part of the 1960s. Some of those firms were tempted to acquire building firms as cases of vertical integration, expecting advantages from integration. Some firms' internal expansion into building and real estate activities were motivated by marketing considerations. Several firms presented the motive of diversification as land development, because they have long been involved in land transactions and holdings for their principal business. The emerging of the marketing function and land development function are regarded as a kind of vertical integration.

Another motive of the US building firms was the transferability of general advanced management principles to the building field. The housebuilding and land development during the late 1960s achieved high growth and appeared to be highly profitable. Major firms or financial holding firms expected to use their superior managerial qualities in the fields noted for backward or indifferent management. The modern techniques of planning, directing organising and controlling business were applied to building and real estate firms. By transferability of advanced management principles to building, the firms can heighten resource efficiency. That is, the building firms may diversify to utilise their managerial know-how to other business. In this case, the know-how may be considered to be the firms' human resources.

The greater merging of housebuilding with the rest of the construction industry was significant in European countries. (Ball *et al*, 1988, ch.5). However, Ball (1988) explained that extensive diversification meant less risk of failure, but it did not mean outstanding success in increasing market share relative to competitors of a similar size, based on the experience of the top five housebuilders' take-over in the 1970s.

So far, we discussed the business strategies and growing patterns which large-scale modern housebuilding firms have pursued, based on relevant studies. The Housebuilding industry in advanced countries has developed with long lasting tradition and history. The building firms were very specialised and since 1970s and 1980s they have become diversified in various businesses in line with world-wide diversification trend in whole industry. The relevant studies on diversification motives cast big implications to the understanding of the background of building firms' diversification.

3.4 Findings and Discussion

In this chapter, we learnt about the nature of the housebuilding industry and its most important attributes of modern housebuilding firms. In terms of the transaction cost approach, housebuilding can be characterised by low asset specificity, low transaction frequency, complex sequency and high uncertainty. This would suggest that contracting is the most appropriate approach. Traditionally contracting was a prevalent governance structure in housebuilding. The building firms normally oversaw the whole process of construction while a small number of special trade subcontractors performed most of the actual work. Indeed, the trend toward increased subcontracting appears to be accelerating in the twentieth century.

One of the outstanding attributes of the modern housebuilding industry has been the growing prevalence of large building firms. Since the 1950s and 1960s, large housebuilding firms have dominated the industry in most of the industrialised countries and they were very specialised in the housebuilding business. They produced all type of houses and they covered whole domestic regions and sometimes operating internationally. Linked with the emergence of large firms in the industry, there have been changes in the production process and production structure of firms.

Over the past two decades, improved contracting relationships between building firms and contractors have been introduced. This means that there have been changes in the governance structure in the production process. Improved relationships between building firms and contractors were observed in the production process with forms of 'quasi-firm' type, 'partnering system', 'long-term contracting', 'vertical and horizontal collaboration'. The relationships are considered as an 'intermediate mode' between 'contracting' and 'integrated organisation'. In this relationship, a housebuilding firm is a powerful leading firm with a core position in the production process and is often a final assembler mobilising a network of suppliers and distributors. There is a clear hierarchical relationship between a range of subcontractors, but the relationship is continuous.

With the emergence of large building firms, another outstanding change is the extent of diversification within building firms. First, the building firms diversified their market separately. Large-scale modern housebuilding firms generally covered a nation-wide market. Multi-area business became a common form in the US and UK building industry. In recent years, it has further been observed that building firms have expanded their business areas into other industries. Housebuilding firms became involved a wide range of products from related businesses such as contracting, engineering, to unrelated businesses such as manufacturing building materials, plant merchandising, and property management. This means that after achieving specialisation in housebuilding, the building firms are pursuing diversification as a further growth strategy.

Multi-production made it possible for the building firms' flexible operation to vary with regenerative demand. The building firms could achieve economies of scale and synergy effects from multi-businesses and they could compensate loss from one business with profit from another business. It was observed that internal financing was one of the most important motives into unrelated businesses. As a result, diversified large building firms could keep an advantageous position in the industry and a powerful relationship with the government.

Summarising the evidence, modern large building firms reflect changing trends in production patterns; moving from simple contracting relationship to more integrated structures with other collaborative firms, and from 'specialisation in housebuilding' to 'diversified into other business' in the production structure.

The changing trend in the production pattern can be described in a matrix. Figure 3-4 shows the changing trend; on the one axis is the change in the production process, on the other is the change in the production structure of building firms. One axis is split by fragmented/ integrated structure in the production process and the other is split by specialised/ diversified structure in the production structure of building firms. The trend in production pattern which modern housebuilding firms show is expressed as an arrow line.

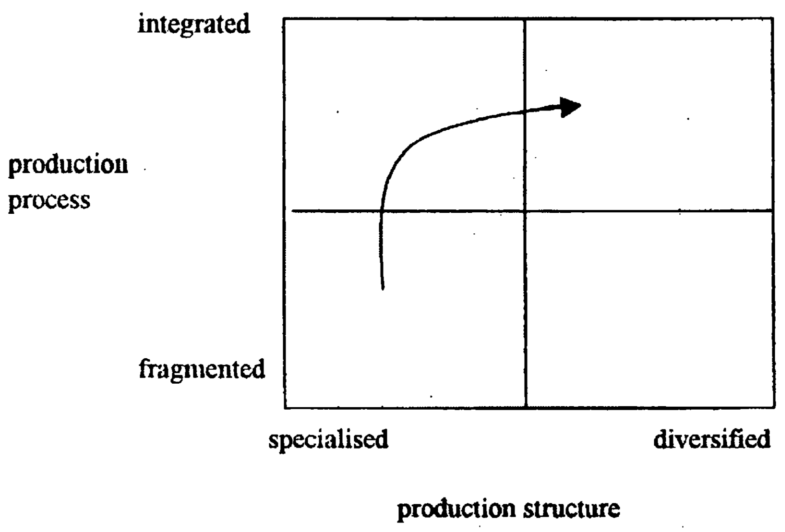

Figure 3-4 A trend in production pattern of housebuilding firms

The starting point has been that, in order to improve productivity in housebuilding, building firms have to generate technical improvement through continuous investment in fixed capital and their labour force. However, such investment can lead to relatively inflexible production processes. Contracting may be chosen as an alternative to technological change so that the building firms can maximise their flexibility by contracting. Dependency on contracting results to an increase of flexibility and productivity; however, the production process is revealed as being fragmented.

In Figure 3-4, the change of governance structure in modern housebuilding is shown as an arrow line traced from the 'fragmented structure' to the 'integrated structure' on one axis. Change of governance structure implies a transition into integrated structure in the production process. Emergence of new contracing relationships such as 'quasi-firm type', 'partnering system', 'long-term contracting', 'vertical and horizontal collaboration' makes it possible to reconcile high efficiency with continuing innovation effectively through the high involvement of its members. The main building firms integrate with an extensive set of differentiated subcontractors, any portion of whom can be employed on a given project. This structure provides a relatively highly differentiated and integrated structure. This structure provides a built-in power balance between central group of building firm as a quasi-firm and peripheral contractors. Each side needs the other but is not totally dependent on the other. This can be considered as an issue of efficient governance structure of transactions in housebuilding, in terms of transaction cost theory.

Figure 3-4 also shows a trend in the building firms' production structure. The curved arrow line is moving into the 'diversified structure' from the 'specialised structure'. We have shown how the large building firms have dominated the private housebuilding sector, that they were originally very specialised in housebuilding, but covering a nation-wide market by constructing all types of houses. Since the 1980s nation-wide building firms have become highly diversified into various business areas moved away from the specialised structure.

The modern housebuilding firms' production pattern can be summarised as 'on the one hand, involving integrated structures with other collaborative firms, and on the other, diversified structure across various businesses'. Based on this evidence, we may investigate the extent to which the 'ideal' production pattern observed in modern housebuilding firms can be applied to Korean building firms and how the 'ideal' production pattern is modified by a country's specific institutional framework.

Chapter 4 Framework of Research

In this chapter, we develop a research framework based on the lessons learnt from previous chapters: In Chapter 1, a general research question was set out; how has the Korean housebuilding industry developed in the regulated circumstance ? In chapter 2, we learnt how the Korean housebuilding industry had grown, how the Korean government has regulated the industry, and how the structure of the industry has changed. In chapter 3, the nature of the housebuilding industry and the production pattern of the modern housebuilding firms were investigated. This chapter will then bring these elements together to clarify the special nature of the housebuilding industry in Korean and develop four main research areas based on the research framework. It will discuss the methodology to be used in addressing these research areas.

4.1 Development of Research Questions

Our analysis so far has highlighted certain basic attributes of the housebuilding industry. Basic attributes of the Korean housebuilding industry are summarised as follows. First, the industry has been dominated by large building firms since the mid 1980s. Second, the large building firms mainly built standardised apartment houses. Thus, the Korean housebuilding industry has been chatracterised as 'an apartment house industry built by large building firms'. A third outstanding attribute was the building firms' diversification. Most of the Korean housebulding firms performed various businesses at the same time and even small firms were operating across various businesses simultaneously.

Another outstanding attribute of the Korean housebuilding industry has been the Korean government's intervention in the private housing sector. The government intervened directly at all stages in the private housing sector with various policy measures. There were various regulations in the building process such as house price regulation, land development regulation, house size regulation, and obligatory building ratio of small-size dwellings etc. House price regulation was one of the most important regulations which directly affected the profit of building firms. Furthermore, since the mid 1980s residential land has been provided and allocated by the government even in the private housebuilding sector.

The Korean government's regulation on private housing sector is totally different from the modern US and UK private housing sectors. Instead, it shows some similarities with public housing sector in European countries' public housing sector where the industry was operated by a state's plan. The role of the state is indicated clearly in the housing production process. For example, in the Netherlands, the state is involved in the land supply, land pricing and infrastructure provision. In Sweden, state control of land transactions puts an effective constraint on housebuilding profit. In those countries, housebuilders are mostly concerned only about the building process.

The regulatory circumstance may restrict housebuilding firms' behaviour. Korean housebuilders were originally speculative builders like those in the advanced countries. They were involved in five stages of housebuilding from the planning stage to the sales and maintenance stage of the completed dwellings. However, since the 1980s when the government initiated the large scale building programme and developed residential land and infrastructure, housebuilding firms' business has been restricted in various ways. Housebuilding firms could then participate only in the construction and the sales and maintenance stages. This meant that the Korean building firms' business boundary was restricted to the construction and the sales of completed houses.

The regulatory framework has made other important impact on Korean housebuilding firms. The government's policy encouragement of large-scale construction firms to participate in the housebuilding industry brought about a significant change in the production structure of building firms. Those firms which came from the construction industry into housebuilding were inherently diversified. However, an important point is that small-scale building firms which started their business in housebuilding have also diversified into a range of other businesses. Behaviour such as pursuing diversification into other business even before specialising in housebuilding is not considered as a desirable one. In particular, the fact that housebuilding firms became highly diverse during the short growth period is considered as a peculiar attribute of the Korean housebuilding industry. In itself this implies that the structure of a country's housebuilding industry and firms' behaviour in it can be heavily modified by the government's regulatory framework and the policy measures.

We clarified the outstanding attributes of the modern housebuilding industry in chapter 3. Large building firms have come to dominate the private housebuilding sector and virtually have shown themselves to be very specialised in housebuilding, tending to cover a nation-wide market by constructing all types of houses. With the emergence of large building firms in the housebuilding industry, some changing patterns have been observed; the one is the integrated relationship with other contractors in the production process, the other is diversification in the production structure. The changing pattern was expressed as a curved line in Figure 3-4.

An important research question is whether this pattern is applicable to the Korean housebuilding industry given the different regulatory circumstance ? In particular, do Korean housebuilding firms follow the trend in terms of the production process and the production structure or show other trends ?

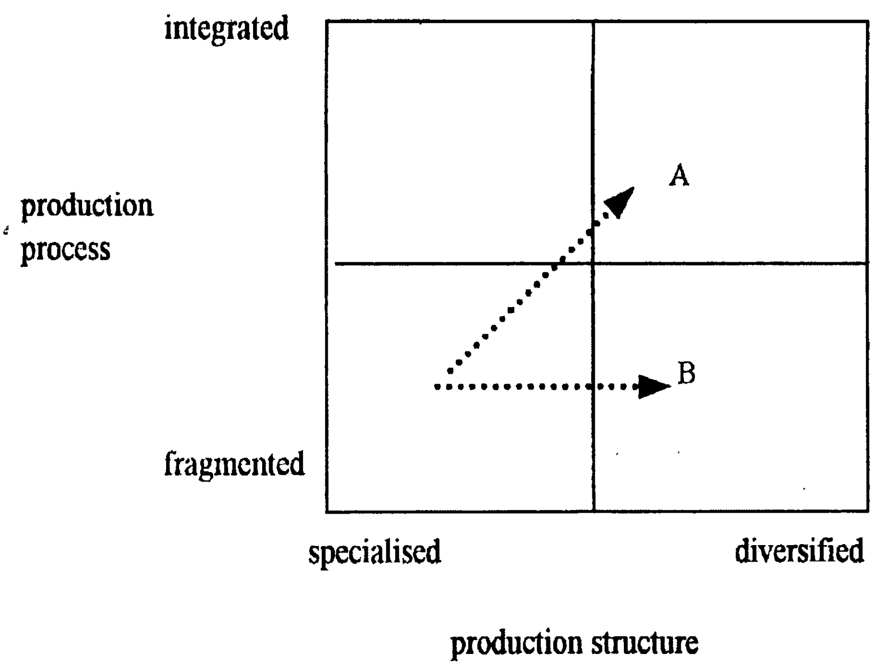

Figure 4-1 Possible trends in production pattern of Korean housebuilding firms

Figure 4-1 suggests possible trends in the production pattern of the Korean building firms as dotted lines A and B, based on evidence from chapters 2 and 3. The dotted line A reflects the possibility that building firms maintain more integrated relationship with other contractors in the production process, diversifying into other business. The dotted line B suggests a case which building firms depend on simple contracting in the production process, but still pursuing diversification into various business on the other hand.

Based on this general structure, this research aims to investigate the production pattern of the Korean housebuilding firms and to evaluate the efficiency of the structure. One general hypothesis is as follows: *Korean building firms may show different attributes in the production process and the production structure from those of the other countries because of the specifics of the Korean structure.*

With this general framework a range of relevant research questions can be derived including: what is the governance structure observed in the production process of Korean housebuilding ? Do the building firms depend on simple 'contracting' or show 'integrated contracting' in relation with contractors ? To what extent is the observed structure efficient ? Other questions are relevant to production structure of building firms: are the building firms specialised or diversified ? If diversified, to what extent have the building firms diversified ? What is the pattern of their diversification ? Is the multi-production structure of the firms economically efficient ?

To investigate the above research questions, two kinds of analyses; descriptive analysis and evaluative analysis, will be undertaken. The analysis will be done at project level and at firm level. Based on this approach, four main research areas are developed and those are addressed in more detail in following section.

4.2 Main Research Areas

4.2.1 Governance Structure in the Korean Housebuilding Business

The first research area is to investigate a prevalent governance structure in the Korean building business. Would the integrated contracting structure such as 'quasi-firm type', 'partnering system' be observed in the Korean housebuilding industry ? Otherwise, do the Korean building firms simply depend on a 'contracting' relationship with other contractors ?

The governance structure in the Korean housebuilding business may be explained in relation to business uncertainty in the regulated circumstance. Besides uncertainty inherent in the production process, the Korean government's various regulations may heighten uncertainty in the business and limit the firms' profitability. The Korean government intervened in the industry with various policy measures. First, the land development and allocation regulation may limit the building firms' business chance. Even though the building firms wanted to participate the building project, if they could not get the public land develped and allocated by the government, they could not participate in the building business. This is a sort of entry barrier. The regulation on land development and the allocation system may heighten uncertainty in the business. As a result, the building firms would not expect profit from land development. This means the housebuilders' profit source is limited only in the building site. Second, Korean housebuilders could not expect high profit in the building stage due to the 'house price regulation'. The private building firms have argued that the price regulation reduced profit of the business and caused the deterioration of the development of the industry in the long run. In the mid 1980s, many firms strongly insisted on the abolishment of the price regulation because they became unable to contine business under the price regulation. In fact, there were many firms which ceased business due to the increase of input factors' price.

The enforced uncertainty and limited profit might influence the governance structure in the production process. In the circumstance, building firms may avoid investing in a specific asset required in the housebuilding business and may emphasise 'flexibility' rather than 'efficiency'. The government's various regulations in the production process may be a major force pushing the industry towards 'market governance' of transactions. A general hypothesis is that 'contracting' may be a prevalent governance structure in the Korean housebuilding rather than more efficient contracting relationship observed in modern housebuilding industry.

4.2.2 Cost Efficiency of the Korean Housebuilding Business

The Korean housebuilding industry is characterised as a standardised apartment house industry dominated by large building firms. In the previous section, 'contracting' was assumed as a transaction governance chosen by the Korean building firms. The second research area is to investigate the efficiency of the housebuilding business by analysing its cost structure.

As the advantages of the contracting system, flexibility and minimisation of capital commitment are discussed. The building firms can do the works requiring machinery and equipment under their own management. This is sometimes done if it appears more economical than contracting, but it adds to overhead cost and managerial problems. The housebuilding firms may choose 'contracting' structure in order to maximize flexibility. For the building business, contracting converts the fixed costs involved in machinery and equipment into variable costs and thus, reduces investment risks. On the other hand, it has been said that extensive emphasis on flexibility disturbs the development of the industry. That is, emphasis on flexibility encourages firms to reduce commitment to fixed capital and stifles technological change and commitment to human capital. Hence, it encourages the casualisation of the labour force and a refusal to invest in training. In the long run, contracting may result in lack of skilled labours and low productivity. These resultant attributes must be reflected in the cost structure.

The current cost structure of the Korean housebuilding business may show how efficiently the Korean housebuilding firms operate their business. From the cost structure, we may investigate dependency on contracting, profit level achieved in the housebuilding business, most important input factor among various inputs, contracting relationship between input factors, and productivity of the building business.

4.2.3 Diversification: the Building Firms' Growth Strategy

The third research area is to investigate the Korean housebuilding firms' diversification strategy in detail. The extent of the Korean housebuilding firms' diversification, the pattern of the diversification, and the motives of the firms' business diversification are to be investigated.

The modern building firms' diversification can be summarised as in Figure 4-2. This is based on the three dimensional market of the building firms discussed in chapter 3. The building firms are diversified into all three dimensions. They are normally producing all types of houses, that is, they show product diversification. Furthermore, large building firms cover a nation-wide market and some of the leading firms are diversified into international regions. We may say that they are specialised in the housebulding business covering all types of houses in whole domestic regions and sometimes in international regions. They are also diversified into other related and unrelated business. Figure 4-2 shows their case roughly. Some firms may be involved in a very focused market, for example, in the high-rise apartment housing market or large-scale rental housing market. They may also be involved in the other business only in a domestic area. Even though Figure 4-2 cannot show a more specific situation of each building firm, it shows the general business directions of the large building firms in three dimenstions.

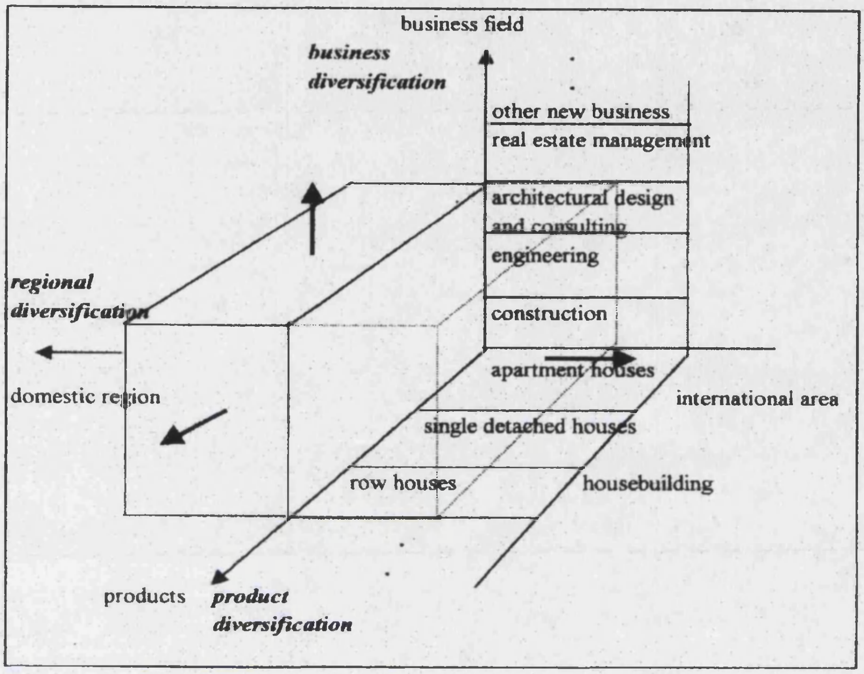

Figure 4-2 Business areas of the modern housebuilding firms

Korean housebuilding firms mainly produce apartment houses among various types of houses and they focus on Seoul and large cities. In both product and region, the Korean housebuilding firms show a narrow, not a generalised pattern. On the other hand, they are highly diversified into other business directions.

Table 4-1 Diversification pattern, means and type of strategy of the building firms

	Industrialised countries	Korea
Product	All types of houses	Apartment houses
Regions	National area International areas	Seoul, capital regions and Some large cities
Business diversification	Related business first and recently Unrelated business	Related business or unrelated business
Means of diversification	Mergers/ take-over Internal extensions	Take-over or Internal extensions
Type of strategy	Specialisation in the housebuilding Recently pursue to diversify into other business	Which type ? Specialisation vs. Generalisation

Table 4-1 summarises the differences in the building firms' diversification pattern, means and type of strategy between other industrialised countries and Korea. It is interesting that the Korean building firms are diversified into various business, even though they do not have long business experience in housebuilding. Figure 4-3 shows hypothesised Korean housebuilding firms' business areas and it is quite different from Figure 4-2.

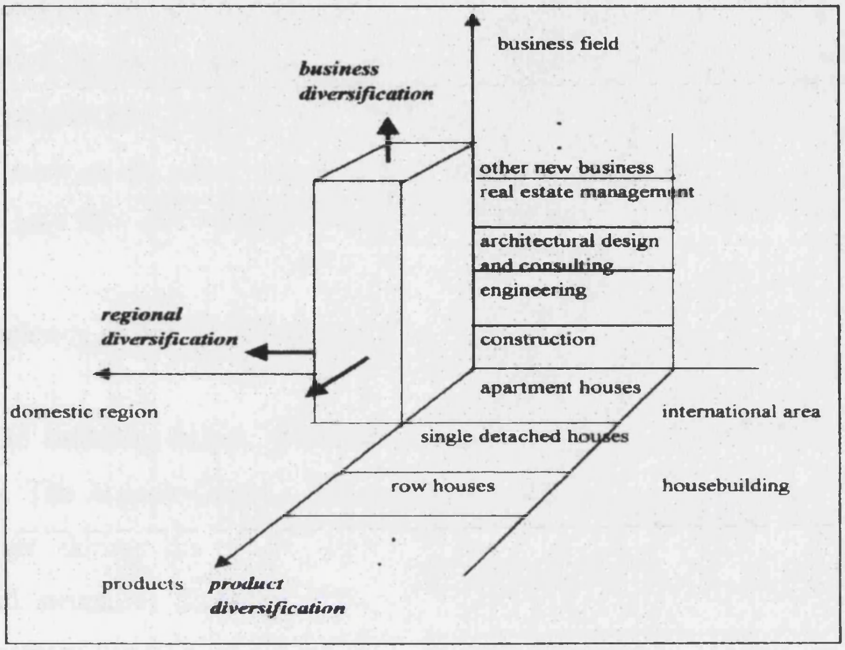

Figure 4-3 Hypothesised business areas of the Korean housebuilding firms

The different diversification pattern may be motivated by different views. The public land allocation system and house sale price regulation may heighten the uncertainty of the business and influence the firms' diversified structure. In order to prepare for the case in which the building firms cannot continue the building business due to the land development regulation or the public allocation system, they may diversify into 'counter-cycle business' or totally unrelated business. If the firms could not get a satisfactory level of profit from housebuilding due to the house price regulation, they may diversify into other business to compensate for the loss of business, that is, uncertainty and business loss from the regulatory circumstance might be an important motive for the diversification. This may be explained by the risk avoidance view.

The Korean housebuilding firms' diversification may also be related to the nature of the building firms. The Korean government encouraged the large contracting firms to enter into the business from the beginning of growth. Normally, large firms which have enough capital can easily diversify into other business. The firms having enough resources might diversify in order to use these resources efficiently in the market or other market. This is a resource view of diversification. The firm's large scale may be a diversification motive. The large capital, whether it is physical capital or human capital, could also be a motive for diversification. Financial difficulties in the building firms may be considered as a diversification motive. The building business is by nature a cash-hungry business and the building firms mainly show a very weak financial structure. They depend highly on outside financing. The transactions to get outside finance may heighten transaction costs and the building firms may diversify into 'good cash flow business' such as the restaurant or hotel business. That is, the building firms' financial weakness may be a diversification motive.

4.2.4 Efficiency of the Building Firms' Multi Production Structure

The building firms' diversification is considered to be one of their growth strategies. The housebuilding firms in the advanced countries grew through take-over and merger during the 1970s and 1980s. In Korea, housebuilding firms showed diversified structure. However, they showed different patter in diversification. They showed narrow production pattern in product and region, but high diversification into other business. Even the building firms which recently entered into the housebuilding business or have not much experience in building, also pursue the business diversification. As a result, Korean building firms commonly showed multi-production structure.

In the previous section, it was assumed that the Korean housebulding firms may diversify in order to use firms' existing resources more efficiently and to reduce transaction costs. If the diversification was initiated by various efficiency motives, the efficiency must be reflected in the production structure.

The fourth research area is the analysis of the efficiency of the Korean building firms' multi-production structure as the result of the business diversification. There is no empirical study estimating the economies of scale of scope in the construction and housebuilding industry. This is the first analysis to estimate the efficiency of the multi-production structure of the building industry. From the estimation, we may estimate economies of scale and economies of scope. Most of the Korean building firms want to expand their scale because the Korean government treated large firms distinctively from small firms with various policy measures. In the circumstance, optimal scale of the firms' business and desirable direction of diversification need to be examined. The efficiency measures may give some information about these. All analyses can be carried out by estimating cost function of the multi-product firms.

4.3 Research Methodology

This research can be carried out as a comparative study. However, we could not find adequate similarities between the Korean housebuilding industry and those of the other countries. We could not compare the detail attributes such as industry's growth pattern, outcomes, economic, demographic, and social situation, and policy system with those of any other countries. Thus, this research is solely based on the Korean housebuilding industry and focus is on the investigation of the specialities of the building firms' behaviour. To proceed to the four research areas, two kinds of methods will be used; first, a descriptive analysis using the interview survey method and secondary data sources; second, the empirical approach using secondary data.

The first research area is to investigate how the housebuilding firms operate their business. Focus will be given to examine the prevalent governance structure and the determinants of the Korean housebuilding industry in the current circumstances. It is hypothesised that 'contracting' may be a prevalent governance structure in the production process and the government's various regulations in the production process may be a major force pushing the industry towards the market governance of transactions.

For the first research area, we need to investigate the whole process of the housebuilding business. For this, it is necessary to get information through an in-depth case study. A series of interviews were carried out through two time points in 1996. The total number of firms included in the interview was 24 (Appendix 2). The interviews were carried out with semi-structured questionnaires (Appendix 3) and the interviewees were either senior managers in charge of the housebuilding business or president of the sample firms. In designated firms, most of the interviewees were senior managers in the housebuilding division and in small firms or registered firms, the interview was performed with presidents.

Through the interview method, we surveyed the business objectives and the business strategies of the building firms. Governance structure in the production process was examined, that is, how the decision-making was organised such as land acquisition and development methods, labour purchasing, and materials purchasing in the production process was investigated. We also examined whether 'vertically integrated structure' or 'quasi-firm type structure' was observed in the Korean housebuilding industry or not. Contract type and nature of the contract with other specialists were observed.

The second research area is to examine efficiency of the housebuilding business. The following questions will be examined; how much profit has achieved in the housebuilding business? What is the most important input factor among various inputs ? Does the 'contracting cost' appear substitutable to other input factors ? Can any productivity be observed in the Korean housebuilding business pursuing 'flexibility' ? To answer these questions, statistical analysis using secondary data will be used. First, we need to estimate a cost function of the housebuilding business. Fortunately it was possible to get cost data of housebuilding projects in each building firm. The cost data are taken from 'the cost statement of the completed building works' available from 'the Korea Construction Firm Association'. The data used for the analysis are project-base data, not firm-base data and pooled time-series data from 1986 till 1994. The total number of samples are 823 projects and the data consists of building project data from designated firms and registered firms.

The Translog Cost Function will be estimated with the cost share equations as a multivariate regression system and then, several efficiency measures will be derived from the estimated cost function. The model consists of aggregate cost of 'apartment house building' as a dependent variable, total sales as an output variable and five input factors and time trend as independent variables. The difference from the other studies is that this analysis is performed by extending the range of input factors and by examining in more detail the productivity effects of changing technology. Attention will be concentrated on the role of contracting by reviewing the substitution and complementary relationship with other input factors.

The third research area is to examine diversification details at the firm level. For this, we need a historical approach on the housebuilding firms and a series of statistical analyses. First, using secondary data, to what extent the building firms are diversified will be investigated. The patterns of diversification are examined through four time points between 1980 and 1995. Such diversification details are taken from the building firms' 'the Annual Business Report' published by 'The Korean Stock Exchange'. More than 140 firms are included in the sample. Second, financial analysis of the building firms will be carried out for three time points (1985, 1990 1995) and an attempt will be made to find a relationship between diversity and performance. Lastly, through setting up a diversification model of the Korean housebuilding firms, motives of the diversification will be investigated. In order to find out the motives of the firm's diversification, a Korean housebuilding firms' diversification index will be developed considering specialities of the Korean industry. Market power variables, resource variables, transaction cost variables, a variable explaining uncertainty or risk, profitability and growth variables are considered as explanatory variable of diversification motive. The numbers of sample firms in total is 353 (151 designated firms and 202 registered firms). A multivariate regression model will be used and the estimation will be carried out for different types of firms, type I firms and type II firms. In order to find out the motives of different types of diversification, the above process will be followed separately in two parts, related diversification and unrelated diversification.

The fourth research area is to analyse cost efficiency of the building firms' multi-production structure which is the result of the diversification strategy. First, cost function of the multi-product firms will be estimated. The estimation model is a multivariate Translog Cost function. For the estimation, cross-sectional data are used and the data are taken from 'the income statement' of the housebuilding firms' annual business reports published by 'the Korea Stock Exchange'. The sample included is a total of 318 firms' cost data. The period for the analysis is limited from 1993 till 1995 as output data from separate businesses are available only for recent three years. The estimates are performed by using the SAS statistical package (6.08 version). Second, from the estimated cost function, economies of scale, economies of scope, and cost complementarity between products will be derived. The estimations also indicate desirable direction of diversification and optimum scale of the housebuilding firm in the current situation.

Figure 4-4 summarises four research areas, contents of analysis and methodology in a flow chart. Appendix 2 shows contents of research, data source and research methodology more specifically.

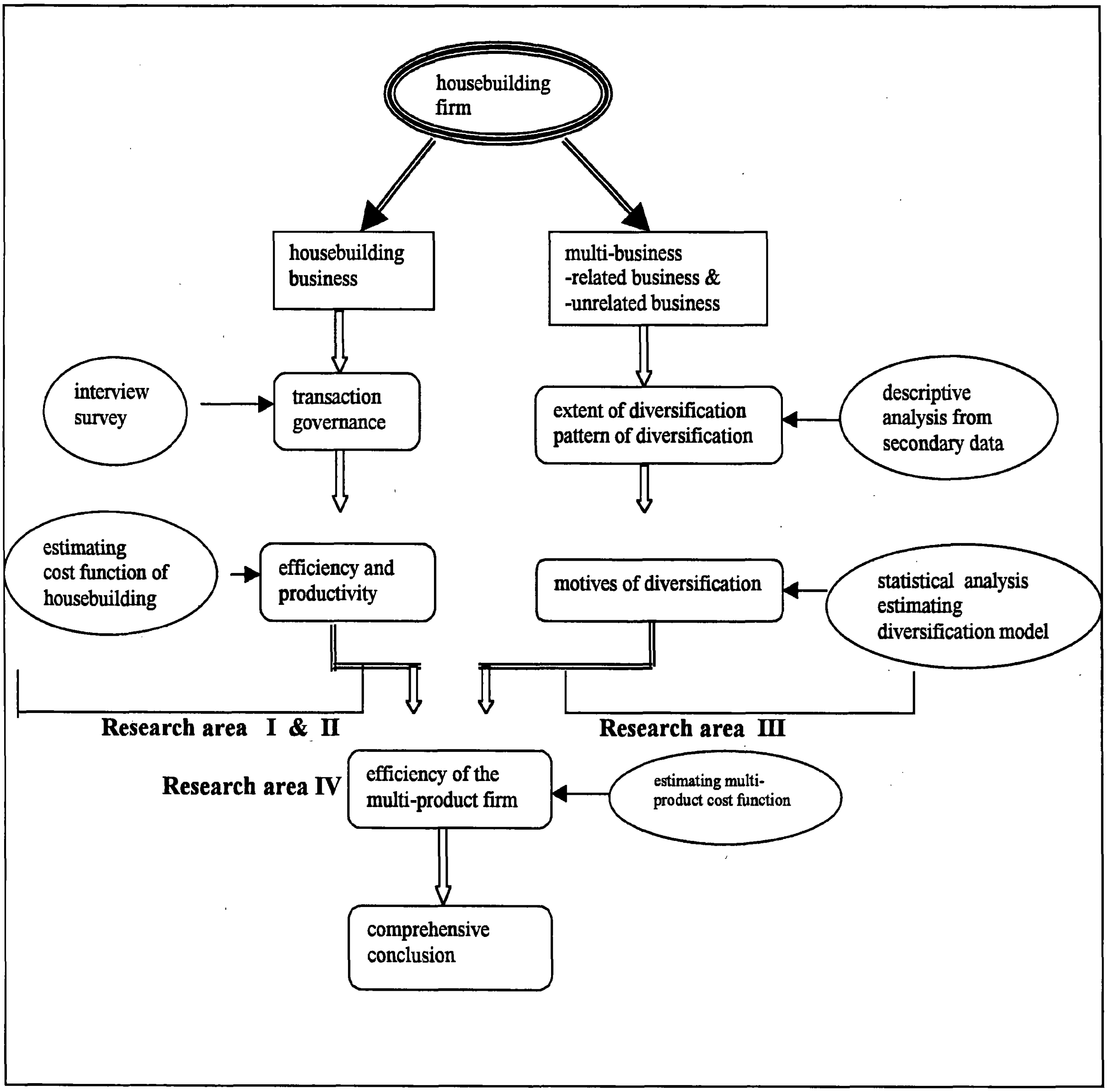

Figure 4-4 Four research areas and research methods

Chapter 5 The Organisation of the Korean Housebuilding Business

5.1 Introduction: Interview Survey Method

The current Korean housebuilding industry is characterised by 'the apartment house industry' built by designated and registered firms. Another outstanding attribute is that the government has greatly intervened in the industry. It was assumed that in the limited business circumstance, 'contracting' may be a prevalent governance structure in the whole production process. It has been a general trend that the contracting system is a prevalent organisational structure in the building site and the contracting ratio has increased. Increase of flexibility and minimisation of capital commitment are frequently commented on as main reasons for the contracting system.

In this chapter, we examined how the Korean building firms have operated the housebuilding business in regulated circumstances. First, business objectives and strategies of Korean housebuilding firms were investigated. Second, in regulated circumstances, it was examined how the building firms have purchased residential land, building materials, and necessary skilled labours. Contracting relationships between subcontractors throughout the production process were examined. Focus was given to the investigation on the governance structure of transaction with subcontractors, that is, whether the improved contracting relationship with other contractors such as 'quasi-firm type', 'partnering relationship', or 'collaborating relationship' is observed in the production process are investigated.

For the analysis, it was difficult to use only secondary data. We needed to investigate the whole process of the housebuilding business, therefore, an in-depth interview method was used. A series of interviews were carried out through two time points; the first interview was carried out during four months from April till July in 1996, the second was done for the three months from October till December in 1996. The total number of firms included in the interview was 24 (10 designated firms, 12 registered firms and 2 small private builders). For details about the firms, see Appendix 3. The firms were basically chosen by random sampling among 115 designated firms and about 4000 registered firms. First, 15 designated firms and 15 registered firms were chosen and then, we tried to contact them. Taking into consideration their responses and

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The interviews were carried out with semi-structured questionnaires (Appendix 4). Through the interview, the building firms' business objectives, strategies to meet the objectives and transaction governance in the production process were investigated. That is, we scrutinised how the decision-making had been carried out on land acquisition and development, labour purchasing, and material purchasing. We also examined whether vertical integrated structure or quasi-firm type structure was observed or not in the Korean housebuilding business. Contracting type and nature of the contract with other specialists were observed. Interviewees were basically senior managers in charge of the housebuilding business or presidents of the sample firms. In the designated firms, most of the interviewees were senior managers in the housebuilding division whereas in the small firms and some of the registered firms, presidents responded to the interview.

5.2 Objectives and Strategy of the Housebuilding Business

Through the interviews, it was observed that most of the building firms were operating the business based on Seoul and the capital region. Only four among the 22 firms were operating their business in local cities and had a regional firm image. Four firms had international branches in the past, but now they are not involved in overseas works, concentrating on domestic housebuilding. All firms were building mainly apartment houses. Some of them tried to build row houses in central Seoul on small scale, but the output was not consistent. We may say that the Korean housebuilding firms are building mainly apartment houses among various types of houses and their housing market is limited to the domestic area, especially in Seoul and capital regions.

5.2.1 Business Objectives

The interviewees were asked about objectives of the housebuilding business. In the first interview, there were some difficulties in surveying the objectives. There was confusion between the concept of objectives, strategy and planning. The managers stated their mission in the business instead of their objectives and answered in an abstract way, such as 'to be a national and international building firm' and 'to achieve high performance and growth'. Therefore, the objectives of business were given in ten categories and they were asked to choose two objectives, taking priority into consideration. Time was limited to the recent 5 years (since 1990). Table 5-1 shows the objectives given in the replies and they were classified into three broad categories.

About 50 percent of objectives were related to business size and nearly 40 percent were social objectives emphasising firms' image, reputation and quality of performance. Only 11.36 percent of objectives were financial objectives such as profit maximisation and high growth. Most of the large firms and designated firms represented their objectives with more stress on 'quality of performance', rarely using the word 'maximisation' in the interview. They emphasised a proper balance between financial objectives and social objectives such as 'acceptable return on shareholders' asset', 'continuous growth', 'good relationship with other workforce' and 'reputation'. Small and registered firms generally emphasised financial objectives and business size objectives such as 'profit maximisation', 'high growth' and 'increase of market share' etc.

Table 5-1 Objectives of the business

Three categories	Objectives	No.of response (%)	
Financial objectives	(1) profit maximisation	3 (6.81)	
	(2) high growth	2 (4.55)	11.36 %
Business size	(3) sales maximisation	5 (11.36)	
	(4) increase of market share	2 (4.55)	
	(5) extension of business areas	6 (13.63)	
	(6) continuous growth	9 (20.45)	49.99%
Social objectives	(7) acceptable return	2 (4.54)	
	(8) quality of performance	11(25.00)	
	(9) honesty and high reputation in the business	2 (4.55)	
	(10) good relationship with other workforce, modernisation of production etc.	2 (4.55)	38.65%
Total	Total	44 (100)	

Each of the 22 interviewees responded to two objectives.

The interviewees consistently responded that the objectives of business have changed over time and emphasised their objectives were influenced by changes of government policies and market conditions. In the 1980s when house prices and land development were regulated, their objectives were more focused on 'sales maximisation', 'extension of business area' and 'continuing growth', rather than financial objectives such as 'high growth' and 'profit maximisation'. Since 1993 when the mass construction plan was completed, most firms emphasised social objectives such as 'production of high quality of houses', 'modernisation of production', acceptable return' etc.

5.2.2 Business Strategies

As the means to meet the objectives, we asked about business strategies. The firms interviewed were operating several strategies at the same time. An open question was given to the interviewees to describe their two major strategies. The business strategies were classified into five strategies as shown in Table 5-2.

Table 5-2 Business strategies of interviewed firms

Three categories	Strategies	Priority 1 (%)	Priority 2 (%)
Differentiation	(1)production of high quality houses	9 (40.91)	7 (31.82)
	(2) development of various types of houses	1 (4.55)	2 (9.09)
Cost-reduction	(3) cost reduction	4 (18.18)	7 (31.82)
Focus	(4) mass production of standardised houses/rental houses	3 (13.64)	1 (4.55)
	(5) niche market strategy	5 (22.72)	5 (22.72)
Total		22 (100.00)	22 (100.00)

The five strategies were divided into three categories based on Porter's basic strategy. Production of high-quality houses was chosen as a first major strategy. It is one of the differentiation strategies. They thought production of high quality houses by strong and solid construction and by using high-quality materials is the best strategy to achieve their objectives. Most of the large firms emphasised the firms' image that they were producing high quality, safe and high-tech modern houses. Actually some firms among them emphasised especially 'secure construction in the production process' and 'usage of high quality materials in the building process'. A manager in H firm stressed that in 1994 the firm produced high-quality, high-cost apartment houses using their own prefabricated frames and high-cost finishing furniture in large-scale apartment buildings. He said that even though the building cost was higher than the regulated sale price, the firm decided to continue the strategy. Some interviewees answered that they are pursuing a differentiation strategy by 'development of distinctive design houses' and 'production of new style houses'.

Focus strategy was the second major strategy. Three firms among the 22 chose focus strategy by 'mass production of standardised houses for labourers or rental houses for middle class'. Five firms chose 'niche market strategy' such as garden-town development in suburban areas for high income households, one-room apartment buildings so-called 'city vill' for urban single households. One of them had a plan for silver town development in near urban area equipped with high-technical medical facilities, sports and convenient facilities. It was observed that most of the registered firms and small firms were pursuing focus strategies. However, they mainly focused on labour household and urban middle-income groups rather than high-income groups. One of them focused on rental households and produced only rental houses from the beginning of their business.

Cost reduction was one of the strategies the firms were pursuing. Only four firms chose cost reduction as their business strategy. It is natural that the firms pursue cost minimisation in order to increase their profits in house price regulation. Cost reduction can be achieved in various ways. It is achieved by reducing unit-costs through large scale operation. The large scale operation made it possible for the firms to purchase materials in direct-transaction with manufacturers and in carload lots and to maintain large inventories. The large- scale operation made it possible to keep more an efficient relationship with other labour forces. Large firms are in an advantageous situation to keep large-scale operation. As a result, the large firms can reduce total costs and get higher profits than small firms. Cost reduction also may be achieved by product innovation such as prefabricated factory engineering, development of pre-assembled and pre-fitted systems. However, it is only possible by long-term investment in new technology and new materials. Without such long sustained effort and investment, cost reduction may be easily reflected in low quality houses.

Most of the interviewees said that cost reduction was the most important strategy in the 1980s. Particularly before 1988 when house prices were ceiled in a constant level, cost reduction effort was vital. However, since 1989 when the adjusted construction cost system was introduced and the price rise of input factors were reflected in house prices, their interest has changed to differentiation strategy such as 'production of high quality houses' and 'development of new style houses'. However, cost reduction strategy has still been as a second priority strategy as shown in Table 19.

We observed some changes in Korean housebuilding firms' business objectives and strategies. In 1980s their objectives were focused on 'business size' such as 'sales maximisation' and 'extension of business area'. 'Cost reduction' was chosen as the most popular strategy. However, in the 1990s, social objectives were emphasised and 'differentiation strategy' and 'focus strategy' have been mostly chosen by the building firms. Most of the interviewees explained that housebuilding is not a profitable business any more due to various regulations and changing market conditions. They have already become involved in other business in order to compensate for the loss from housebuilding. Most of the firms have plans to extend their business area and divert into other business. Surprisingly, even small firms not having enough experience in housebuilding were operating other businesses and have a plan to expand further.

5.3 Contracting in the Production Process

5.3.1 Contracting in the Korean Housebuilding Industry

It is known that 'contracting' is a prevalent organisation structure in the construction and the housebuilding industry. In the Korean housebuilding industry, it was observed that the dependency on contracting was gradually increasing. During the interview period, a survey on the dependency on contracting in the housebuilding process was performed in Korea Research Institute for Human Settlements (KRIHS). The survey showed interesting facts. Contracting has been performed not only in the construction stage, but also in the other stages. They divided the housebuilding process into six stages from the land development stage to the repair and maintenance stage as shown in Table 5-3. The ratio indicates the proportion of the contracting costs to total costs at each stage. The data were provided by the support of each department in charge of the functions in the building firms.

Table 5-3 Contracting ratios in the housebuilding process (Unit: %)

	Average	Large firms	Medium firms	Small firms
Land Development	**8.3**	6.6	2.6	18.3
Design	**100**	100	100	100
Construction	**81.0**	86.8	80.4	78.6
Material Purchasing	**16.0**	7.5	8.8	28.3
Marketing & Sales	**18.0**	10.9	7.4	35.8
After Service, Repair & Maintenance	**15.8**	17.7	11.6	16.7

Source: KRIHS Survey 1996.

Contracting ratios were different at each stage. It is noteworthy that the contracting ratio in the design stage is the highest. The reason for this is explained by a building regulation. According to 'the Building Act', design function has to be performed by an independent specialised architect or architect firms. The contracting ratio in the construction stage was the second highest and large firms showed a higher contracting ratio. The contracting ratios in materials purchasing, marketing and sales, and after-service, repair and maintenance stages were about 15 percent. Contracting in land development was about 8 percent. In the four stages, small firms showed commonly higher contracting ratios than large firms. We may think the reason to be that small firms usually don't retain such manpowers performing marketing and advertising functions and heavy equipment for land development. In material purchasing, as small firms cannot expect cost reduction through 'direct buying' and 'carload-lots purchasing' like large firms, they choose contracting.

Another result shows depending ratio on contracting in housebuilding. The cost data were collected from 'The Korean Construction Firm Association'. Table 5-4 shows the trend of contracting costs to total building costs in apartment building. The total cost reflects real 'building cost' spent in the construction stage and land cost was not included in the cost. In apartment house building, the contracting ratios were shown as 29.70 percent to total cost in 1986 and it increased to 46.88 percent in 1994. The larger firms show higher contracting ratios than medium and small firms. More detailed analysis on cost structure will follow in Chapter 6.

Table 5-4 Contracting ratio to total cost (Unit: %)

	1986	1987	1988	1990	1992	1994
Large firms	30.23	34.85	36.45	42.19	47.67	49.15
Med/small firms	28.58	30.12	27.52	33.58	34.60	44.10
Average	29.70	32.73	32.44	38.47	42.33	46.88

Source: The Korea Construction Firm Association

The two results showed how much the Korean housebuilding firms depend on contracting by contracting ratio to total cost. Obviously a very high contracting ratio was observed in the construction stage. In land development, material purchasing, marketing and sales, and after service stages, the building firms showed a rather high contracting ratio. In this case, small firms showed a higher ratio than large firms. The reason was assumed to be that small firms were not able to retain all kinds of manpower within firms. However, these are based only on cost data. More detailed and specific surveys were carried out by the interview method. The following sections show how the Korean building firms operate each function throughout the production process.

5.3.2 Land Acquisition and Development

Successful land acquisition was known as the most important factor in the success of building projects in the circumstances in which the development of residential land by private firms has been highly restricted. Land acquisition is closely related to the firms' financial situation. Even after purchasing land, firms need additional money to develop the land into available status. Furthermore, if building firms wanted to buy a plot of land and the site was not designated as a residential area, the firms have to follow all converting procedures of the land site from its previous to its new use. Nobody can predict how long it will take for the converting process.

In Korea, before 1980 the government were not involved in land development and there were land developers designated by the government. Housebuilders either developed residential land by themselves or purchased the developed land from the land developers. However, in the 1980s when the government intervened in land development, a change took place in the building process. Land developers either stopped their business or diverted into other related businesses such as housebuilding or property management.

The objective of public land development was to reclaim profits realised in the conversion process and to return it to the social welfare provision. The fact that a building firm purchased public land means that the government performs all the functions related to the development and the firm does not need to undergo the conversion process and various permission procedures by itself. However, it was not a voluntary choice by the firms considering the cost and benefit of the development. The government's regulation led to changing patterns of the production structure. Since 1993 when private land development in the semi-agricultural area and semi-forest areas was partly allowed, some building firms have developed land by themselves; however, they still found difficulties in getting adequate land.

It is meaningful to investigate how the changing pattern in land development affects the firms' behaviour or the structure of production. According to interviews, Korean housebuilding firms normally purchased private land and developed by themselves before 1980s. Since the beginning of the 1980s when the government started to become involved in land development, the firms' land purchasing and development chance has been restricted. Since the mid 1980s most of the building firms have depended on public land. Most of the firms answered that they wanted to buy public land because they could avoid all the complex and long-lasting administrative procedures. However, the acquisition of public land was not always advantageous. The publicly developed land was provided at a rather high price and the building firms have to wait a long time to use the land. Furthermore, firms have to pay the price for the land in advance even before the development process starts. Normally the firms which were not able to afford the high land price, had to borrow money in any form. The high interest rate of the borrowed money was another burden for them.

However, all the firms which wanted to buy the public land could not always do so, as the government was involved in the allocation procedure. It was observed that registered firms relied more on development of private land. The reason for this was found in the regulatory framework. The Korean government treated large building firms distinctively in the allocation of public land. The government gave more chance to the designated firms than registered firms in the allocation process of public land. In this situation, the registered firms had to find private land.

During the interview, a survey for land banking was also carried out. Most of the designated firms retained a larger scale of residential land than small firms or registered firms. The common thing was that due to the shortage of residential land in Seoul and the capital regions, they mostly retained land in other cities. The designated firms retained 700,000 m^2–1,600,000 m^2 land on average in 1995. This represents about 2-3 year land banks at the 1995 housing start level. However, as housing demand was still concentrated in Seoul and the capital region, they did not have any specific building plan in the local areas. Among registered firms, a large firm, K retained a similar level of land as designated firms (about 800,000 m^2), but other small firms kept 100,000-200,000 m^2 residential land in local areas.

The recent deregulation that 'the semi-agriculture and forest areas' around large cities were allowed to be developed as residential land gave important meanings to the building firms. The building firms can have higher a possibility of buying and developing the private land. Actually since 1993, some large firms among those interviewed have developed residential land in near capital regions. However, there exists another bottleneck. According to interview, most of the local governments request the installation of infrastructure facilities around the project area as the condition to permit the development. It is a kind of entry barrier to the land development and building business and became a very big burden to most of the medium and small building firms.

Among the interviewed firms, actually four firms have been unable to continue their business just because they have been unable to find adequate land since 1993. The firms wanted to buy public land, but they were excluded in the allocation process and they could not find any alternative land. On the other hand, there was a successful firm, using land banking strategy. The firm developed private land on a small scale, mainly in suburban Seoul. The manager emphasised 'well located land' more than anything else. Success of this firm's land bank strategy can only be possible by the firms' good financial situation. In fact, the firm achieved progressive growth in recent years and its good financial situation made it possible to purchase more residential land. Some interviewees pointed out that most of their debts occurred when they bought land. In order not to lose the chance to buy land, they borrowed money in spite of the high interest rate.

Interviewees gave a consistent opinion about the base of decision making when they purchased land. The decision has been changed as the relevant policy changed. Before 1988 when the housing price was controlled at a constant level, housebuilding firms wanted to buy 'low cost land' as much as possible. At that time, as demand for housing exceeded supply, the completed apartment houses were all sold out regardless of location and size. It was natural that they wanted to buy 'low cost land' and lower the total cost. However, the situation has changed since 1989. The land price could be reflected in the housing price by the 'adjusted construction cost system'. If they bought high cost land, it might be reflected in the price of the house. 'Good location' became a more important factor than 'low cost'. If the location was not good, the completed houses sometimes would not be sold, even though prices were relatively lower than those of well-located houses. The housebuilding firms wanted to find good located land first of all, and then tried to reduce the unit cost of land by adjusting the whole coverage ratio of the project.

In the process of interview, it was found that land development regulation was one of the strongest interrupting factors in the business. To overcome the limitation, building firms were performing an alternative strategy. That is, building firms were carrying out the housebuilding business in a 'contract type' method. This means that there is another developer, which could be central government, local government, other government organisations or other private building firms. The reason was definitely because they could not obtain adequate land to build on. In this case, the housebuilding firms have a contract relationship with the developer only for the construction of the on-site work. Planning function, land purchase and development function, and other functions are performed by the main developer. When the firms perform the housebuilding business in this type, they only pursue efficiency of the construction process and efficient management technique on-site as a contractor.

Most of the large firms were carrying out the building project by two methods; 'development type' and 'contract type'. As large firms usually have a high name value and better financial situation, they were able to maintain the balance between 'development type' business and 'contract type' business. In the case that they did not have any residential land for housebuilding, they applied the contracting process. As a result, they were able to keep stability of total sales. They might apply the bidding process at any time and they could continue the housebuilding business by 'contract type'. On the other hand, medium and small firms depended more on 'development type' business. This was purely because the government operated 'public allocation system of developed land' distinctively between large and small firms. The government allocated a larger amount of land to the designated or large firms than to the registered or small. The limitation of using public land and land shortage led the small firms to seek other land desperately. However, the private land they developed was not always profitable or adequate to their business. If they did not buy adequate land, they could not continue the business and finally bankrupted. Their business depends totally upon the acquisition of residential land and the business cycle.

Table 5-5 Operating type of the housebuilding business (Unit: %)

	Average	Large firms	Medium firms	Small firms
Development type	**65.5**	42.8	52.7	72.7
Contract type	**34.5**	57.2	47.3	27.3

Source: KRIHS survey, 1996.

The KRIHS survey (1996) supported the fact. Table 5-5 shows the operating type of the housebuilding business. It explained the fact that large firms showed a higher ratio in contracting type as follows; most of the large firms had experience in the contracting business before entering the housebuilding industry and they were able to utilise their know-how and management skills acquired in the construction industry in the contract type of housebuilding business. On the other hand, the medium and small firms having no experience in contracting business showed higher dependency on the development type work.

We may summarise land acquisition and development of the building firms as follows. Korean housebuilding firms have depended on publicly developed land since the mid 1980s when the government became highly involved in land development. However, since 1993 deregulation in the 'semi-agriculture and semi-forest areas' around large cities gave important meanings to the building firms. Building firms can participate in small scale (less than 30,000m^2) development. However, they have to install the necessary infrastructure facilities in the project area as the condition for permitting the development. This policy gave another burden to most of the medium and small building firms. In these circumstances, the building firms became gradually involved in 'contract type' business of housebuilding. This means that the building firms are only involved in the construction stage by contracting relationship with a main developer. If they could not participate in the contracting type of housebuilding, furthermore, could not find adequate residential land, they might finally give up the housebuilding business.

5.3.3 Labour Purchasing

High dependency on contracting was observed as a prevalent attribute in labour purchasing. Throughout the production process, labour purchasing was observed in complex relationship with various participants. A housebuilding firm, the designated or registered firms, is a developer of the building project. Various specialised building firms (specialised subcontractors), material dealers and manufacturers, and on-site craftsmen are involved in the project. Specialised building firms and labour-only-contractors usually perform practical on-site works requiring specific skills. The specialised building firms are classified as 23 categories according to 'the Construction Business Law'[1]. The labour-only-contractors are independent contractors, however, they do not belong to any formal contractor. They perform some specialised building works such as brick laying, wood work, concrete work, and plaster work. Usually they are temporarily recruited by the housebuilding firms or specialised building firms under the contract with the housebuilding firms and/or the specialised building firms.

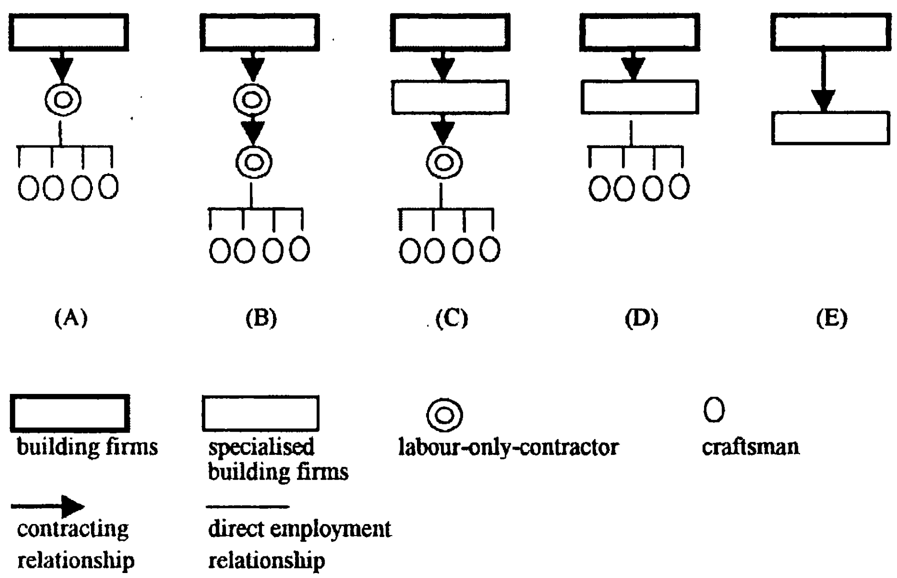

Figure 5-1 Five types of contracting relationship

[1] decorating, earth work, plaster and plumbing, stone and masonry, painting, brick laying, scaffolding, doors and windows instalment, roof and sheet metal, reinforced concrete, metal work, utility service, water supply and sewerage, boring and grouting, railroad and rail track, paving work, underwater work, landscaping and plating, landscaping and facilities installing, building assembly work, steel frame work, lift installation work, greenhouse provision work.

Figure 5-1 shows various types of contracting found in the Korean housebuilding industry (KRIHS 1992). The contracting relationship among the housebuilding firms, specialised building firms, and other labourers is classified into five types as shown in Figure 5-2.

(A) is a case that a housebuilding firm contracts out some parts of the building works to the labour-only-contractor on a temporal contract. In this case, the labour-only-contractor employs craftsmen and odd-job men on a daily basis. (B) shows a higher level of contracting. The housebuilding firms contract out to a labour-only-contractor first, then the labour-only-contractor subcontracts to several labour-only-contractors in several local regions. This is the case that the building project is large-scale or the site works are performed on several sites. (C) is a traditional labour contract type. A housebuilding firm contracts out some works to a specialised building firm and then the specialised building firm subcontracts out some parts of the works to labour-only-contractors. (A) (B) (C) show the contracting relationships with the labour-only-contractors. The relationships may develop in more complex and various types by scale of the project.

(D) shows the case in which a housebuilding firm has a relationship with a specialised building firm only. The specialised building firms perform on-site work with their own technicians. This case is commonly found in performing the equipment-intensive and material-intensive works such as electric, facilities, window work etc. (E) shows the traditional material contracting type that a housebuilding firm contracts out the purchasing of materials to a material manufacturer. Several types of contracting relationship may be used in one building site and the level of the contracting may be higher than 4-5 stages.

If the building scale is small, simple and first level contracting relationship is revealed. For small builders who build less than 20 dwellings per project, contracting was found only with labour-only-contractors and material manufacturers as shown in Figure 5-2. Sometimes, the material manufacturers may perform the building works with their own craftsmen. This is called 'supply-fix-contract'.

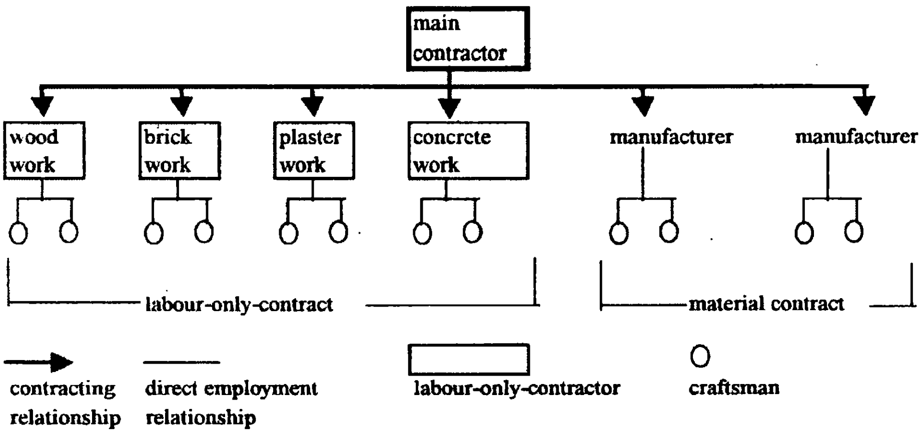

Figure 5-2 Contracting type in small builder

As the building scale becomes large, the contracting relationship becomes complex and multi-level contracting is revealed. Figure 5-3 shows an example of the traditional contracting structure in the large-scale apartment building.

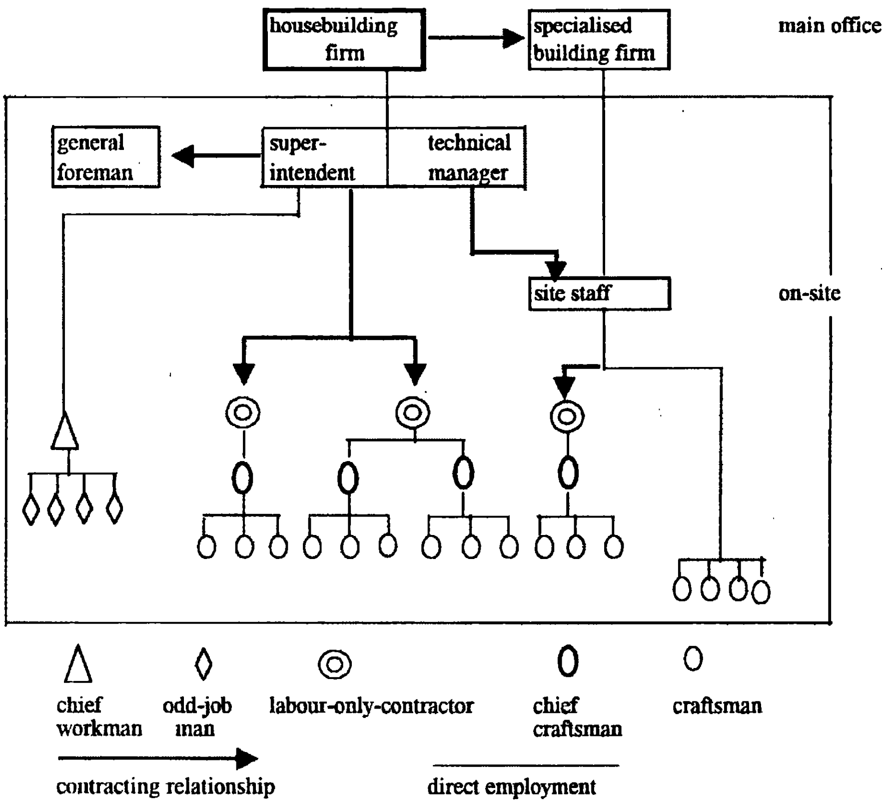

Figure 5-3 Traditional contracting type in housebuilding
Source: revised from The Construction Labour Market in Korea, KRIHS,1992. P.12.

Housebuilding firms may include a general foreman, superintendent and technical manager as their own employees. The general foreman supervises the whole building project from planning stage to sales stage. The superintendent and technical manager are managers on the building site. They have rights of management and control of the whole site works. When the scale of the building project is large, the firms may temporarily employ a chief workman and odd-job man on the building site. They carry out miscellaneous works such as delivery of the building materials and cleaning works etc.

The specialised building firms usually employ site staff and specialised technicians. The site staff are usually regular members of the firm and their role is to control and supervise the contracted work on site. Technicians are usually specialists in electric, facilities installation and other site work. The specialised building firms may employ labour-only contractors as temporary labour force in case their own employees can not perform the whole work.

The labour-only-contractors are temporarily recruited by the housebuilding firms or specialised building firms. Labour-only-contractors carry out mainly labour intensive works such as excavation, reinforced concreting, plastering, concrete blocking, brick laying work. If they have long experience and competence in the site work and the ability to enlist building labourers, they may employ their own skilled or semiskilled craftsmen. However, this is not a firm type and this is a type of interlocking network among independent simple labourers.

During the interview, contracting ratios were surveyed by types of the works. The contract type and the contracting ratio in each work may be different by firms. Table 5-6 shows the contracting ratio in each type of works in construction stage. The ratios indicate proportions of contracting costs to total costs in each work. For example, they mean that Korean building firms contracted 72 percent of work in the foundation work and they performed the residual 28 percent of works by themselves. Contracting ratios were shown as high in each type of work. In particular the labour intensive works such as foundation work, excavation, brick laying, plaster, tiling work are usually carried out by 'labour-only-contract', whereas the material intensive works such as window, glazing, furniture, heat insulation, electric facilities, lift, painting and landscaping works were usually carried out by 'supply-fix-contract'.

Table 5-6 Contracting ratio by type of site work (Unit: %)

	Subcontracting ratio	Supply-fix-contract	Labour-only-contract
Foundation work (and Piling work)	72.1		V
Excavation work	71.9		V
Reinforcing concrete work (steel work)	67.0		V
Brick laying and stone work	81.2		V
Plaster and water proof work	84.7		V
Internal work(heat insulation, window, glazing, furniture)	80.6	V	
Painting and colouring work	90.9	V	
Landscaping	85.7	V	

Source: interview survey in 1996.

In the late 1980s (1989-1990), a large firm (B firm) in Korea tried to employ labour-only-contractors as their own employees in order to maintain the balance of supply and demand of labour, to improve their skill, and to secure the labourers. That is, the firms tried 'the in-house production' type in the building stage. At that time, it was very difficult to find skilled building labourers at the adequate time and at the adequate price. However, after 2 years, their effort proved to be a failure. The firms were not able to afford to pay their fixed salary, which was not relevant to their completed workload. This is a good example of indicating that 'contracting' is a more efficient production system in housebuilding.

During the interview, it was observed that there were outstanding differences in the reason for contracting. Most registered firms and small firms replied that they depended on contracting because it was the cheapest method by using a competitive tendering procedure. They were able to reduce construction costs in the bidding process. However, large and designated firms commented on the specialisation of building work, controllability of unstable work load and reduction of overhead costs as the reason for contracting.

5.3.4 Materials Purchasing

A great number of materials are necessary for housebuilding. As the major materials, cement, remicon, aggregates, reinforcing bars, concrete steel, plywood, wood, windows, sanitary fixtures, cement bricks are considered and there are hundreds more materials necessary. The materials costs consist of about 35 percent of the total costs. Economic purchase of building materials may be a factor in reducing the total cost and usage of high-cost, high-quality materials is directly reflected in the quality of the house. Materials purchasing is regarded as an important process in housebuilding. According to the interviews, the method of purchasing materials was performed in three ways; 'market purchasing', 'contracting' and 'vertical integration'.

First, market purchasing means that housebuilding firms buy their materials directly from the manufacturers or retailers. Medium and small firms usually purchased the materials themselves from agencies or retailers on the project basis and frequently whenever the site work requires. This was because their workload was not as stable as large firms. The site staff on the building site was usually in charge of purchasing materials per project and by region. The manager of medium and small firms commented on the difficulties of materials purchasing, especially when some materials were lacking. They actually experienced difficulty in buying some materials, especially in 1989 and 1990 when housebuilding works were at a peak.

It was observed that the large firms mainly bought their materials from material manufacturers. Large firms have operated 'partnering systems' with several material manufacturers, that is, they have networked with material manufacturers. Through the partnering system, large firms purchase materials from the manufacturers directly and the transaction was performed on a regular, and normally long-term, basis. They usually set an 'annual purchasing plan' and steadily transacted by the plan. The purchase was normally carried out in the purchasing division at head office, taking into consideration the firms' whole building process. When the firms needed more materials than the material collaborators could supply for them, they purchased the additional materials from other manufacturers or agencies or retailers. This partnering system is considered as an intermediary type between market structure and in-house production.

Among the firms interviewed, three large building firms (Hyundai, Chunggu, Hanyang) were using a peculiar materials purchasing method, that is, they depended on so-called 'Materials Purchasing Centres' for purchasing materials. The Centre is controlled by the group's head office. In the Huyndai business group, there are three construction firms (Hyundai Construction Company, Hyundai Sanup Development, and Korea Ssanup Development). They are all involved in the construction and housebuilding businesses. The Centre makes materials purchasing plan at the business group-level and annually. Most of the materials are purchased by the Centre (90 % in case of Hyundai sanup development, 80 % in case of Korea sanup development). The Chunggu and Hanyang corporation also have independent 'materials purchasing division' at the business group level. They depended on the purchasing division for the purchase of various materials. The materials purchasing centre and division transact directly with the materials manufacturers. They can gain some advantages such as economy of scale from mass purchasing and direct purchasing, stability and rapidity in purchasing materials, and acquisition of high quality materials.

A second method of purchasing materials was the 'contracting method'. The contracting method means that the purchasing is performed by other firms or subcontractors. This is known as 'supply-fix-contract' method in which both purchasing of materials required in the building work and carrying out the works are included in the contract. For example, internal building works such as heating, insulation, furniture and glazing, and especially the works having high depending ratio on materials are carried out by 'the supply-fix-contract'.

A large firm tried the 'contracting' method to purchase materials. C firm tried to buy most of its materials through 'contracting' in 1992 and 1993. The manager said that they could reduce the housebuilding cost by as much as 150,000 won per pyong (about 20 % of total cost) by using this method. Another H firm showed the same situation. Since 1992, they increased the ratio of 'supply-fix-contract' in the building process. When they contracted with specialised building firms, materials purchase was included in the contract. The subcontractor purchased materials required in the building work, as well as carrying out the building work. However, a manager in one other firm interviewed strongly commented that reduced materials cost by the 'supply-fix-contract' meant low quality of materials. The problems of using low quality materials appeared in competed houses. He emphasised that as materials costs can be reflected in house price in 'the adjusted construction cost system', more secure construction and production of high quality houses may be competitive advantages of the building firms.

During the interview, it was found that some large firms showed vertical integrated structure in purchasing materials. The vertical integration is considered as a third method of purchasing materials. 'Backward integration' in the housebuilding industry was observed, that is, some housebuilding firms were participating in the manufacturing of the building materials. Six large building firms among 22 interviewed firms were involved in materials manufacturing. Details of materials produced by the firms are summarised as Table 5-7.

Table 5-7 Building materials produced by housebuilding firms or within same business group

	Within firm	Within same business group
Hyundai Sanup	Heavy equipment PC panels	Concrete steel, Furniture, Aluminium window, Steel pipe, Lift, Boiler, Remicon, Home Automation
Daewoo	Plywood Steel	heavy equipment
Chunggu	PC panels	-
Kyaeryong	Aggregates Remicon	-
Korea Sanup	Remicon Ascon Aggregates	Concrete steel, Furniture, Aluminium window, Steel pipe, Lift, Boiler, Remicon, Home Automation
Shinho	Steel Aggregate	Home automation, Steel

Source: interview survey in 1996

The materials that the building firms were producing are those such as remicon, ascon, aggregates and prefabricated materials. 'Hyundai sanup' produced heavy equipment and P.C. panels within the firm and several materials such as cement, steel, furniture, aluminium etc. were produced within the same business group. Some large firms such as Chunggu and Hanyang were operating a factory to produce pre-fabricated materials in order to reduce the housebuilding cost in the long term. To produce the pre-fabricated materials, a large amount of initial investment is needed. However, it was proved that the pre-fabricated materials were not yet popular in Korea due to drawbacks in soundproofing and less sophisticated finishing skills etc. The firms producing pre-fabricated materials were not able to achieve good performance yet. We found common attributes of the firms which participated in the production of building materials. The first is that they are all large-scale firms and their financial conditions are better than small firms. The second is that they have long business experience in the production of the building materials or they started their business in the manufacturing of materials (in Korea sanup, Shinho, Kyaeryong).

In the process of materials purchasing, different patterns were observed between large firms and small/medium firms. Large firms developed various methods of purchasing materials. Most of them were operating a 'partnering system' with materials manufacturers based on continuous transaction. Some of them (three firms of twenty two) were achieving 'cost reduction' from centralised and mass purchasing methods at the business group level. Six large firms of them were involved in the production of materials, that is, they showed 'vertical integrated structure'. On the other hand, most of the small and medium firms were purchasing materials by the 'market structure'. They usually purchased the materials themselves from agencies or retailers on the project basis. However, according to the type of building works and the nature of the materials, they sometimes depended on supply-fix-contract as well.

5.4 Transaction Governance in the Housebuilding Business

Throughout the production process, high dependency on contracting was observed, that is, contracting was observed as a prevalent governance structure in Korean housebuilding. However, contracting relationships with other building firms or other contractors was different from those of the UK and US building firms, that is, more advanced contracting structures were not observed in Korean housebuilding.

Actually, the Korean government has sought to improve the relationship between the developers and specialised contractors by an institutional system. Since 1986, the government has encouraged the building firms to co-operate with small, specialised firms in a partner-relationship. The 'partnering system' is a kind of production structure in which the firms keep contract with specialised building firms on a long-term basis for specific building works. This system is based on the view that housebuilding firms support their contractors in financial and technical respects and that contractors perform the site work for the housebuilding firm and their relationship is based on 'trust' between firms. This is a similar concept with 'quasi-firm type', 'partnering system', 'networking system' and 'collaborators' observed in advanced countries.

To develop the partnering system, the government has pursued various institutional efforts[2]. The partnering relationship between the firms and contractors is basically possible by continuous contract relationship. Once the scale of the firms' sales reaches some level, it is easier to adopt 'the partnering system'. Most of the large housebuilding firms were operating the partnering system with the specialised contractors in each building works. According to the KRIHS survey (KRIHS,1996), 73.5 percent of large housebuilding firms and 47.9 percent of medium firms adopted the system. However, the building firms still used many labour-only-contractors as the site labourers, besides their collaborators. The transaction with the labour-only-contractors has been kept in project basis or temporarily.

During the interview, it was investigated whether the contracting relationship with the housebuilding firms and contractors is similar with the advanced structure such as 'quasi-firm type', 'partnering system', 'networking system' and 'collaborators' observed in advanced countries. All firms among the interviewed firms answered that they were operating the partnering system with their contractors. Most of the building firms followed the institutional frame and had their collaborators. To investigate the relationship with contractors in more detail, several questions were asked such as selection standard for 'collaborators' (selected contractors), the transaction period, pricing method, and extent of supporting.

As the standard to solicit 'collaborators', the large firms usually considered the contractors' high performance, work experience and management skills in order, whereas the medium and small firms considered the number of technicians and retained equipment. This explains why the medium and small firms were using their collaborators to compensate for their weakness in skilled labours and building equipment. The transaction periods with their collaborators were also different. Four large firms kept the relationship with the same collaborators for about 10 years, whereas most of the other firms kept 3-5 years in average. The interviewees said that they tried to change their

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[2] The government included a clause about the partnership of subcontracting in 'the Construction Business Law' in 1984. It was enacted as 'the Promotion Act of Partnering System of Contracting' in 1986. The objective was to establish a co-operative relationship between large building firms and contractors. The Korean government recommended various advantages of this system in the provision. Since October 1995, the Ministry of Construction and Transportation has organised 'the Committee for Promotion of the Partnering System' and made efforts to consolidate such a system. The objectives are to evaluate the performance of 'the partnering system of subcontracting' and to choose excellent performers and to subsidise some grants to them. However, this is not an obligatory, only an advisory system.

collaborators every 2-3 years in order to search for better contractors. The transaction period was closely related to their scale of the firms and business period.

The pricing method showed some differences between firms. The pricing method in the contracting procedure could be classified into four groups; 'private contracting', 'estimated cost or average cost', 'competitive bidding among nominated bidders' and 'lowest tendering method'. Only three large firms having long relationships with their collaborators were mainly using 'the private contracting' and 'estimated cost or average cost'. However, other firms, especially small firms, mainly depended on 'lowest tendering method'. They wanted to reduce costs as much as possible in the pricing procedure. This indicates that their relationship with collaborators was not as mature as in the case of large firms. It was found that the longer the transaction period with contractors was, the more they gave some advantages to their collaborators by securing their work load and by guaranteeing some profit in the pricing process.

Large housebuilding firms have supported their collaborators by providing business training, and offering favourable terms of payment (usually undelayed payment and cash payment). However, this is not considered to be enough level as an investment for their collaborators. Most of the other firms did not support their collaborators except in providing good conditions of payment terms. It is known that the relationship between the building firms and the small contractors in Japan is famous for the 'trust' relationship. The prime firms are strongly networked with contractors. They have a comprehensive investment plan for their collaborators and the level of investment to them is very high.

During the interviews, a movement was found that large housebuilding firms have reduced the number of their collaborators but heightened the level of support for them. It was known that housebuilding firms tried to reduce the number of collaborators in order to develop the partnering system at a more satisfactory level. The large firms wanted to keep a strong relationship only with the most reliable firms, as transaction with too many contractors resulted in an increase in the administrative cost. They pursued a genuine 'trust relationship' based on high investment and quick and frequent communication between firms.

We may summarise building firms' relationship with contractors as follows: most of the building firms were networked with specialised building firms or contractors. However, considering the relationship between firms and specialised contractors, the partnering system has still been operated at an introductory level. It is not working yet as the original meaning itself, based on strong 'trust' and 'co-operation. Some large firms contributed to the development of the system by investment for the collaborators, distinctive treatment in pricing, and long-lasting transaction. However, most other firms did not invest in their collaborator, because the collaborators may show opportunistic behaviour after obtaining some training and transferring of technical know-how from the main firms. Continuous and long-lasting transaction makes it possible to develop the relationship into a mutual trust stage. Their relationship was not developed into a 'trust' relationship. We could not find 'quasi-firm' type, 'partnering system', 'long-term contracting', or 'vertical and horizontal collaboration' with specialised contractors as found in the advanced countries. It was also observed that small firms did not try to invest for their contractors, as they could not guarantee the business's continuity. We may consider the relationship between building firms and on-site specialised labours as traditional 'contracting' relationship in the market, not 'partnering relationship'.

5.5 Findings and Discussion

In this chapter, we examined how the Korean housebuilding firms operated their business, focusing on some major decision making in the production process. Through the interview survey method, we investigated how the important decision making on objectives of the business, business strategy to achieve the objectives, and purchasing land, labour and materials were operated.

It was observed that the objectives of housebuilding firms and the strategies to meet the objectives have changed as time went on, responding to the demand situation and government regulation. Since 1977 prices for newly built apartment houses have been regulated within a ceiling price. In the mid 1980s, demand for housing was high and demand for apartments was somehow guaranteed. Many firms entered into the housebuilding industry and their objectives were focused on 'profit maximisation' and 'high growth'. 'Cost reduction' was a key strategy in order to compensate for the loss of profit due to the ceiling price. However, since 1992, after achieving mass construction of houses, demand for housing has continuously decreased and the regulation for house prices also changed. The objectives of the business were changed into those which more emphasised 'quality of performance', 'firm's image', 'continuity of business', and 'extension of business'. The building firms' strategies were also changed into 'differentiation strategy' and 'focus strategy'. Building firms segmented their market, based on income level and household characteristics. More emphasis was given to specific demand market and development of differentiated, high-quality and design-specific houses. It was also observed that most firms wanted large-scale operation and extended firms' scale in order to achieve economy of scale. Only competitive building firms could survive during the highly volatile period after 1992 when take-over and bankruptcy were prevalent in the housebuilding industry.

It was observed that most of the Korean building firms depended highly on 'contracting' in the whole building process. Interviewees pointed out that changing policies in the housebuilding industry generated 'enforced uncertainty', besides the natural uncertainty observed in the building process. The perceived high extent of uncertainty gave birth to the 'contracting' type structure in the production process. The uncertain business situation led the building firms to pursue 'flexibility' rather than 'efficiency' or anything else. Most of the interviewees replied that housing demand was changed with the change of the government's policy and building firms were responsive to meet the demand. In particular, land development regulation and the public allocation system of land were important factors pushing most of the firms to 'contracting type' business. Due to the regulations, Korean housebuilding firms' profit was limited to building profit on site and their business was highly influenced by the chance to purchase public land. The firms not gaining public land were not able to keep the housebuilding business.

In the uncertain situation, housebuilding firms did not want to invest both in the product and the production process. More advanced 'integrated' structure such as 'quasi-firm type', 'partnering system', 'networking system' and 'collaborators' were not observed, even though the Korean government put efforts to settle down 'partnering system' between building firms and contractors in the production process. The building firms did not want to invest in the training of their own employees and did not try to improve the relationship with their contractors. Building firms showed very opportunistic behaviour in relation to contractors. They changed specialised contractors every two years as they wanted new, more reliable contractors. They also showed very competitive relationship with contractors in the contracting process. Some of the large leading firms showed a different relationship; long-term relationship with the same specialised contractors or material manufacturers and 'vertical integrated structure' in materials manufacturing. However, these cases were exceptional and limited to a small number of large building firms. 'Contracting' has been established as a transaction governance throughout the development process.

Interviewees pointed out that uncertainty in the housebuilding business enforced building firms to divert or diversify into other businesses. It was a surprising result that building firms were pursuing diversification, even before not reaching specialisation in housebuilding. The building firms' diversity is similar to the large building firms in advanced countries. However, the pattern and motive of the diversification may be different (Further investigation will be followed in chpater 7 and 8).

Throughout the interviews, we could confirm that the Korean government's intervention in the housebuilding industry influenced production structure and the building firms' behaviour. The result gave some implications on the Korean housebuilding industry. The contracting system might contribute to rapid growth of the Korean housebuilding industry for a short period. However, we may have some doubts whether the structure has contributed to the development of the industry in the longer term. Contracting was observed as a prevalent transaction governance in the production process and competitive and opportunistic relations with contractors may bring about some negative effects on the industry. Interviewees have also commented that managers of building firms did not want to invest in housebuilding. They did not want to invest in training their own employees and in the long run, this will lead to a shortage of skilled labour in the construction industry. The building firms showed opportunistic behaviour in relation to the contractors and they did not invest for a more stable and mature relation with the contractors. The aggregate negative effects may delay the development of the building industry.

Chapter 6 Cost Efficiency of the Korean Housebuilding Business

6.1 Introduction

The objective of this chapter is to investigate how building firms have operated the housebuilding business. It was found that 'contracting' was a prevalent governance structure in housebuilding. It was also found that building firms depend on 'contracting' to reduce uncertainty and to maximise flexibility in the building process and the structure may be reflected in the cost function. Cost analysis was focused on the relationship between contracting cost and other input factors.

It was hypothesised that 'contracting cost' may appear substitutable for the other input factors. To test the hypothesis, first, it was necessary to estimate the cost function of the Korean housebuilding business. From the estimated function, we may derive various efficiency measures such as substitution elasticities, price elasticity of input demand, returns to scale and productivity. The difference from the other studies is that first, contracting cost was considered as an independent factor. As part of this extension, five input factors of production such as materials, labour, overhead, equipment and contracting costs are considered. It is noticeable that contracting cost is considered as an independent factor. Attention was concentrated on the role of contracting by reviewing substitutive or complementary relationship between input factors. Second, the effects of changing technology on productivity were examined in more detail in this analysis.

6.2 Estimation Model

6.2.1 Basic Model : Translog Cost Function

We assumed that the housebuilding industry could be characterised by a twice differentiable production function relating the output of housing services Y to several factor inputs. We considered five input factors; materials M, labour L, contracting S, overhead O and equipment P. Here T is time trend representing non-neutral technological change and accounting for technological shifts in the production function as suggested by Baltagi and Griffin (1988).

$$Y=Y(M, L, S, O, P, T) \tag{1}$$

If firms minimise costs, the production technology is reflected by the cost function. It can be represented by a cost function of the firms by the Shephard Duality Theorem (Shephard, 1953).

$$C=C(P_m, P_l, P_s, P_o, P_p, Y, T) \tag{2}$$

Here C is total cost and P_m, P_l, P_s, P_o, and P_p are the prices of material, labour, contracting, overhead, and equipment respectively. From the general representations, n-factor second-order approximations to arbitrary analytic functions can be specified.

As the theoretical model, the generalised translog-production technology originally developed by Christensen, Jorgensen and Lau (1973) was used. The reasons for using the Translog cost function are that the function does not constrain restrictions to be homothetic or homogeneous, unlike the other cost functions such as Cobb-Douglas and CES (Constant Elasticity of Substitution) cost function. It also does not impose restrictions on the elasticities of substitution. The translog cost function is known as the most flexible and improved function to allow these restrictions to be tested. Therefore, from the Translog cost function, we may estimate 'returns to scale', 'elasticities of substitution or complementarity' between input factors, and other productivity measures.

The specific translog function is of the following type (Brox, 1993 p3).

$$\begin{aligned}\ln(C) = \alpha_0 + \alpha_y \ln(Y) + \sum_{i=1}^{n} \alpha_i \ln p_i + \frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n} \alpha_{ij} \ln p_i \ln p_j + \alpha_{iy} \sum_{i=1}^{n} \ln Y \ln p_i \\ + \frac{1}{2}\alpha_{yy} (\ln Y)^2 + \alpha_t T + \alpha_{ty} \ln YT + \sum_{i=1}^{n} \alpha_{it} \ln p_i T + \frac{1}{2}\alpha_{tt} T^2\end{aligned} \tag{3}$$

subject to

$$\sum_{i=1}^{n} \alpha_i = 1,\ \sum_{i=1}^{n} \alpha_{ij} = 0,\ \alpha_{ij} = \alpha_{ji},\ \sum_{i=1}^{n} \alpha_{iy} = 0, \text{ and } \sum_{i=1}^{n} \alpha_{it} = 0. \tag{4}$$

Here i and j denote the aggregate inputs, M, L, S, O and P. The restrictions, specified by equation (4) are imposed so that the dual cost function satisfied the properties of neo-classical production theory. These restrictions suggested that equation (3) is nonnegative, real valued, strictly positive for nonzero levels of output and linearly homogeneous and concave with respect to the input price for each level of output.

The cost-minimising share equations are derived by applying Shephard's lemma to equation (3) (Diewart, 1971). That is, after differentiating equation (3) with respect to the logarithm of prices, the share equations become

$$S_i = \alpha_i + \sum_{i=1}^{n} \alpha_{ij} \ln p_j + \alpha_{iy} \ln Y + \alpha_{it} T , \tag{5}$$

where S_i represents the share of factor i (i=M, L, S, O and P in total cost which sum to unity). Using the estimation results of the cost function and share equations, we can estimate various factor elasticities and productivity indices.

6.2.2 Elasticities and Productivities

This analysis pursues the investigation of important input factors in the housebuilding business and examines how the input factors are affected by the changes in the other factor price and the scale of the building project. Another objective is to examine the efficiency and productivity of the Korean housebuilding project under the sales price regulation. Three sets of elasticities and two sets of productivity indices are derived from the model equations (3), (4), and (5):

Elasticity

The elasticity measures give some answers to find important input factors in the housebuilding business and relationship between input factors when input factor's price changes and input factor's use changes, and when the scale of business changes.

- the Allen's own and cross partial elasticities of substitution, δ_{ij}, are given by equation (6)

  $\delta_{ij} = (\alpha_{ij} + S_i\,(S_i - 1)) \,/\, S_i$, if i=j, and

$$\delta_{ij} = (\alpha_{ij} + S_i S_j) / S_i S_j, \quad \text{if } i \neq j. \tag{6}$$

The elasticities of substitution (δ_{ij}) mean the percentage change in the use of the input factor when other input factors increase by one percent.

- the own and cross price elasticities of factor demand, ε_{ij}, are given by equation (7).

$$\varepsilon_{ij}=\delta_{ii}S_i \quad \text{if } i=j, \quad \text{and}$$

$$\varepsilon_{ij}=\delta_{ij}S_j \quad \text{if } i\neq j. \tag{7}$$

The price elasticities of factor demand (ε_{ij}) mean the percentage change in the use of the factor when each factor's price increases by one percent with output held constant. Own price elasticities of factor demand (ε_{ii}) shows the percent decline in the use of a factor when its price increases by one percent with output held constant. Global concavity of the cost function requires that all Allen's own partial elasticities of substitution (δ_{ii}) and consequently, all own price elasticities of factor demand (ε_{ii}), are negative at all data points[1].

- the price elasticities of factor demand with respect to output, η_{iy}, are given by equation (8).

$$\eta_{iy} = \frac{\alpha_{iy}}{S_i} + \alpha_y + \alpha_{yy} \ln Y + \sum_{i=1}^{n} \alpha_{iy} \ln p_i + \alpha_{ty} T \tag{8}$$

Pindyck (1979) explained that these elasticities (η_{iy}) mean price change of factor demand with respect to output. Lopez and Tung (1982, p129) classified the input factors as inferior (η_{iy}<0), normal ($0\leq\eta_{iy}\leq1$), or superior (η_{iy}>1), based on the values of the elasticities. If η_{iy} is greater than one, the factor is considered to be a superior factor, if η_{iy} is greater than zero and less than one, as a normal factor, and if η_{iy} is less than zero, as an inferior factor. Brox (1993) explained that the price elasticity of factor demand (η_{iy}) provided two kinds of information. First, they indicate the manner by which an anticipated change in output will affect input demand for given relative prices and

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[1] For details on the properties of such flexible function forms, see Guilkey *et al* (1983), Diewart and Wales (1987)

technology. Second, they provide evidence on the nature of the inputs in question as classified by Lopez and Tug (1982).

Productivity

The scale of the Korean housebuilding project has grown rapidly during the mid 1980s. Relevant questions are; how did the expansion of the scale of project affect the price responsiveness of the housebuilding industry ? Did the larger scale operation lead to a greater flexibility in the housebuilding industry ? Did the input factors demand curve become more elastic as the production scale expanded ? These questions were rarely considered in the Korean housebuilding study. It could be answered by various productivity measures such as elasticity of total cost with respect to output and the elasticity of total cost diminution suggested by Brox (1993 pp.4-5).

- the elasticity of total cost with respect to output, ε_{cy} is given by equation (9).

$$\varepsilon_{cy} = \frac{\partial \ln C}{\partial \ln Y} = \alpha_y + \alpha_{yy} \ln Y + \sum_{i=1}^{n} \alpha_{iy} \ln p_i + \alpha_{ty} T \qquad (9)$$

This index means the change in total cost of the housebuilding project as the output grows. It indicates the presence of economy of scale. While this index considers total factor efficiency, it is interesting to consider the factor-specific efficiency effect.

Berndt and Khaled (1979, p1240) defined the specific factor efficiency as follows;

- The specific factor's price elasticity of demand (specific factor efficiency),

$$\pi_{iy} = \frac{\partial \ln(Y / X_i)}{\partial \ln Y} = 1 - \varepsilon_{cy} - \alpha_{iy} / S_i \qquad (10)$$

The specific factors' price elasticity of demand (π_{iy}) means the degree of price responsiveness of a factor demand when the scale of the project changes by one percent. π_{iy} is defined as the elasticity of specific factor efficiency and it is known that if π_{iy} is less than zero, it means the factor becomes more responsive to price change with increase of scale of the project. Lopez and Tug (1982) explained that the specific factors' price elasticity of demand (π_{iy}) is simply equal to one minus the price elasticity of factor demand (η_{iy}) given equation (8) when the restrictions implied by a generalised Leontief cost function are considered. ($\pi_{iy} = 1 - \eta_{iy}$)

As another productivity measure, the elasticity of total cost diminution may be considered.

- the elasticity of total cost diminution (ε_{ct}) is given by equation (11).

$$\varepsilon_{ct} = \frac{\partial \ln C}{\partial \ln T} = -(\alpha_t + \alpha_{tt} \ln T + \sum_{i=1}^{n} \alpha_{it} \ln p_i + \alpha_{ty} \ln Y) \qquad (11)$$

This elasticity (ε_{ct}) shows the degree of technical progress in the housebuilding project with respect to time. Elasticity of specific factor cost diminution are shown in equation (12).

- elasticity of specific factor cost diminution, π_{it},

$$\pi_{it} = \frac{\partial \ln(Y/X_i)}{\partial \ln T} = \varepsilon_{ct} - \alpha_{it} / S_i \qquad (12)$$

6.3 Data

6.3.1 Data Sources

In this analysis, only apartment houses were considered. Due to the heterogeneity of the product, it is difficult to compare costs of all type of houses. Apartment houses are relatively standardised and most of the designated and registered firms have built apartment houses since the mid 1980s. Furthermore, it is easier to get cost data of apartment housebuilding from a qualified association, whereas it is difficult to get reliable cost data of single detached houses from small independent builders. Data included in this analysis were limited to the apartment building.

According to 'the Construction Business Act Article 29', all the registered construction firms have an obligation to report their cost data to 'the Korea Construction Firm Association' if the contract amount is more than 100 million won. The report aims to continuously provide basic statistical data to the construction firms. The basic statistics provide valuable information about the structure of costs and trend of each input costs and can be used for more efficient cost management and cost reduction. The contents of the survey are detail cost items; materials cost, labour cost, subcontracting cost, overhead cost, equipment cost, total construction cost, and contract amount etc. which occurred during the construction period. The data are classified by construction type such as 24 civil engineering, 21 architecture, 3 special construction. 'The Korea Construction Firm Association' aggregates the costs by type of construction and publishes 'Analyses of Cost Items in Complete Works' annually. The Korea Construction Firm Association does not show specified analysis, for example, by types of houses. It publishes only the overall figures of the cost structure.

With the help of the association, from the raw data, only apartment housebuilding data among residential buildings were collected for this analysis. Actually, this is a first detail analysis on cost structure of housebuilding in Korea. The data consists of detail costs of apartment building that designated firms and registered firms built, therefore, they are project-base data, not firm-base data. The total number of samples was 823 projects as shown in Table 6-1.

Table 6-1 The number of samples

	1986	1987	1988	1990	1992	1994	Total
Designated firms' Housebuilding project	84	67	66	76	94	86	473
Registered firms' Housebuilding project	39	64	54	57	68	68	350
Number of samples	123	131	120	133	162	154	823

The nature of the data source may be limiting factors on the scope of analysis. For example, the cost data did not allow an urban/rural split and high/low floor split of analysis. All the data were limited to the high-rise apartment projects in urban areas. Land cost was not included in the total cost, even though the land cost was a big portion of it. However, this point can be regarded as an advantage in the analysis, because land cost is quite different by region and area. The total cost in this study indicates pure expenditure required in the building site. Therefore, we can evaluate pure productivity of the housebuilding project with this cost data.

6.3.2 Used Variables

The model utilised the aggregate cost of 'apartment housebuilding' as a dependent variable and total sales as an output variable. Five input factors (i.e. materials, labour, contracting, overheads and equipment) and time trend were used as independent variables.

Materials costs are the expenditures for the building materials used to perform the on-site building works. Labour cost includes not only wages for on-site labourers such as superintendent, technical managers, chief workman and odd-job man, but also office employees' wages. Superintendents and technical managers are regular employees like the head office's employees, whereas chief workman and odd-job man are temporarily employed during the project period and/or by the project regions.

Contracting cost means expenditure the firms have to pay when the firms contract out some parts of the building works to other firms or to other specialised builders. Contracting is carried out by two methods; 'labour-only-contract' and 'supply-fix contract'. 'Labour-only-contract' means that the firms contract out some parts of the building works to the other firms, whereas 'supply-fix contract' means that not only performing the works but also purchasing of materials needed in the building work are included in the contracting. For example, if the building firms purchased materials, the cost would be included in the material cost. However, if the firm contracted out purchasing of some materials and/or performing the works to the other firms through supply-fix-contract, the material cost would be included in the contracting costs. Therefore, contracting cost may include labour costs and, sometimes, material costs related to the works performed by the contractors.

Overhead cost means indirect cost relevant to the building project. It includes all supporting costs to perform the building works such as light and heating, water, site transportation, and other maintenance costs related to the building project such as taxes, insurance, advertising, depreciation, travelling and fees payable etc.

Equipment cost means that cost for using some equipment and facilities required to perform the building work. If the firm retained the equipment and facilities as a capital of the firms, the depreciation cost as a fixed cost may be included in it, whereas if the firms borrowed the equipment in any way, the leasing cost or the rent is included in it.

All the data were based on each building project. The scale of each project is shown differently. For analysis we need to standardise the project data. It is reasonable to standardise the data by total building area. However, the building area was not available in the raw data. As an alternative, the duration of project was used to standardise them. The data were standardised with the duration of project period. Therefore, all the costs mean average costs required per month in each project. Table 6-2 shows average values of used variables for this analysis. It indicates average duration of project, total sales, cost structure of the apartment house building project per one month, and profits to total sales.

Table 6-2 Cost structure in apartment house building (unit: 1000 won, %)

		Average	1986	1987	1988	1990	1992	1994
Number of Samples		**804**	123	120	120	132	159	150
Duration of Project (Months)		**17.75**	13.74	16.03	14.42	18.51	20.18	21.87
Cost	Materials (1)	**157,299**	172,761	148,346	132,005	142,307	178,472	162,804
	(%)	**36.82**	42.19	37.12	36.82	35.45	36.12	34.58
	Labour(2)	**57,781**	70,867	57,787	63,208	58,028	56,910	43,315
	(%)	**13.53**	17.31	14.46	17.63	14.46	11.52	9.20
	Contracting (3)	**169,608**	127,986	139,417	121,721	161,979	220,600	219,193
	(%)	**39.70**	31.26	34.88	33.95	40.35	44.65	46.56
	Overheads (4)	**36,400**	30,614	48,654	35,013	32,441	32,119	40,500
	(%)	**8.52**	7.48	12.17	9.77	8.08	6.50	8.60
	Equipment (5)	**6,113**	7,217	5,488	6,579	6,642	5,982	5,002
	(%)	**1.43**	1.76	1.37	1.84	1.65	1.21	1.06
Total costs (6)		**427,201**	409,444	399,692	358,526	401,396	494,083	470,814
(%)		**100**	100	100	100	100	100	100
Total sales (7) A		**475,574**	486,210	410,590	406,094	466,943	550,401	502,887
Profit (8) B		**48,373**	76,765	10,898	47,568	65,547	56,318	32,073
Ratio of Profit to Sales (%) (B/A)		**10.17**	15.79	2.65	11.71	14.04	10.23	6.38

First, when we consider the scale of projects by total sales, we may find a trend. Before 1988, the average sales of a project decreased, whereas it increased between 1988 and 1992 and decreased again in 1994. We can find the reason for this in the housing policy at that time. The reason that the project scale has increased may be due to the government's mass production policy of housing. The period in which the project scale increased is consistent with 'the construction programme for two million dwellings' period (1988-1992). In fact, the mass construction programme encouraged housebuilding firms to participate in the housebuilding project by adopting 'the adjusted construction cost system' (1989), 'public land development' (1989) and other policy measures. When we consider the scale of housebuilding projects by the duration of project, it also shows a continuous increasing trend (except in case of 1988). The duration of each project increased from 13.74 months in 1986 to 21.87 months in 1994. Figure 6-1 shows the trends in a graph. It is outstanding that the scale of the housebuilding project has continuously increased since 1988.

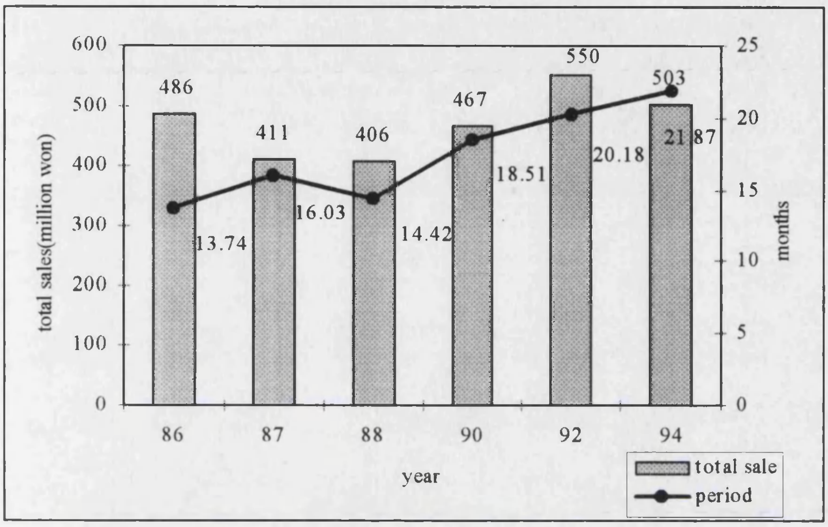


Figure 6-1 Average scale of building project.

Second, when we consider the cost structure of the projects, proportions of materials cost and contracting cost are rather big (almost 80 percent of total cost). We may see the trend of each cost in Figure 6-2.

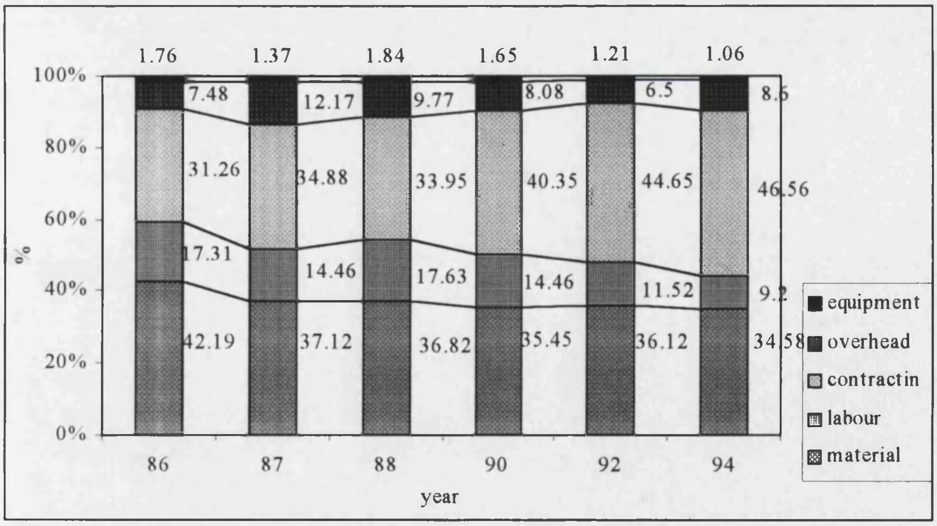


Figure 6-2 Cost structure in the housebuilding project

As time went by, the proportions of material and labour cost decreased and the proportion of contracting cost increased. The proportions of overhead cost and equipment cost showed an inconsistent trend. In particular, the increasing rate of contracting was shown as quite high (31.26 %->46.56 %).

Ratios of profit to total sales show different figures in each year. Till 1988, profit ratios were very changeable. Since 1988 when the regulated house price was adjusted, profit ratios increased into 14.04 % in 1990. However, after then, it continuously decreased. It is difficult to find the reasons. According to the firms' interview, housing demand has decreased, particularly since 1990, and has changed. Unsold apartment houses increased. The housebuilding firms have to compete with 'quality'. Housebuilding firms could differentiate their products (the standardised apartment houses) only by secure construction and by using high quality materials. Firms cannot avoid increasing cost to build high quality houses. Figure 9 showed an increase of material cost and contracting cost since 1990.

6.3.3 Estimation Method

Table 6-3 shows operational definition of used variable.

Table 6-3 Operational definition of used variables

	Variables	Operational definition
Dependent variable	TC: total cost	Total cost per project
Output variables	y: housebuilding sales	Total sales per project (proxy for total building area per project)
Input factor variables	w1: materials factor w2: labour factor w3: contracting factor w4: overheads factor w5: equipment factor	w1: materials factor price per project w2: labour factor price per project w3: contracting factor price per project w4: overheads factor price per project w5: equipment factor price per project
Time trend	t: time trend	86:1 87:2 88:3 90:5 92:7 94:9

For estimation of the Translog cost function, the data were transformed. First, all cost expenditures were discounted by GNP deflator in order to control the structural changes of each input factor's price, based on year 1990. Second, variables were transformed into ratio variables by dividing the value by the sample mean. When we use nominal monetary data, the problem of multicollinearity may occur. If high multicollinearity was observed in the model, the estimated coefficient would be unstable. The elasticities and productivities estimated from the model may be different according to the variables chosen in the model. Once we used ratio variables by dividing raw data by sample mean, the problem of multicollinearity may be resolved. In the model, if the values which are less than mean value were transformed into logarithmic value, they would be negative, therefore they show low correlation with the square value of the variables.

Using the variables, we estimated a cost function of the housebuilding business and cost share equations. The translog cost function has to be estimated with the cost share equations as a multiple regression system. In this case, current endogenous variables in the equation (3) are used as regressors in other equations (5) of the system. Therefore, OLS estimates are biased and inconsistent, because a critical assumption of OLS is that the regressors are not correlated with the residual.

It is known that the Seemingly Unrelated Regression (SUR) estimation method is useful when we believe that error terms are contemporaneously correlated across equations. The SUR estimation method uses the estimates of the covariance of residuals across equations in an attempt to improve the efficiency of estimates[2]. The 'syslin' procedure in SAS statistical programme was used in estimating parameters in the system of equations composed with equation (3), (4), and (5).

As the full set of share equations must sum to unity, the variance-covariance matrix for the full system would be singular. Christensen, Jorgensen and Lau (1973) explained that only n-1 share equations should be estimated and the parameters of the omitted equation may be calculated using the restrictions implied by the model. It is also known that the estimates are invariant to the choice of equation omitted. The omitted equation in this study is the cost-share equation of contracting cost.

The data used for the analysis were pooled time-series data from 1986 till 1994. During the analysis period, the mass construction plan period from 1988 to 1992 was included. It is thought that during this mass construction period there must be an outstanding difference for the business of the building firms and it might be reflected in the production function and cost function of building firms. To test whether there is a difference in the structure of costs during the period, the period was divided into two periods based on the year 1989; period I (before 1989) and period II (since 1989). Actually since 1989, the regulated sale price has been adjusted reflecting a price rise of input factors. It was considered that the effects of the policy change would be reflected in the cost structure. Besides, data were collected from designated firms and registered

[2] SAS Users' Guide, 5th Edition.

firms. The designated firms are on a large scale than the registered firms and there may be some difference in the cost structure between designated firms and registered firms.

To test whether there are structural changes between the two periods, and between two types of firm, a Chow test was carried out. Test equation is as follows under the hypothesis that there is no structural change in the cost structure between two periods and between two types of firms.

$$d = \frac{n_1 + n_2 - 2k}{k} \cdot \frac{SSR_t - (SSR_1 + SSR_2)}{(SSR_1 + SSR_2)}$$

Here, n_1, n_2 are numbers of observations in period I and period II and in designated firms and registered firms. k is the number of variables for estimation. SSR_t, SSR_1. SSR_2 are the sum of error term of the estimated model in each case. They are shown in Table 6-4.

Table 6-4 Calculation of decision value for chow-test

	Period	Type of firms
n_1,	Period I 281	Designated firms 435
n_2	Period II 404	Registered firms 250
k	36	36
SSR_1	SSR_1 = 1589	SSR_1 = 2667
SSR_2	SSR_2= 2216	SSR_2= 1351
SSR_t	SSR_t= 3757	SSR_t = 3757
F value	F(36,613)=1.455	F(36,613)=1.455
d	0.215	1.106

If we calculated the value d, d was 0.215 for two periods and 1.106 for type of firms. They are all less than the decision value 1.455 of F distribution (36,613). Therefore, the hypothesis that there is no structural change between two periods and there is no difference in cost structure between designated firms and registered firms is accepted. It means there is no problem in analysing the pooled time series data from 1986 to 1994 and data from designated firms and registered firms. Actually the estimates were not much different from those of the total sample as expected.

6.4 Estimation Results

All the results were reported in Appendix 5, as the estimates of cost function are not the main concern in this analysis. Using the restrictions imposed on the model, 36 parameters were estimated for the translog model. The estimations of the model by the SUR technique were statistically significant. Adjusted R^2, meaning explaining degree of explanatory variables are shown as rather high (0.9927). F-values showing the adequacy of the model are shown as statistically significant. Among 36 coefficients, 28 were found to be statistically significant at 1% probability level. The goodness of fit (the associated standard errors and T values of these estimates) were satisfactory.

There is another method to test the adequacy of the model. Durbin-Watson statistic (D-W) shows whether the error terms are mutually independent and normally distributed. The D-W value can be calculated by run test and Shapiro-Wilk test on error terms. If D-W value is near 2, it means error terms are normal distributed and the model is adequate as there is no relationship between residuals. If the D-W value is near to 0, it means there is a positive relation between residuals and if the D-W value is near to 4, it means there is negative relation between residuals. Therefore, if the D-W value is near 0 or 4, it means that the model is not adequate as there is a relationship between residuals.

D-W value of this model was shown as 1.668 and it says that the model was estimated properly. We can say the estimation model used in this analysis is adequate. In order to draw further inferences from the estimated parameters, the procedure to calculate several indices (elasticities and productivities) were followed.

6.4.1 Elasticities

Allen's elasticities of substitution (δ_{ij})

The Allen partial elasticities of substitution were reported in Table 28. Guilkey, Lovel and Sickles (1983) pointed out that global concavity of the cost function requires that Allen's own elasticities of substitution (δ_{ii}) and all own price elasticities of demand (ε_{ii}) should be negative at all data points. At simple means they were estimated to be negative as shown in Table 6-5 and Table 6-6. Therefore, we can say the estimation model used in this analysis is adequate.

Table 6-5 The elasticities of substitution

	Substitution Elasticities				
	Materials	Labour	Contracting	Overhead	Equipment
Materials	**-0.15367**** **(0.02595)**				
Labour	0.01123** (0.00329)	**-0.05762** **(0.36241)**			
Contracting	0.08018** (0.00646)	0.03020 (0.06390)	**-0.24378**** **(0.04013)**		
Overhead	0.00018 (0.00069)	-0.00035 (0.00516)	0.00551** (0.00040)	**-0.35529** **(0.33714)**	
Equipment	0.00043** (0.00000)	0.00013 (0.00009)	0.00026** (0.00004)	-0.00009 (0.00016)	**-0.00669** **(0.4463 1)**

( ): standard errors. ** : significant at 1 % level.

Elasticities of substitution (δ_{ij}) were observed between each pair inputs. We can see that most of the elasticities are positive implying that these inputs are substitutes not complements, with the exception of between overheads and labour (-0.00035) and between equipment and overheads (-0.00009).

While it is difficult to compare these results to those of other studies due to the different set of inputs analysed, these results show that the elasticities of substitution between input factors in the Korean housebuilding sector appear low. Among various input factors, the substitutability with contracting was examined and found to be relatively high, especially between subcontracting and materials and between contracting and labour. It can be explained that when it is difficult to purchase some materials due to the over-demand of the materials or price increase of the materials, the firms contract out the works requiring the materials to the other firms (by supply-fix-contract type). When it is difficult to find on-site skilled labourers, they contract out the work with the labour-only-contractors. The estimated results show that contracting is a comparatively good substitute for materials (0.08018) and low substitute for equipment (0.00026). Labour is a good substitute for contracting (0.03020) and for materials (0.01123) but complements for overheads (-0.00035, but not significant). The degrees of substitutability between the other inputs were generally weak.

The price elasticities of demand for inputs (ε_{ij})

This elasticity means that the percentage changes in the use of a factor when its price increases a percentage. The elasticities were estimated as price inelastic. These elasticities are consistent with findings in other studies that factor demands in the residential sector are generally price inelastic. However, the elasticities were estimated as lower than those obtained by other studies[3]. This means input factor demand in the Korean housebuilding business is very price inelastic.

Table 6-6 Input-price elasticities

Demand of input	Input-Price (+)				
	Materials	Labour	Contracting	Overheads	Equipment
Materials	**-0.04481****	0.00448**	0.09822**	0.00010	0.00001**
	(0.00176)	(0.00 122)	(0.00368)	(0.00009)	(0.00000)
Labour	0.00345**	**-0.00287**	0.01529	0.00024	0.00000
	(0.00051)	**(0.00263)**	(0.02943)	(0.00063)	(0.00000)
Contracting	0.02366**	0.00452**	**-0.07868****	0.00077**	0.00000~
	(0.00095)	(0.00067)	**(0.00236)**	(0.00008)	(0.00000)
Overhead	-0.00004	-0.00005	0.00233**	**-0.00273**	0.00000
	(0.00008)	(0.00006)	(0.00015)	**(0.00160)**	(0.00000)
Equipment	0.00016**	0.00004**	0.00008**	0.00001**	**-0.00731****
	(0.00001)	(0.00000)	(0.00000)	(0.00000)	**(0.00048)**

( ): standard errors. ** : significant at 1 % level.

With respect to the cross-price effects, first, most input factors display substitutable relationship. Exceptionally, cost complementarities were observed between overheads and materials (-0.00004) and between overhead and labour (-0.00005) but not significant.

Generally, the magnitudes of the coefficients indicate small effects. It is noticeable that the substitutability between contracting and labour, and between contractor and materials were shown as rather high. In particular, an increase in the price of materials significantly affects increase in the demand of labour (0.00345) and in the demand of contracting (0.02366). It implies that when the price of material increases, the firm may substitute the use of materials into labour and contracting. Similarly, an increase in the price of labour significantly affects the increase in the demand of materials (0.00448) and in the demand of contracting (0.00452). It implies that if the price of labour increased, contracting and cost-efficient material would be substitutable

3	Materials	Labour
MacDonald (1981)	-0.380	-0.830
Stover (1986)	-0.035	-0.028
Hutchinson (1990)	-0.404	-0.717
Brox (1993)	-0.064	-0.814
This study	-0.045	-0.003

for labour. Similarly, if the price of contracting increased, cost-effective material and labour would be substitutable for the contracting (0.09822, 0.01529 each). The substitution elasticities between the other factors were estimated as low.

Price elasticities of factor demand (η_{iy})

Using equation (8), we calculated the price elasticities of factor demand to output as shown in Table 6-7. The elasticities of each input factor were estimated as rather weak, but all statistically significant. It is outstanding that elasticities of overheads and equipment were shown as comparatively high. Price elasticities of materials, labour and overhead factors' demand were positive (0.00316, 0.00858, 0.02555). On the other hand, those for contracting and equipment were found to be significantly less than one (-0.00333, -0.02807).

These results suggest that materials, labour and overheads are normal inputs in the housebuilding business. This means that as output expands, the demands for materials, labour and overheads expand by less than the proportional expansion of output. It is noteworthy that demands for contracting and equipment tend to decrease, as output expands.

Table 6-7 Output elasticity

Input factors	Output elasticities
Materials	0.00316** (0.00001)
Labour	0.00858* (0.00261)
Contracting	-0.00335** (0.00061)
Overheads	0.02555** (0.006 17)
Equipment	-0.02807** (0.00136)

( ): standard errors.
** : significant at 1 % level, *: significant at 5 % level

This argument could be explained in terms of the nature of the input factors as pointed out by Lopez and Tung. This implies that materials, labour and overheads are normal factors ($0 \leq \eta_{iy} \leq 1$) in the Korean housebuilding sector, and contracting and equipment are characterised as inferior inputs factors ($\eta_{iy}<0$). This result suggests the importance of other factors in the Korean housebuilding sector. That is, any increase in output would be accomplished through expansion of the use of other factors. We may think land and financial factors to be the superior factors which are not included in this analysis. If the land factor was included in this analysis, it might be characterised as a superior input factor. However, it is just a hypothesis; additional analysis needs to be followed to prove this.

6.4.2 Productivities

Elasticity of Total Cost to Output (ε_{cy}, π_{iy})

As a productivity measure, the elasticity of total cost to output (ε_{cy}) was estimated as less than unity (0.00218). This means that as the output level increases, the total cost of housebuilding does not increase as much as output (ε_{cy}<1). This indicates the presence of economy of scale in the housebuilding business. The elasticity of total cost to output may show 'increasing returns to scale'. It means that it is more profitable for housebuilding firms to carry out housebuilding projects on as large a scale as possible in this cost structure. Apartment housebuilding is a typical standardised house type and it is somehow possible to expect economy of scale in large-scale project.

Table 6-8 Elasticities of total cost and input factor cost to output

Elasticity of total cost to output (ε_{cy})	Elasticities of specific factor efficiency (π_{iy})				
	Materials	Labours	Contracting	Overhead	Equipment
0.00217** (0.00007)	0.99684** (0.00010)	0.99141** (0.00260)	1.00334** (0.00061)	0.97444** (0.00617)	1.02807** (0.01364)

( ): standard errors.
** : significant at 1 % level, *: significant at 5 % level

Table 6-8 also shows the specific factors' price elasticities of demand (π_{iy}). The elasticities mean change of i factor demand with respect to i factor price as total output grows[4]. When this measure is negative (π_{iy} <0), it means the factor becomes more responsive to price change. If an input was a superior factor (η_{iy} >1) as shown in equation (8), then it still became more responsive to price change, that is, its factor

[4] Berndt, E.R. and Khaled, M.S. (1979), pp. 1241-1242.

efficiency would be more negative. Whereas, if an input was a normal or inferior factor ($0< \eta_{iy} <1$ or $\eta_{iy} < 0$), then it still became less responsive to price changes for that factor, implying higher factor efficiency. All the estimates were significantly different from zero and not different from one significantly. This finding means that the prices of specific input factors do not respond proportionately to output level and it means all the specific input factors show cost efficiency.

Elasticities of Total Cost Diminution (ε_{ct}, π_{it})

Table 6-9 reports another productivity measure; the elasticities of total cost diminution and specific factor cost diminution by equations (11) and (12). First of all, the elasticity of total cost to time (ε_{ct}) indicates the degree of technical progress with respect to time. The decision base is zero (0). If elasticity is positive, it means there is cost diminution over time. The elasticity of total cost diminution (ε_{ct}) was shown as negative, but nearly zero (-0.00742). It actually means that there has been no cost diminution over time. It means there is no technical progress over time in the Korean housebuilding industry.

Table 6-9 Elasticities of productivity

Elasticity of total cost diminution ε_{ct}	Elasticities of specific factor cost diminution (π_{it})				
	Materials	Labours	Contracting	Overheads	Equipment
-0.00742** (0.00016)	0.00326** (0.00056)	-0.02011** (0.00516)	-0.01549** (0.00088)	0.02097** (0.00749)	- 0.02067** (0.00598)

( ): standard errors.
** : significant at 1 % level, *: significant at 5 % level

Table 6-9 also shows elasticities of specific factor cost diminution (π_{it}). The decision base is also zero (0). All the elasticities were estimated as significant. It shows that materials cost and overheads cost have slightly decreased over time, whereas labour cost, contracting cost and construction equipment cost have slightly increased over time. This means that technical change in the Korean housebuilding sector has been progressed in material- and overhead-saving trends (0.00326, 0.02097) and labour-contracting- and equipment-using trends (-0.02011, -0.0154, -0.02097).

6.5 Findings and Discussion

The cost analysis showed the Korean housebuilding firms' behaviour in the regulated circumstances. It was very difficult to get adequate data especially 'total building areas' as an output variable. Alternatively, 'total sales' was used as an output variable. The estimation results may differ by type of data used in the analysis. Even though it is difficult to compare this result with others not only because there are few analyses but also because of different set of data included, it is meaningful in a view that this was a first analysis to examine the cost structure of the Korean housebuilding project and to estimate various efficiency and productivity measures from that.

Despite the weakness of data, the estimation model used in this analysis was found to be adequate. The fact that Allen's own elasticities of substitution (δ_{ii}) and own-price elasticities of demand for inputs (ε_{ii}) were all estimated to be negative indicates adequacy of the model. The estimation results of the model were statistically significant and the goodness of fit (the associated standard errors and T values of these estimates) were satisfactory. From the cost function, three sets of elasticity and two sets of productivity measures in the Korean housebuilding sector were estimated.

These results gave important meaning to the understanding of the Korean housebuilding business and the firms' behaviour in the regulated circumstance. The main findings are summarised as follows. First, dependency on contracting has increased gradually and contracting cost consisted of the highest proportion to total cost since 1990. Second, substitution elasticities and price elasticities of demand between input factors are very inelastic. The results are consistent with the findings in other countries; however, the extents of the elasticities were observed to be smaller than those. Most input factors displayed a substitutive relationship. Substitution elasticities between contracting and labour, and between contracting and material were comparatively high. Therefore, the hypothesis that 'contracting' may appear substitutable for the other input factors was accepted. This means that when it is difficult to purchase some material and to find skilled labour on site, the firms tend to depend on contracting by 'supply-fix-contract type' or 'labour-only contract type'. The result shows that the building firms are using contracting as a flexible alternative. The price elasticities of demand were estimated as 'price inelastic'.

Third, it was examined that in the Korean housebuilding business, labour, materials and overheads were normal factors and contracting and plant were inferior factors. This means when output expands, the demands of materials, labour and overheads expand by less than the proportional expansion of output, but the demand for contracting and equipment decreases. It can be interpreted that among those input factors, materials, labour and overheads input are more important factors than contracting and equipment inputs. The result suggests the importance of the other factors in housebuilding.

The fourth finding was low productivity in the Korean housebuilding sector. Inelasticity of total cost diminution indicates the fact. The specific factor cost diminution showed that technical change in the Korean housebuilding sector has been progressed very slowly only in material-saving and overhead-saving trends, but not labour-, contracting-, and equipment-saving trends. It tells us technical change in the Korean housebuilding project has been slowly carried out mainly in material and overhead sides. This is supported by the results of the interview survey that some large building firms produce some materials within the firms and make some effort to reduce material cost by 'networked purchasing with manufacturers' and 'centralised purchasing within business group level'. The above results can be considered by the circumstance that house price is regulated. In price regulation, firms do not invest in building equipment and building plant requiring large amounts of capital. Rather than that, firms control the cost of building by contracting alternative. They do not invest for R&D and innovative organisation. They tend to contract out the works requiring high technique and professional know-how. Technical change in the Korean housebuilding project has been slowly carried out only in material and overhead cost sides. This was supported by the productivity measure which was estimated as negative total cost diminution.

The fifth finding was that 'increasing returns to scale' were observed in the Korean housebuilding sector. It is an outstanding attribute that there is economy of scale in standardised apartment housebuilding. Normally Korean building firms have built high-rise apartment houses (about 15-25 floors) on a large scale (at average 300-400 dwellings per project). This result tells us that even though Korean building firms could not expect high profit from land development (due to land development regulation), they might achieve some profit in large-scale standardised apartment building. This attribute may be the main force leading to mass production of the standardised houses in 1980s. It must have been an important motive for a large number of firms to enter into the industry in the mid 1980s and a motive to develop the housebuilding industry quantitatively.

It was also observed that in the housebuilding projects, the proportions of labour cost, contracting cost, and construction equipment cost increased as time went on. The results suggest that the Korean housebuilding business has become more labour-intensive and dependency on contracting and construction equipment has become higher. At this stage, it is necessary for building firms do their best to develop a more efficient contracting system and a more improved labour training system.

Chapter 7 The Strategic Behaviour of Housebuilding Firms

Diversification is a pronounced trend in most of the advanced economies and large conglomerates are also prominent in many developing economies. While the average level of diversification may have increased or decreased in recent decades, multi-product businesses still remain a dominant feature in the world-wide economy. The Korean housebuilding industry has grown rapidly since 1980 and large construction firms have emerged in the industry. Considering the nature of building firms, it is natural that the housebuilding firms show diversified production structure. However, it is an interesting fact that the firms which have short business experience in housebuilding and are not large enough to extend their business are diversified into various businesses. In this chapter, strategic behaviours of Korean housebuilding firms are to be examined, focused on the diversification strategy. First, the areas in which Korean housebuilding firms have diversified, and the extent of diversification, were investigated. The extent of vertical integration was also investigated as a diversification strategy. Second, the patterns of diversification were examined over the period between 1980 and 1995. Lastly, the relationship between the firms' diversity and performance was investigated.

7.1 Diversification: a Strategy of the Firms

7.1.1 Diversification of the Housebuilding Firms

The housebuilding industry is classified in the construction industry by the Korean Standard Industry Classification (KSIC)[1]. However, the nature and process of the business is quite different from the contracting as reviewed in previous chapter 3. The housebuilding business requires various managerial functions from the planning stage, building stage, to the sales and marketing stage. Market, demander and distribution process of housebuilding are also quite different from those of the contracting business. Most of the construction firms are involved in the housebuilding business

[1] This system is a numerical system developed by the government for classifying all types of economic activity within the Korean economy. This system is based on establishment classifications according to its primary activity.

simultaneously, however, they regard the housebuilding business as an independent business.

According to interviews carried out in 1996, only one firm among 22 replied as they were concentrating their activities on housebuilding. Though the firm also had an interest in property management and contracting, its concentration on the core business of housebuilding was a deliberate decision. The other firms were involved in related and unrelated businesses such as property management, materials production, manufacture of pre-fabricated building materials, building equipment rental, building material merchandising, technical advice, hotel and leisure town management, broadcasting and so on. Of course, they have kept the largest part of their activities in the housebuilding business. Large firms among those interviewed were more diversified in unrelated business. Even a medium sized firm (Woolim) which started in the housebuilding business in 1992 showed diversified production structure. The firm was involved in the restaurant business and property management, beside the original housebuilding business. It started the other business one year later than the housebuilding business.

In the interview, the reasons for the building firms' diversification into related or unrelated businesses were surveyed. The first reason was to increase profit and then grow further. The second reason was connected with improving the security of the firm. Most of the interviewees commented about 'uncertainty' found in the housebuilding business and 'limited profit'. Uncertainty in the land acquisition stage and uncertainty in the permission process and in the contracting process was a pushing motive for diversification. The limited profit in housebuilding also made them search for new business areas to secure the firms' financial situation. That is, they decided to operate other businesses simultaneously to compensate for loss or limited profit from the housebuilding business. The third reason was to reduce financial burden. Some managers mentioned that the housebuilding business was a typical cash-hungry business and financial difficulty is a main motive to diversify into 'good-cash flow' business. An interviewee commented that a quarter of his firm's profits came from interest on cash available during the contract period of the construction business. The reason many housebuilding firms diversified into the contracting business may be due to this. The fourth reason was related with those to increase efficiency. One method of achieving increased efficiency was by controlling the source of supply of materials to avoid erratic or long delivery times, high prices or poor quality. Backward integration may be a form of this method. Seven firms out of the 24 firms interviewed were involved in building materials manufacturing such as cement, ready-mixed concrete, reinforcing steel, furniture etc. The last reason was a general desire for aggrandisement. Two interviewees replied that diversification was a trend in the Korean industry and they followed leading large firms' diversification strategy.

Nearly all firms were seeking further opportunities for diversification. They wanted to find new business areas where they could utilise their know-how and where the business cycle was different from housebuilding cycles. Indeed the construction and housebuilding businesses suffer from fluctuations in demand. One way in which firms have created a more stable business situation is by securing the demand for a new product over several years by long-term contracts to purchase. Another way of overcoming the problem of economic cycles is to spread their business around the world so that at least the ups and downs of national cycles do not necessarily coincide. However, if they are not large enough, it is nearly impossible to create new demand for a new product and to invest new products, furthermore, to expand their market into international regions.

A recent study (KRIHS, 1996) supports this trend. They found on average 74.1 percent of housebuilding firms were operating other businesses besides housebuilding and 36.2 percent of them were operating a totally unrelated business. Large firms showed a higher involvement ratio in unrelated business than medium and small firms. From the survey, 51.8 percent of the sample firms had a specific future plan to diversify into unrelated business. They pointed out decrease of sales and profit in the housebuilding business as the main reason to diversify into the other business.

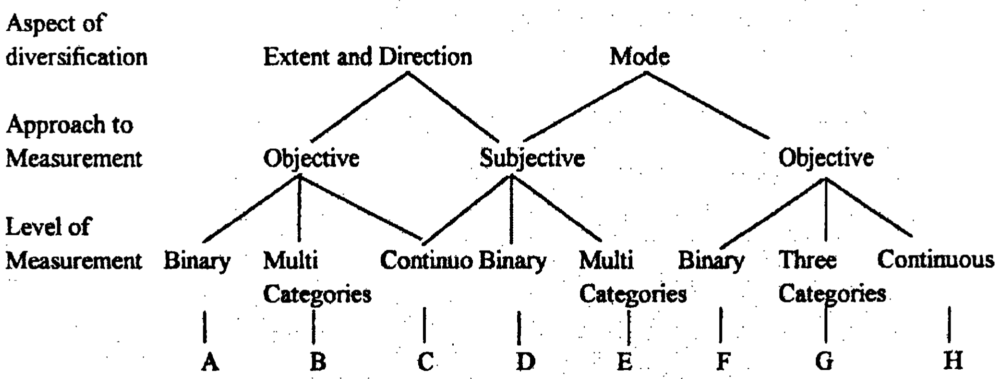
7.1.2 Conceptualisation of the Firms' Diversity

One of the objectives in this chapter is to examine the extent and the patterns of diversification of housebuilding firms. Here, a diversified firm is defined simply as a firm involved in more than two businesses at two-digit level according to KSIC code. A number of conceptual and empirical studies focused on the measurement of diversity. Commonly used product-count measures of diversification are based on the Standard Industrial Classification (SIC) system. The argument in support of product-count measure has been drawn from the objectivity of the measurement method. When a firm is involved in various SIC codes, any researcher could objectively compute a product-count measure of diversification. Hence, measurement reliability for the product-count measure should be high. The product-count measures range from simple counts of the number of SIC codes in which a firm participates, to weighted average measures that consider the importance of each SIC involvement to the particular firm. On the other hand, the SIC system has some weakness. According to the criteria for classifying the industry, market or production process, relevant products could be classified in disparate categories and the distance between SIC numbers cannot be interpreted as a measure of relation (Montgomery 1982).

Rumelt (1974) developed a pioneering approach to categorise the extent and type of diversification of firms that is based on the relatedness of products, markets and technologies. His categorical measure of diversification was developed in response to the weakness inherent in the SIC system. He examined the levels of economic performance associated with nine different categories of diversification that he had identified. According to his scheme, once a firm attains a diversity status, the firm becomes vertically integrated or related-diversified or unrelated-diversified. His scheme represented a significant conceptual leap over the traditional diversity measures based on product count that were widely used in industrial organisation economics. However, the lack of objectivity has been frequently discussed as the disadvantage of his approach. Varadarajan and Ramanujam (1987) pointed out that Rumelt's measure was time-consuming, as it assembled data from numerous fragmentary sources like annual reports and other publications. Thus the measurement of diversification of firms remains a controversial and unsettled area.

Ramanujam and Varadarajan (1989) excellently reviewed the measures of diversity. Figure 7-1 shows the variety of approaches used in a lot of literatures. Basically, studies of diversification have focused on the extent, direction and mode of diversification. Studies rooted in the industrial organisation economics paradigm have generally been concerned mainly with the extent of diversification and have used objective measures based on SIC counts to capture this aspect of diversification. In many studies, diversification is treated as a continuous variable. On the other hand, particularly within the strategic management discipline, categorical variables are developed using somewhat arbitrary cut-off points. While some studies employed only two categories (Bettis 1981), other studies group firms into multiple categories. Some researchers

(Jacquemin & Berry 1979) have used multiple continuous measures in an attempt to capture both the extent and direction of diversification. Other studies start with multiple continuous measures but subsequently transform them into categorical measures in order to develop a parsimonious set of diversification categories, typically using the median or a point of discontinuity along their continuous measures as cut-off points. Studies by Palepu (1985) and Varadarajan (1986) illustrate these approaches.



Approach	Illustrative Example
A	Conglomerates vs. Non-Conglomerates (E.G. Beanie, 1980)
B	Broad and Narrow Spectrum (E.G. Varadarajan, 1986)
C	Herfindahl and Berry Indices (E.G. Jacquemin & Berry, 1979)
D	Product Diversity and Market Diversity (E.G. Ward, 1976) Diversifiers vs. Non-Diversifiers (E.G. Macdogall & Round, 1984)
E	Relatedness-Based Measures (E.G. Rumelt, 1974; Nathanson, 1985)
F	Internal vs. Acquisitive Diversifiers (Pins, 1977)
G	Internal Growth, Acquisitions-Based Growth, Mixed Mode (E.G. Lainont & Anderson, 1985)
H	Diversifying Acquisition Ratio (Pitts, 1978)

Figure 7-1 Approach to the measurement of firm diversity
Source: Ramanujam and Varadarajan (1989) p. 538.

Strategic management studies of diversification have generally followed Rumelt's study (1974). In many studies, Rumelt's classification was adopted after a subjective reclassification by the researchers to confirm the appropriateness or current validity of Rumelt's original classification. Montgomery (1982) demonstrated that use of either Rumelt's approach or the traditional measures based on SIC codes produces similar classification. However, Nathanson (1985) casts some doubts on the managerial relevance of Rumelt's approach and challenged the adequacy and managerial usefulness of Rumelt's classification scheme. Furthermore, he proposed a classification scheme of his own.

Other variations of the subjective approach to measure the diversity are also evident in studies of diversification. McDougall and Round (1984) created a binary scheme to classify firms as 'diversifiers' and 'non-diversifiers' using managers' perceptions. Ward (1976) also relied on managerial perceptions, but used the notion of 'difficulty of entry' and distinguished between 'product diversity' and 'market diversity'.

7.2 Diversification Status of Korean Housebuilding Firms

To examine the diversification status of Korean housebuilding firms, a survey was performed based on Korean Standard Industry Classification (KSIC) code. Even though the simple product-count measure has some weaknesses that cannot reflect the ratio of the business, their simplicity and their immediate interpretability may be an advantage of the measure. Bianco (1995) explained the validity of using the simple measures of diversification as follows. The simple measure may be a poor measure when it is used for describing diversification across a wide range of firms. However, when the measure is used for making finer distributions among groups of diversified firms, it may give significant differences among indices.

From 'The Annual Reports' of housebuilding firms published in Korea Stock Exchange, the areas in which the firms were diversified were examined. All businesses that the firms performed in each year were classified according to the KSIC code. Changes of the extent and the pattern of diversification were also investigated. The survey period was between 1980 and 1995 and diversification status of the firms was investigated at four time points (1980, 1985, 1990, 1995).

The number of sample firms was 143 in total. The sample firms were divided into two groups in order to examine the differences between different type of firms. Type I firms are defined as those whose main business is construction and which also involved in the housebuilding business. Type II firms are those which started their business in housebuilding and their main business is also housebuilding.

Table 7-1 The characteristics of type I firms and type II firms (1995)

	Type I firms (79)	Type II firms (64)
No. of employees	1,101	264
Business period (years)	28.56	13.55
Scale of total sales (million won)	388,727	121,284
Scale of capital (million won)	88,601	19,364
Designated firms Registered firms	64 (81.01%) 15 (18.99%)	24 (37.5%) 40 (62.5%)

Table 7-1 shows the number and characteristics of each type of firm. There were some differences between types of firms. Type I firms showed a larger scale in the number of employees, total sales, and capital and a longer business period. About 80 percent of these were designated firms. On the other hand, type II firms appeared smaller in the number of employees, total sales, and capital and they showed a shorter business period. Only 37.5 percent of type II firms were designated firms.

7.2.1 Business Areas of Building Firms

Table 7-2 shows the areas in which the building firms were involved at 2-digit and 4-digit levels. The firms were involved in a total of 10 businesses at 2-digit level; besides the construction industry, forestry, mining, manufacturing, wholesale and retail trade, hotel and restaurant management, transport, financial intermediates, real estate, renting and management, and other social and personal service business.

The number of businesses that the sample firms performed was a total of 50 at 4-digit level. The forestry and logging industry (D1) includes 'timber tracts conservation activities' which plants trees and conserves forestry for producing timber and 'logging activity' from forestry. A total of 7 firms were involved in the forestry and logging business. In the mining industry, 'quarrying of crushed and broken stone, sand, gravel, and clay for construction materials' was included. Manufacturing products which firms produced could be itemised into about 15 categories; from leather products like luggage, handbag to furniture (D3-Dl7). Among them, the firms which produce handbag, shoes, pulp and paperboard were those which started their business in manufacturing and they entered into the housebuilding area later. Among the products, paper and paper board (D7), refractory ceramic products (D9), structural non-refractory clay and ceramic

Table 7-2 The number of businesses in which housebuilding firms are involved (1995)

2-digit business	4-digit business	Total sample (143)	Type I firms(79)	Type II Firms(64)
Forestry	Forestry and logging (D1)	7(4.9%)	4(5.1)	3(4.7)
Mining	Quarry of stone, sand and clay (D2)	1(0.7%)	1(1.3)	0
Manu-Facturing	Manufacturing of luggage, handbags and the like (D3)	2(1.4%)	0	2(3.1)
	Manufacturing of foot wear, shoe making (D4)	1(0.7%)	0	1(1.6)
	Sawmilling and planting of wood (D5)	6(4.2%)	4(5.1)	2(3.1)
	Pulp, paper and paperboard (D6)	1(0.7%)	1(1.3)	0
	Other articles of paper and paperboard (D7)	2(1.4%)	2(2.5)	0
	Refined petroleum products (D8)	6(4.2%)	5(6.3)	1(1.6)
	Refractory ceramic products (D9)	1(0.7%)	1(1.3)	0
	Structural non-refractory clay and ceramic products (D10)	3(2.1%)	2(2.5)	1(1.6)
	Ceramic, lime and plaster (D11)	12(8.4%)	7(8.9)	5(7.8)
	Articles of concrete, cement and plaster (D12)	35(24.5%)	**23(29.1)**	12(18.8)
	Non-metallic mineral products (D13)	35(24.5%)	**27(34.8)**	8(12.5)
	Basic iron and steel (D14)	15(10.5%)	**13(16.4)**	2(3.1)
	Steel rolling, drawing and extruding, steel pipe (D15)	1(0.7%)	0	1(1.6)
	Primary smelting and refining of non-ferrous metals (D16)	1(0.7%)	1(1.3)	0
	Furniture (D17)	1(0.7%)	1(1.3)	0
Con-struction	Site preparation (D18)	49(34.3%)	27(34.2)	22(34.4)
	Building of complete construction (D19)	142(99.3%)	79(100)	65(98.4)
	Heavy construction (D20)	139(97.2%)	78(98.7)	61(95.3)
	Building construction related special structure (D21)	9(6.3%)	5(6.3)	4(6.3)
	Building installation (D22)	130(90.9%)	**76(96.2)**	54(84.4)
	Building completion (D23)	42(29.4%)	**32(40.5)**	10(15.6)
	Renting of construction or demolition equipment with operator (D24)	3(2.1%)	1(1.3)	2(3.1)
Wholesale and retail trade	Wholesale of motor vehicles (D25)	3(2.1%)	2(2.5)	1(1.6)
	Retail sale of motor vehicles (D26)	1(0.7%)	1(1.3)	0
	Maintenance and repairs of motor vehicles (D27)	12(8.4%)	**10(12.7)**	2(3.1)
	Sale of motor vehicle part and accessories (D28)	4(2.8%)	2(2.5)	2(3.1)
	Wholesale on a fee or contract base (D29)	1(0.7%)	1(1.3)	0
	Wholesale of textiles, clothing and footwear (D30)	1(0.7%)	1(1.3)	0
	Wholesale of construction material hardware, Plumbing and heating equipment and suppliers (D31)	23(16.1%)	14(17.7)	9(14.1)
	Foreign trade (D32)	31(21.7%)	**21(26.6)**	10(15.6)
	Supermarket (D33)	13(9.1%)	**9(11.4)**	4(6.3)
	Other non-specialised retail trade/department store (D34)	2(1.4%)	0	2(3.1)
Hotel & Restaurant	Hotels (D35)	21(14.7%)	**14(17.7)**	7(10.9)
	Restaurants (D36)	4(2.8%)	**3(3.8)**	1(1.6)
Transport	Passenger and freight transport by road (D37)	6(4.2%)	4(5.1)	**2(3.1)**
	Transport via pipeline (D38)	1(0.7%)	0	**1(1.6)**
	Storage and warehousing (D39)	8(5.6%)	4(5.1)	**4(6.3)**
Financial Institutes	Other credit granting (D40)	4(2.8%)	4(5.1)	0
	Financial intermediation investment company (D41)	3(2.1%)	0	**3(4.7)**
Real estate renting and business	Rental of real estate (D42)	101(70.6%)	52(65.8)	49(76.6)
	Subdividing real estate (D43)	16(11.2%)	9(11.4)	7(11.9)
	Real estate business as a fee or contract basis (D44)	40(28.0%)	26(32.9)	14(21.9)
	Renting of construction and civil engineering machinery & equipment (D45)	36(25.2%)	**28(35.4)**	8(12.5)
	Research and experimental development on natural science And engineering (D46)	2(1.4%)	1(1.3)	1(1.6)
	Architectural, engineering activities And related technical consultancy (D47)	32(22.4%)	**23(29.1)**	9(14.1)
	Personal supply service (D48)	1(0.7%)	**1(1.3)**	0
	Advertising (D49)	4(2.8%)	**4(5.1)**	0
Other business	Radio and television business activities (D50)	1(0.7%)	**1(1.3)**	0

products (D10), ceramic, lime and plaster (D11), articles of concrete, cement and plaster (D12), non-metallic mineral product (D13), basic iron and steel (D14), and steel pipe (D15) may be used as construction materials. Type I firms were mainly involved in the manufacturing of construction materials and some of the type II firms also participated in the manufacturing of cement and plaster, non-metallic mineral, steel and steel pipe.

The construction industry may be sub-divided into 7 sections. Site preparation activity (D18) includes the wrecking and demolition of unnecessary building or structure on the construction site and excavation and land levelling etc. Building of complete construction (Dl9) includes construction of residential building, office and commercial building and industrial buildings. The housebuilding business is included in this category. Heavy construction (D20) means construction of highways, streets, bridges, tunnels, railways, waterways, dams and water supply facilities, and street pavement works. Building construction related special structure (D21) includes pile driving and related construction foundation works, boring grouting, water well drilling works, scaffolding and frame works, steel frame works, steel reinforcing and reinforced concrete work. Building installation (D22) means plumbing, heating and related works, electrical work, water proofing, soundproofing and fire proofing works. Building completion (D23) such as painting, landscaping and related service activity and renting of construction or demolition equipment with operator (D24) are also classified in the construction industry. Most of the building firms, whether type I firms or type II firms, were involved in the building of complete construction (Dl9) and heavy construction (D20). About 30 percent of the building firms were involved in the site preparation activity (D18) and building completion works (D23).

Among the wholesale and retail trade, type I firms were mainly involved in wholesale and retail sale of motor vehicles (D25, D26), maintenance and repair of motor vehicles (D27), and sale of motor article parts and accessories (D28). Both types of firms were involved in wholesale of construction material and equipment (D31), foreign trade (D32), supermarket operating (D33). It was noteworthy that type II firms were operating supermarkets (D33) and department stores (D34). It was outstanding that hotel and restaurant businesses (D35, D36) and financial institutes business (D40, D41) were also included in their business.

In the transport business, passenger and freight transport by road (D37), freight transport (D38), and storage and warehouse business (D39) were included. Most of the firms which were involved in the transport business are those which started their business in that industry and diversified into the housebuilding business in mid 1980s. In real estate renting and management, building firms showed a high involvement ratio in rental of real estate (D42), subdividing and sale of real estate (D43), real estate business as a contract basis (D44), renting of construction and civil engineering machinery and equipment (D45), and construction-related technical consultancy (D47).

It is noteworthy that Korean housebuilding firms are involved in totally unrelated businesses such as forestry and logging, sales of motor vehicles, hotel and restaurant business, broadcasting, and financial institutions. In the construction section, there is no big difference between these two types of firms. Type I firms - having larger capital - were more involved in unrelated businesses such as manufacturing, wholesale and retail of motor vehicles, hotel and restaurant business. Type I firms were also participating in labour supply (D48), advertising (D49) and broadcasting business (D50), even though the number of firms which participated in the business were small. It was outstanding that type II firms show a high ratio in transportation, financial institutions, and supermarkets and department stores.

7.2.2 Extent of the Diversification

So far, we have briefly reviewed the business areas in which the Korean housebuilding firms diversified. The extent of diversification in the Korean housebuilding firms was considered. Considering availability of data in this study, the extent of diversification was measured by the number of businesses and sales share of each business in which the firms were involved.

Number of businesses

Table 7-3 presents the average number of business the sample firms were involved in at 2-digit and 4-digit level. 2-digit industry is a broader classification than 4-digit. A high number at 2-digit level means that the firms are more diversified into either unrelated business or less closely related business, whereas a high number at 4-digit level means that firms are more diversified into related business. In 1980, the average business number at 2-digit level was 2.58 and it increased into 4.75 in 1995 (about 1.8 times increase). The average business number at 4-digit level also increased more than two times (3.16->7.18). It is noteworthy that the maximum number at 2-digit and 4-digit level were 11 and 20 in 1995. This means some building firms were involved in about 20 businesses at the same time in 1995.

Table 7-3 Average number of business at 2-digit and 4-digit level

		1980	1985	1990	1995
	Number of sample firms	106	122	142	143
2-digit	**Mean**	**2.58**	**3.41**	**4.40**	**4.75**
	Sta. dev.	1.08	1.41	1.91	2.04
	Max.	7.00	8.00	10.00	11.00
	Min.	1.00	2.00	2.00	2.00
4-digit	**Mean**	**3.16**	**4.92**	**6.53**	**7.18**
	Sta.dev.	2.07	2.67	3.19	3.27
	Max.	14.0	15.00	19.00	20.00
	Min.	0.00	1.00	1.00	2.00

Figure 7-2 shows the increasing trend of the number of businesses at 2-digit and 4-digit level. Figure 7-3 shows the level of increase in each period. The number of businesses involved shows a higher increase in 1980s than 1990s. At 4-digit level, firms showed the highest increase between 1980 and 1985. At 2-digit level, firms showed highest increase between 1985 and 1990. We may summarise that the extent of diversification of the Korean housebuilding industry has increased since 1980; however, the increase level has decreased since 1990.

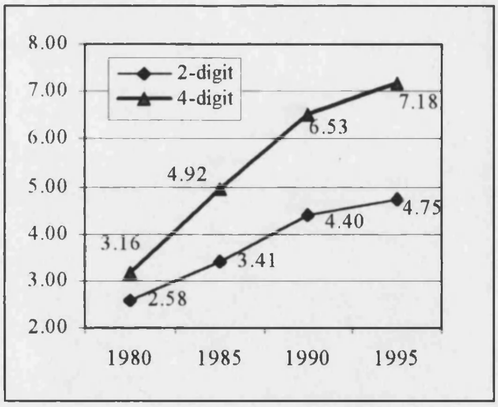


Figure 7-2 Average number of business

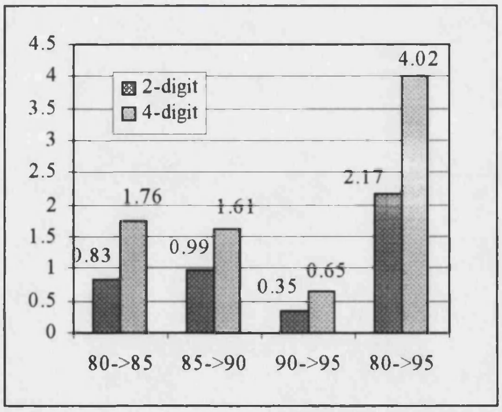


Figure 7-3 Level of increase in each period

Considering Figure 7-2 and Figure 7-3, we may think that the increase in the number of businesses is higher at 4-digit level than at 2-digit level. However, if we considered the total business number at each digit level, we may find that the level of increase at 2-digit level is higher than the one at 4-digit level.

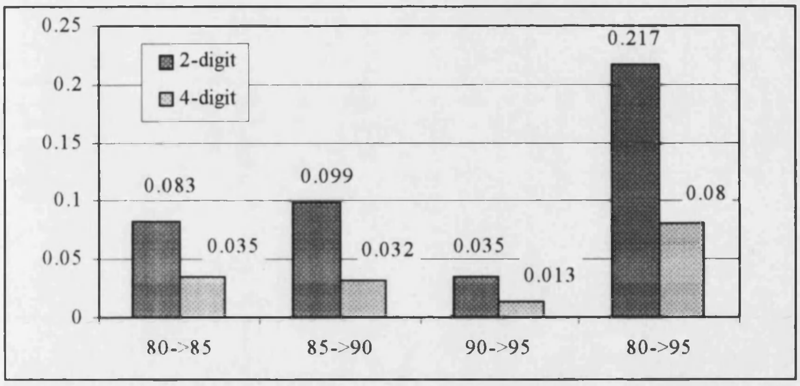


Figure 7-4 Average increasing level

Figure 7-4 shows the average increasing level in each period. At 2-digit level, 0.83, 0.99 and 0.35 among 10 businesses increased in each period, whereas at 4-digit level, 1.76, 1.61 and 0.65 business among 50 businesses increased in each period. The figure 13 shows that the average increasing level at 2-digit level is higher than the one at 4-digit level and it means the building firms were more diversified into unrelated or less closely related business areas.

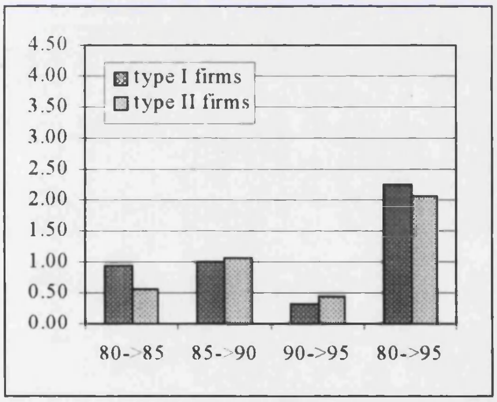


Figure 7-5 Level of increase in the number of businesses at 2-digit level

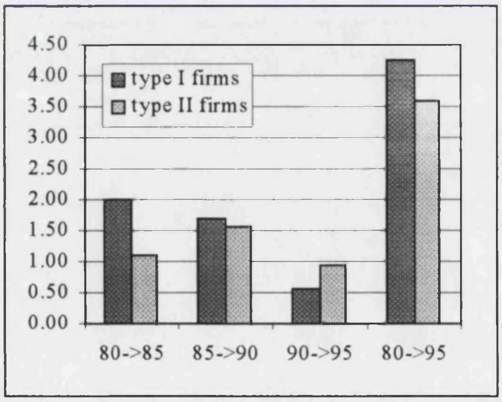


Figure 7-6 Level of increase in the number of businesses at 4-digit level

Figure 7-5 and Figure 7-6 show the level of increase in the number of businesses by types of firms. At 2-digit level, two types of firms showed the highest increase during the period between 1985 and 1990 and since 1985 type II firms showed a higher increase than type I firms. At 4-digit level, type I firms showed the highest increase between 1980 and 1990, whereas type II firms showed the highest increase between 1990 and 1995. It is also noteworthy that at both digit levels, the increase levels have decreased commonly since 1990, and after 1990 the increasing level of type II firms was higher than that of type I firms.

Table 7-4 shows the evidence of an increasing trend in the number of businesses from another view point. The proportion of the firms performing less than 3 businesses outstandingly declined from 69.8 % in 1980 to 9.0 % in 1995. On the other hand, the proportion of firms performing more than 9 businesses increased from 0.9 % in 1980 to 21 % in 1995. The proportion of firms which performed 6 to 9 businesses increased steadily from 4.7 % in 1980 to 30.1 % in 1995.

Table 7-4 Distribution of number of businesses at 4-digit level

	1980	1985	1990	1995
Sample firms	106	122	142	143
No. of 4-digit <= 3	74 **(69.8 %)**	39 **(32.0 %)**	20 **(14.1 %)**	13 (**9.0 %)**
3< No. of 4-digit <= 6	26 **(24.5 %)**	57 **(46.7 %)**	63 (44.3 %)	57 (39.9 %)
6< No. of 4-digit <=9	5 (**4.7 %)**	16 **(13.1 %)**	37 **(26.1 %)**	43 **(30.1 %)**
9< No. of 4-digit <=12	0 (0 %)	9 (7.4 %)	15 (10.6 %)	19 (13.3 %)
12< No. of 4-digit	1 (0.9 %)	1 (1.8 %)	7 (4.9 %)	**11 (7.7 %)**

Summarising the above, the extent of diversification in the Korean housebuilding industry has increased since 1980 and the level of increase has decreased. Generally type I firms showed a slightly higher increase than type II firms at 2-digit level. Type II firms showed the highest increase since 1985 at 4-digit level. Considering the above results and the fact the Korean housebuilding firms started to grow in the beginning of the 1980s, we found an important point that the Korean building firms have diversified from the beginning stage of growth. After the high growth period (1988-1992), the housebuilding business has been stagnant and the extent of diversification has also decreased. We may say that Korean housebuilding firms have been actively diversified through in high growth period, 1980s.

Sales Share of Business

We may examine the extent of diversification by sales share of each business. However, we had some limitations in raw data. We were not able to get separate sales share in each business at 2-digit level and 4-digit level. We could only distinguish firms' total sales into three large sections; construction, housebuilding and other businesses.

Table 7-5 shows the sales share and number of different businesses in each of the three sections.

The sales shares were different by type of firms. In the case of type I firms, the shares of the housebuilding business were about 25 % in average and have decreased since 1990 (→20.74 %). The number of housebuilding business is only one unit in 4-digit level. They were more involved in the construction business and the sales share was highest at about 60-70 %. The number of construction businesses was between 2.58 and 2.97. In the case of other businesses, the sales shares decreased (10.98->7.38), but the number of businesses increased from 2.53 in 1985 to 4.27 in 1995. It is noteworthy that numbers of other businesses were more than those of construction business.

Table 7-5 Sales share in each business

		Type I firms			Type II firms		
Year		1985	1990	1995	1985	1990	1995
Housebuilding business	Number	1	1	1	1	1	1
	Sales share (%)	**22.40**	**28.92**	**20.74**	**57.65**	**56.71**	**63.02**
Construction business	Number	2.58	2.97	2.77	2.56	2.41	2.39
	Sales share (%)	**66.69**	**61.67**	**71.87**	**33.67**	**34.24**	**26.83**
Other business	Number	2.53	4.94	4.27	1.82	2.84	2.75
	Sales share (%)	**10.90**	**8.40**	**7.38**	**9.02**	**9.06**	**10.15**

Type II firms showed the highest sales share in the housebuilding business (between 57 % and 63 %). The numbers of construction business kept constant at about 2.5. The sales shares of the construction business were shown at about 30 %, but this share has decreased to 26.83 % since 1990. Contrary to type I firms, the sales shares of other businesses increased from 9.02 % to 10.15 % and the number of businesses also increased (1.82→2.25). Here, we may divide the sales share in other businesses into 4 groups as in Table 7-6.

Table 7-6 Sales distribution in other business by types of firms (unit: %)

	Type I firms			**Type II firms**		
	1985	**1990**	**1995**	**1985**	**1990**	**1995**
Average sales share	**0.1090**	**0.0840**	**0.0738**	**0.0902**	**0.0906**	**0.1015**
less than 5%	67.5	53.1	68.4	42.1	35.4	51.6
5- less than 10 %	10.0	15.6	10.1	17.5	31.7	10.9
10- less than 30 %	15.0	28.1	13.9	33.3	28.1	23.4
more than 30 %	7.5	3.1	7.6	7.2	4.9	14.1

In case of type I firms, the proportion of the firms having more than 30 % of sales share in other business was about 7.5 % in 1985. 28.1 percent of firms showed 10-30 % sales shared in other business in 1990 and 7.6 % of the firms showed more than 30 % sales share in other business in 1995. In the case of type II firms, about 40 % of the firms showed more than 10 % sales share in other businesses in 1985 and 14.1 % of the firms showed more than 30 % sales share in other businesses in 1995. The proportion of firms having more than 30 % sales share in other businesses was higher (14.1 %) in type II firms than in type I firms (7.6 %) in 1995.

Summarising the above, the housebuilding business is the most important business in both types of firm, considering the unit sales share. Type I firms show an increasing trend in construction business but decreasing trend in housebuilding and other business, whereas type II firms showed increasing trends in housebuilding and other business but decreasing trend in the construction business. On average, the sales share in the other businesses were rather low at about 10 %, but the number of businesses increased every year. Type I firms showed smaller shares of other business in each year, but larger numbers of the businesses than those of type II firms. This means type I firms (those whose main business is construction) were involved in a large number of other businesses but the sales shares were smaller than those of type II firms (those whose main business is housebuilding). Type II firms showed larger sales share and an increasing trend in unrelated business.

7.2.3 Vertical Integration

As we saw in a previous section, Korean housebuilding firms were commonly diversified into various industries. Among the businesses in which they were involved, manufacturing of construction materials such as bricks, tiles, cement, ready mixed concrete, plaster, concrete roofing tiles, asphalt products and basic iron, and supply of land and building labours may be included in 'backward integrated business'. Sales and rental of residential and non-residential buildings, real estate, real estate appraisal and management, and advertising may be classified into 'forward integrated business'. 'Backward vertical integration' is justified by the need to overcome a failure of existing suppliers to meet the firm's demand at the time required, in the right quantity, at the right quality, and at a reasonable price.

It was very difficult to investigate the degree of vertical integration of housebuilding firms. Even though they were producing building materials, all products were not consumed by their own firms. Therefore, we were not able to define the businesses exactly as 'backward vertical integration'. Sometimes they consumed all materials within the firm, sometimes some of them were sold by other consumers. With data used in this analysis, we were not able to distinguish the products' usage between 'using within the firms' and 'selling out in market'.

According to H firm interviewed in 1996, the firms extended the business into production of building materials such as ready-mixed concrete, ascon, and aggregates. They usually consumed the materials as much as they needed within the firm and then sold the remaining materials in the market. At the beginning of material production, they consumed all the materials within the firm. As they produced more materials, they were able to sell them in the market or to the other firms. K firm (interviewed in June 1996) gave a different story in that they started their business in manufacturing of building materials such as ascon, remicon and cortar. After 5 years, they expanded their businesses into a 'housebuilding business' and further diversified into the general construction business. They have still produced some materials and they sell the materials in market as well.

As a forward integrated business, the building firms were involved in 'sales and rental of buildings' and 'real estate management'. They sold the buildings they built by themselves and sometimes they had bought adequate buildings in market and resell or let to the other consumers. We cannot distinguish between selling, letting and managing of 'the buildings built by them' and 'the buildings purchased from the market'. This is one of the limitations in this data. Each firm only provided the lists of their business. We were only able to examine how many firms are participating in 'the forward and backward integration areas'. Tables 7-7 shows the involvement ratios in the backward and forward integration business areas.

Manufacturing of paper and paperboard (D7) includes producing wall paper and papers lacquered with bean oil. Refractory ceramic products (D9) mean refractory bricks and similar products. Structural non-refractory clay and ceramic products (D10) includes ceramic bricks, clay roofing tiles and similar products. Articles of concrete, cement and plaster (D12) includes non-refractory mortars, ready-mix concrete, plaster products, cellulose fibre-cement products, concrete roofing tiles, bricks and blocks, and auto

Table 7-7 Involvement ratio of backward and forward integration business (1995)

Section	Four-digit business	Total sample (143)	Type I firms (77)	Type II firms (64)
Backward integration	Manufacturing of articles of paper and paperboard (D7) -wall paper and papers lacquered with bean oil	2 (1.4%)	2 (2.5)	0
	Refractory ceramic products (D9)	1 (0.7%)	1 (1.3)	0
	Structural non-refractory clay and ceramic products (D10) -ceramic building materials such as bricks and similar products -clay roofing tiles and related products -clay tiles and similar products	3 (2.1%)	2 (2.5)	1 (1.6)
	Cement, lime and plaster (D11)	12 (8.4%)	7 (8.9)	5 (7.8)
	Articles of concrete, cement and plaster (D12) -non-refractory mortars -ready-mix concrete -plaster products -cellulose fiber-cement products -concrete roofing tiles, bricks and blocks -auto claved light weight concrete products	**35 (24.5%)**	**23 (29.1)**	12 (18.8)
	Non-metallic mineral product (D13) -asbestos products -abrasive articles -asphalt products -mineral wools and their similar products	**35 (24.5%)**	**27 (34.8)**	8 (12.5)
	Basic iron and steel (D14)	**15 (10.5%)**	**13 (16.4)**	2 (3.1)
	Steel rolling, drawing and extruding steel pipe (D15) -hot & cold rolling, drawing and extruding steel pipe -steel wire, tubes and pipes of cast iron or cast steel -steel pipe and tube	1 (0.7%)	0	1 (1.6)
	Site preparation (D18) -wrecking and demolition works -excavation and land levelling	49 (34.3%)	27 (34.2)	22 (34.4)
	Labour recruitment and provision of personnel (D48) -personal supply service	1 (0.7%)	1 (1.3)	0
Forward integration	**Storage and warehousing (D39)** -general warehousing -refrigerated warehousing -dangerous warehousing -farm products warehousing	8 (5.6%)	4 (5.1)	**4 (6.3)**
	Rental of real estate (D42) -rental of residential and non-residential buildings	**101 (70.6%)**	52 (65.8)	**49 (76.6)**
	Subdividing real estate(D43) -sales of residential and non-residential building -land development and sales	16 (11.2%)	9 (11.4)	7(10.9)
	Real estate business as a fee or contract basis(D44) -real estate appraisal -real estate managing -real estate agency and brokerage	**40 (28.0%)**	**26 (32.9)**	14(21.9)
	Advertising business(D49) -advertising agency -advertising preparation -outdoor advertising	**4 (2.8%)**	**4 (5.1)**	0

claved light weight concrete products. Non-metallic mineral products (D13) include asbestos products, abrasive articles, asphalt products, mineral wools and their similar products. Manufacturing of steel rolling, drawing and extruding steel pipe (D15) includes hot and cold rolling drawing and extruding steel pipe, steel wire, tubes and pipes of cast iron or cast steel, steel pipe and tubes.

Among the materials, building firms were producing mainly cement, plaster, ready-mixed-concrete, ascon, bricks and asphalt. They showed a high involvement ratio of between 10 and 25 percent in products D12, D13, D14. Site preparation (D18) includes 'wrecking and demolition works' and 'excavation and land levelling'. About 35 percent of sample firms participated in this business. Labour recruitment and provision of personnel (D48) means supply of building labourers. Among backward integration areas, type I firms show higher involvement ratios than type II firms.

In the forward integration area, five businesses were included. Storage and warehousing (D39) includes general warehousing, refrigerated warehousing, dangerous warehousing, farm products warehousing. Most firms were involved in 'the general warehousing' built by themselves. Rental of real estate (D42) means rental of residential and non-residential buildings. Real estate business (D44) means real estate agency and brokerage, real estate appraisal, and real estate management. They usually let buildings they built themselves, however, the other buildings were also included. In the case of subdividing real estate (D43), only the buildings they built themselves were included. About 70 percent of the firms were involved in rental of real estate (D42) and 28 percent of the firms were involved in real estate business (as a fee or contract base, D44). Only 11.2 percent of the firms were involved in the sales of their own building (D43). In the case of storage and warehousing (D39) and advertising business (D49), the ratios were rather low at 5.6 % and 2.8 % each.

Table 7-8 shows the change of the involvement ratios in backward and forward integrated areas. Building firms started to produce some materials such as concrete, cement, plaster, non-metalic mineral product, and steel since 1980. The involvement ratio shows a gradual increase between 1980 and 1990 and since 1990 there has been no big increase. The ratios in forward integrated areas showed a continuous increase by 1995.

Table 7-8 Change of the involvement ratios in backward and forward integration

Section	Four-digit industries	1980 (106)	1985 (122)	1990 (142)	1995 (143)
Backward Integration	-manufacturing of articles of paper and paperboard(D7)	0	1(0.8)	1(0.7)	2(1.4)
	-refractory ceramic products (D9)	0	1(0.8)	1(0.7)	1(0.7)
	-structural non-refractory clay and ceramic products(D10)	1(0.9)	2(1.6)	3(2.1)	3(2.1)
	-ceramic, lime and plaster (D11)	3(2.8)	9(7.4)	12(8.4)	12(8.4)
	-articles of concrete, cement and plaster(D12)	10(9.4)	21(17.2)	33(23.1)	35(24.5)
	-non-metallic mineral product (D13)	6(5.7)	18(14.8)	29(20.3)	35(24.5)
	-basic iron and steel (D14)	4(3.8)	8(6.6)	14(9.8)	15(10.5)
	-steel rolling, drawing and extruding, steel pipe (D15)	0	0	0	1(0.7)
	-site preparation (D18)	13(12.3)	32(25.4)	43(30.1)	49(34.3)
	-personnel supply service(D48)	0	0	0	1(0.7)
Forward Integration	-rental of real estate(D42)	10(9.4)	49(40.2)	95(66.4)	101(70.6)
	-subdividing real estate(D43)	1(0.9)	9(7.4)	15(10.5)	16(11.2)
	-real estate business as a fee or contract basis(D44)	5(4.7)	14(11.5)	37(25.9)	40(28.0)
	-storage and warehousing(D39)	2(1.9)	2(1.6)	8(5.6)	8(5.6)
	-advertising business(D49)	1(0.9)	2(1.6)	3(2.1)	4(2.8)

The extent of involvement in the vertically integrated business areas was examined. Table 7-9 shows the average number of vertical integration businesses which the firms were operating in 1995. On average, they were involved in 2.64 businesses in the vertically integrated areas; 1.56 in the forward integration areas, 1.77 in the backward integration areas. It is noteworthy that some of the firms were operating 9 businesses in the vertical integration areas.

Table 7-9 Average number of vertical integration business

	No. of vertical integrated business	No. of forward integrated business	No. of backward integrated business
Means	**2.64**	**1.56**	**1.77**
Std.Dev.	1.54	0.63	0.97
Max.	9.00	4.00	6.00
Min.	1.00	1.00	1.00

Table 7-10 shows trends of the number in the integration business areas. The extent of increase in the forward integration areas is very low at between 0.06 and 0.09 and it shows a decrease after 1990. The extent of the increase in the backward integration areas is rather high in 1985, but it shows a very low increase after then. This implies that most of entry into forward and backward integration areas was started before 1980 and since then, the increase has decreased.

Table 7-10 Trends of involvement in each integration business

	1980	1985	1990	1995
Vertical Integration	**1.75**	**2.17(+0.42)**	**2.64(+0.47)**	**2.64(0)**
Forward Integration	1.46	1.52(+0.06)	1.61(+0.09)	1.56(-0.05)
Backward Integration	1.54	1.72(+0.18)	1.74(+0.02)	1.77(+0.03)

( ): increase

Vertical integration can be included in the related diversification in a broad concept. According to Williamson, vertical integration is more likely when there is a high degree of uncertainty in the firm's environment and when transactions recur frequently so that transaction costs would be high. Here, a question may be asked; why do the building firms pursue vertically integration businesses, whereas others pursue other unrelated businesses ?

Table 7-11 The extent of diversification by A and B type of firms

	1980		1985		1990		1995	
Type of firms	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
No. of Vertical integration	**1.75**	**0**	**2.17**	**0**	**2.64**	**0**	**2.64**	**0**
No. of Related businesses	3.00	2.11	3.74	2.60	3.62	3.12	3.66	3.19
No. of Unrelated businesses	0.18	0.28	0.63	0.16	1.31	0.41	1.43	0.71

A firms: the firms involved in vertical integration business
B firms: the firms not involved in vertical integration business

Table 7-11 shows interesting results. The numbers mean the average numbers of related and unrelated business which they were operating at 4-digit level. A firms indicate those involved in vertical integration areas and B firms are those not involved in the areas. This table was made to examine whether there are differences in the extent of diversification between A firms and B firms. A firms show consistently higher numbers not only in related business but also in unrelated business areas, than B type firms. Table 43 indicates that the firms involved in vertical integration shows a consistently higher extent of both related and unrelated diversification.

7.3 Diversification Pattern

7.3.1 Measuring Diversity

To investigate the diversification pattern of building firms, we need to measure the firms' diversity first. Here, Varadarajan and Ramanujam's basic scheme was adopted. This scheme treats broad spectrum diversity (BSD) and narrow spectrum diversity (NSD) as the two dimensions of a four-cell matrix. The narrow spectrum diversification (NSD) is defined as expansion outside of 4-digit KSIC industry but within 2-digit KSIC industry. The broad spectrum diversity (BSD) refers to expansion into a different 2-digit KSIC industry. Broad spectrum diversity is the number of 2-digit SIC categories in which a firm concurrently operates. Narrow spectrum diversity is the number of 4-digit categories in which a firm concurrently operates. As a firm may be active in many or few 4-digit levels for a given 2-digit category, they modified the NSD measure, designating the average number of 4-digit SIC codes per 2-digit SIC code in which a firm is active. Mean narrow spectrum diversity is the number of 4-digit SIC categories in which a firm operates divided by the number of 2-digit SIC categories in which it operates.

Broad spectrum diversity (BSD)	Low	Cell A: *Firms with very low diversity*	Cell B: *Related Diversified Firms*
	High	Cell C: *Unrelated-Diversified Firms*	Cell D: *Firms with very high diversity*
		Low	High

Mean narrow spectrum diversity (MNSD)

Figure 7-7 Two dimensional conceptualisation of diversification in firms
Source: Varadarajan and Ramanujam (1987) p. 383.

Figure 7-7 shows the resulting four-cell matrix, in which each cell represents the totality of a firm's past diversification activities in various 2-and 4-digit SIC categories. This measure distinguished between two distinctive patterns of diversification-narrow spectrum diversification (NSD) and broad spectrum diversity (BSD). Many studies generally consider narrow spectrum diversification-within 2-digit industries-as 'diversification into areas closely related to a firm's primary activities'. On the other hand, they view broad spectrum diversification-across 2-digit industries-as 'diversification into areas either unrelated to or less closely related to a firm's primary activities' (e.g. Jacquemin and Berry, 1979; Palepu, 1985; Wood, 1971). This conceptualisation also provides the inner logic of the SIC coding scheme itself. Although both firms concurrently operate in an equal number of 4-digit SIC categories, one firm can be viewed as being diversified into closely related areas, another firm as diversified into unrelated or less related areas.

Varadarajan and Ramanujam (1987) explained that the proposed categorisation schemes have similarities to other extant conceptualisation of diversity. Firms in cell A have their counterparts in Rumelt's (1974) scheme as 'either single or dominant business firms'. Cell B firms, which display a high degree of mean narrow spectrum diversity but a low level of broad spectrum diversity, are most likely to correspond to Rumelt's 'related diversified firms'. Cell C firms, which are broadly diversified at the two-digit level but reveal a low degree of diversification in any particular two-digit industry, have their counterparts in Rumelt's 'unrelated diversification category'. Cell D firms lack a strict correspondence in Rumelt's typology and are best viewed as highly diversified firms that are neither predominantly related diversified nor predominantly unrelated diversified. An advantage of this proposed matrix is that it does not require data on revenues or sales of business segments, but still provides insights into both the degree of diversification (high/low), and its direction (predominantly related/predominantly unrelated).

7.3.2 Diversification Pattern

Using the four-cell matrix measure, firms' diversity was examined. The firms classified in cell A mean those with very low diversity. Cell B firms are those related diversified firms and cell C firms are unrelated diversified firms and cell D firms are those with very high diversity. Table 7-12 shows the diversification pattern of Korean housebuilding firms by this categorical measure. As cut-off points to divide each dimension, mean values of BSD (means=4.75 s.d.=2.04) and MNSD (means=1.53 s.d.=0.31) were used. In 1995 the largest proportion of sample firms (about 32 %) was included in Cell A- very low diversified firms. The second largest group was the unrelated diversified firms as 28 % of total sample firms. The related diversified firms were about 22 % and 18 % of total firms are included in the very high diversified firms category.

Table 7-12 Diversification Patterns in 1995

	Cell A: Firms with very low diversity	Cell B: Related Diversified firms	Cell C: Unrelated diversified firms	Cell D: Firms with very high diversity	Number of firms
	low MNSD-low BSD	high MNSD -low BSD	low MNSD -high BSD	high MNSD -high BSD	
Total firms (%)	45 (31.5)	32 (22.4)	40 (28.0)	26 (18.2)	143
type I firms (%)	19 (24.1)	16 (20.3)	22 (22.9)	22 (27.9)	79
type II firms (%)	26 (40.6)	16 (25.0)	18 (28.1)	4 (6.3)	64

Table 7-12 also shows the differences in the diversification pattern between two types of firms. Among type I firms, cell D firms showed the highest proportion. The proportion of cell A firms with very low diversity was second highest (24 % of the total sample). Distribution among four cells was rather equal. Among type II firms, cell A firms showed the highest proportion (40.6 %) and cell D firms showed the lowest proportion (6.3 %). There was no big difference in the proportion of cell B firms and cell C firms.

Change of Diversification Pattern

Table 7-13 and Figure 7-8 shows changes of diversification pattern since 1980. In 1980 most of the firms (82.1%) were included in cell A-firms with very low diversity, single business firms. However, the proportion decreased steadily. Related diversified firms (cell B) increased greatly between 1980 and 1985 and the increasing level has decreased since 1985. Unrelated diversified firms (cell C) have outstandingly increased since 1985 and have continued to increase. Firms with very high diversity (cell D) also show a steady increase since 1980.

Table 7-13 Changes of diversification patterns in the Korean housebuilding firms

	Cell A: Firms with very Low diversity	Cell B: Related diversified Firms	Cell C: Unrelated diversified firms	Cell D: Firms with very high diversity	Total population firms
1980 No.(%)	87 (82.1)	12 (11.3)	5 (4.7)	2 (1.9)	106
1985 No.(%)	48 (49.5)	28 (28.9)	7 (7.2)	14 (14.4)	96
1990 No.(%)	37 (32.5)	25 (21.9)	28 (24.6)	24 (21.1)	114
1995 No.(%)	45 (31.5)	32 (22.4)	40 (28.0)	26 (18.2)	143

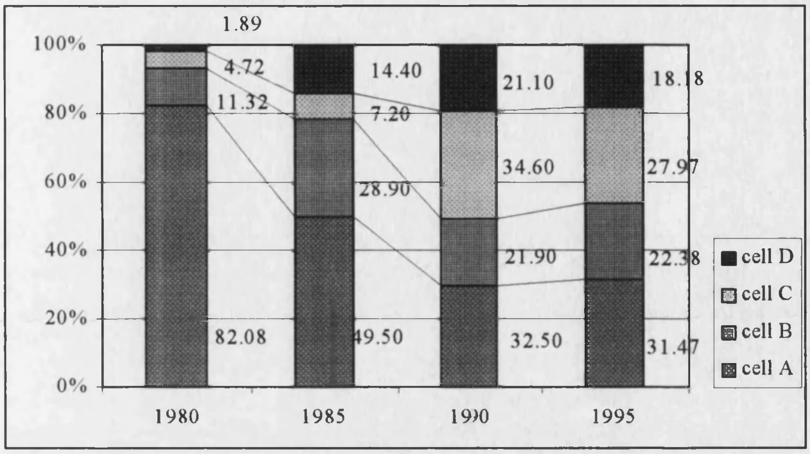


Figure 7-8 Changes of diversification pattern in the Korean housebuilding firms

There is no big difference in the changing pattern between type I firms and type II firms. In type I firms, cell B firms (related diversified firms) highly increased between 1980 and 1985 (11.11 % → 35 %). Since 1985, cell C firms (unrelated diversified firms) have increased (7.5 % → 21,88 %, 27.85 %). Cell D firms outstandingly increased between 1985 and 1990 (→ 43.75%) and after then the level of increase has decreased to 27.85 %. In 1995, the proportions of each cell kept a rather equal level.

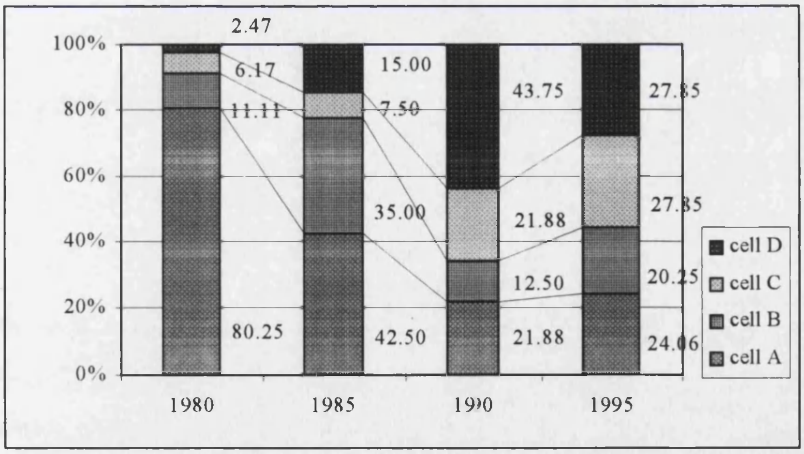


Figure 7-9 Change of diversification pattern in Type I Firms

To examine the differences in firms' scale, the type I firms were divided into two groups; large firms and small firms. Among type I firms, large firms showed higher diversity than small firms; however, the patterns are similar as shown in Figure 7-10 and Figure 7-11.

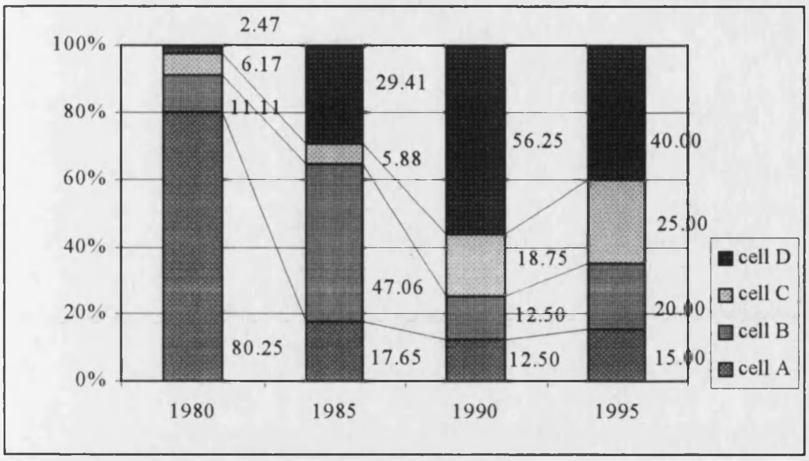


Figure 7-10 Type I firms (large)

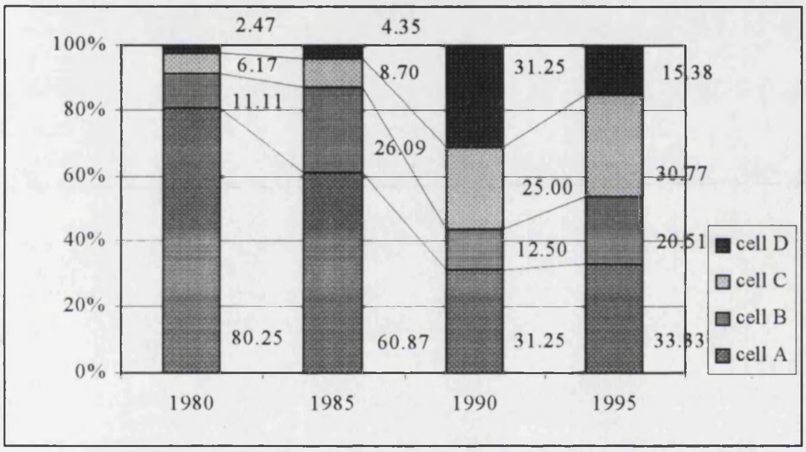


Figure 7-11 Type I firms (small)

We may summarise changing patterns in case of type I firms as follows; first, single business and related diversification were prevalent till 1985. Second, since 1985, diversification into unrelated business area has increased. Third, large firms show higher diversity than small firms, however, their patterns were similar. Fourth, large firms and small firms show the highest diversity in 1990 and the extent decreased in 1995.

Figure 7-12 shows the case of type II firms. In type II firms, the proportions of cell A firms was always highest in each year. Since 1980, cell B firms (related diversified firms) remained at a level of about 25%. Since 1985, cell C firms (unrelated diversified firms) have outstandingly increased (7 % → 25%, 28%). The proportion of cell D firms was rather low (6- 14%), compared to those of type I firms (in Figure 8).

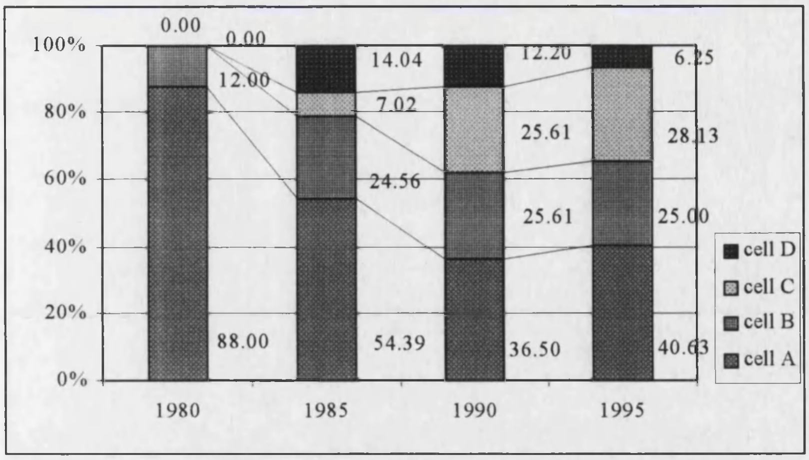


Figure 7-12 Change of diversification pattern in Type II Firms

It is noteworthy that type II firms showed a quite different pattern between large and small firms (Figure 7-13 and Figure 7-14). In the case of large firms, cell B, cell C and cell D firms increased at the same time since 1980 and the diversity is highest in 1995. The diversity in 1995 was higher than those of large type I firms.

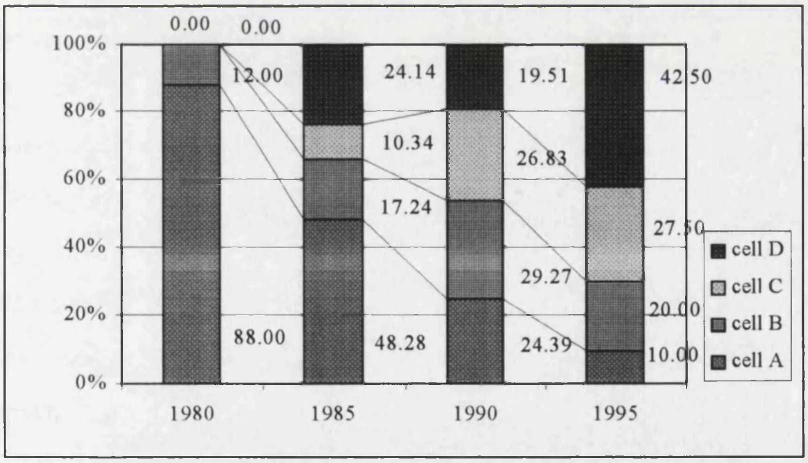


Figure 7-13 Type II firms (large)

Figure 7-14 shows the case of small firms. Among type II firms, the small firms showed a steady increase in related business first and unrelated business since 1990. Cell A firms still showed the highest proportion in each year, whereas cell D firms showed the smallest portion.

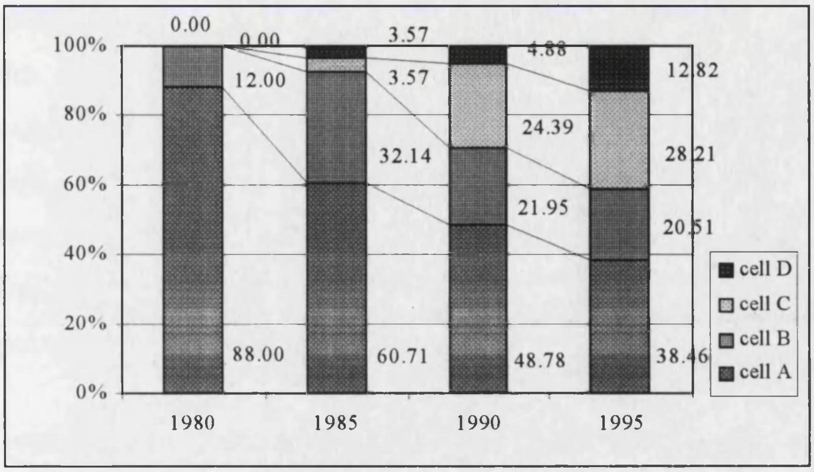


Figure 7-14. Type II firms (small)

Summarising the above result, most of the Korean housebuilding firms were diversified both into related and unrelated businesses. The extent and the pattern of diversification were found to be different between different types of firms and different sizes of firms. In the case of type I firms, cell D firms were still highest and the other firms were keeping a rather equal ratio. Whereas in the case of type II firms, the proportion of cell A firms was still the highest and that of cell D firms was the lowest. Among type I firms, large firms showed a higher diversity than small firms but their patterns of diversification were similar. Both of them show higher diversity in 1990 and the extent of diversity decreased in 1995. However, in the case of type II firms, there were some differences in the diversification pattern between two sizes of firms. The large firms showed a sudden increase of diversity since 1980 and they showed highest diversity in 1995. The extent was higher than that of large firms in type I firms, whereas, small firms showed still the lowest diversity.

7.4 Relationship between the Firms' Diversity and Performance

In this section, the relationship between the firms' diversity and performance were investigated. Five ratio measures were examined to consider the Korean housebuilding firms' performance; measures of business scale, measures of profitability, measures of turnover, measures of stability or liquidity, measures of growth. As the diversity measure, the four-cell matrix measure described in the previous section was used. A continuous dependent variable (performance variables) was measured by the categorical variables (four-cell diversity firms). ANOVA was used to explain the relationship between diversity and performance. As the data in each cell are unbalanced, that is, the number of samples in each cell is different, General Linear Model (GLM) was used for analysis of variance (ANOVA). The results inform us whether there are any differences in performance among different diversity-groups. The sample firms were the same as those used in the previous section. However, we could not get the firms' financial data in 1980 and therefore, the relationship was analysed only at three time points (1985, 1990,1995).

7.4.1 Measures of Business Scale

As measures of business scale, total capital, equity capital and total sales and net profit were considered. The scale and trends were shown in Table 7-14 and Figure 7-15. Among the measures, total capital, equity capital and total sales have showed a steady increase since 1985. The average increase rates per year were between 9.5 and 13.1 %.

Table 7-14 Business Scale of Housebuilding Firms

(Unit: hundred million won)

	1985	1990	1995	Average Increase Rate
Total capital	1,264	2,018	3,941	12.0%
Equity capital	168	293	576	13.1%
Total sales	1,083	1,329	2,690	9.5%

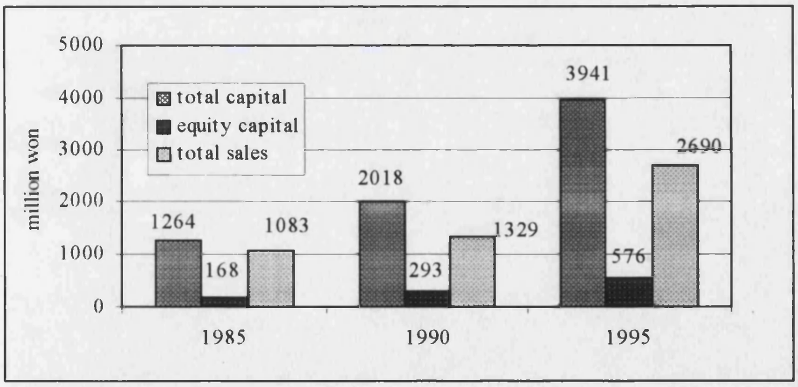


Figure 7-15 Trends of business scale

Table 7-15 shows a positive relationship between the firms' business scale and diversity. Cell D firms (firms with very high diversity) showed higher performance than cell A firms, cell B firms, and cell C firms. Moreover, the differences were statistically significant in 0.05 level. The cells having the same letter means their mean values were significantly the same. For example, in the case of the total capital in 1995, cell D firms' total capital was not significantly different from that of cell C firms, but significantly different from those of cell B and cell A firms. Cell A firms' total capital in 1990 was not significantly different from cell B firms, but significantly different from cell C and cell D firms.

Table 7-15 Two-way ANOVA results between business scale and diversification categories (Unit: hundred million won)

		Cell A	Cell B	Cell C	Cell D
Total capital	1985	472 c,b	1076 c,b	3263 b,a	3354 a
	1990	611 c	1508 c,b	2610 b,a	3933 a
	1995	**1195 c**	**2480 b**	**5669 b,a**	**7833 a**
Equity capital	1985	64 b	98 b	473 a	515 a
	1990	116 b	122 b	204 b	846 a
	1995	**110 b**	**276 b**	**674 b**	**1599 a**
Total sales	1985	407 c	852 c,b	3719 a	2442 b,a
	1990	501 b	1104 a,b	1685 b,a	2390 a
	1995	**814 b**	**1569 b**	**4129 a**	**5106 a**

* Same letters denote significantly indifferent pairs of group means.

7.4.2 Measures of Profitability

Profitability means the return of value over the value put into a business endeavour. Profitability can be considered as an ultimate measure of business efficiency. Profitability can be considered as return on sales, return on assets, or return to the shareholders. When profitability is considered as a return to investors, after-tax results are often the most significant (Fisher 1983, p.43). However, for operational purposes, it is sometimes calculated before taxation. Here, as the aim is to analyse business efficiency, 'before tax profit' was used. As the profit, we considered both 'net income before tax' and 'ordinary profit'.

As the profitability ratios which relate profit to sales, 'ordinary profit to total sales' 'net profit to total sales' are commonly considered. The relationship of profit to sales volume aids the appraisal of the efficiency of the operations. However, the pricing and volume fluctuations tend to limit the reliability of the measures. Therefore, we also consider a more crucial test of business efficiency, namely, profits to capital as a return on investment. As the profitability measure on capital, 'net profit to total asset', 'net profit to equity capital', 'ordinary profit to total asset' and 'ordinary profit to equity capital' were used. Therefore, we considered seven measures of profitability as shown in Table 7-16 and the calculation methods were shown in Appendix 6.

Table 7-16 Profitability ratio

	1985	1990	1995
Net profit to total asset	-0.03	-0.00	0.91
Ordinary profit to total asset	0.02	0.03	0.02
Net profit to equity capital	0.03	0.16	6.27
Ordinary profit to equity capital	0.25	0.55	-0.14
Net profit to total sales	-0.03	-0.05	1.23
Ordinary profit to total sales	0.01	0.05	0.01
Interest cost to sales	0.38	0.25	0.14

Table 7-16 shows the trends of profitability in each year. When extra cost is deducted from and extra profit is added to ordinary profit, net profit before taxation can be derived. Generally, financial cost consists of large part of extra cost in the housebuilding firms. Therefore, when considering profitability using 'net profit', the profitability is revealed as smaller than using the 'ordinary profit'. Table 7-17 shows the situation. The 'ordinary profit to total asset', 'ordinary profit to equity capital', and 'ordinary profit to total sales' were shown as higher than 'net profit to total asset', 'net profit to equity capital', and 'net profit to total sales' in 1985 and 1990. A contrary pattern was revealed in 1995. That is, the 'net profit to total asset', 'net profit to equity capital', 'net profit to total sales' were shown as higher than 'ordinary profit to total asset', 'ordinary profit to equity capital', and 'ordinary profit to total sales'.

Table 7-17 Two-way ANOVA results between profitability and diversification categories

		Cell A	Cell B	Cell C	Cell D
Net profit to total asset	1985	-0.002	-0.020	-0.013	-0.140
	1990	-0.003	0.023	0.001	0.018
	1995	**2.896**	**-0.007**	**0.010**	**0.008**
Ordinary profit to total asset	1985	0.095	-0.042	0.097	-0.111
	1990	0.088	-0.004	0.006	0.019
	1995	**0.029**	**0.001**	**0.019**	**0.013**
Net profit to equity capital	1985	0.147	-0.043	0.223	-0.283
	1990	-0.509	0.065	1.198	0.088
	1995	**20.49**	**-0.96**	**0.12**	**0.04**
Ordinary profit to equity capital	1985	0.480	-0.032	0.767	-0.212
	1990	0.033	0.161	1.229	0.091
	1995	**-0.014**	**-0.887**	**0.167**	**0.065**
Net profit to total sales	1985	-0.015	-0.027	-0.042	-0.049
	1990	-0.146	-0.005	-0.014	0.021
	1995	**3.926**	**-0.019**	**0.005**	**0.009**
Ordinary profit to total sales	1985	0.045	-0.028	-0.010	-0.035
	1990	0.145	0.023	-0.009	0.019
	1995	**0.014**	**-0.006**	**0.010**	**0.014**
Interest cost to sales	1985	0.676	0.162	0.070	0.087
	1990	0.578	0.125	0.095	0.059
	1995	**0.171**	**0.117**	**0.159**	**0.080**

As seen in Table 7-17, we cannot find any relationship between firms' profitability and diversity. The seven measures indicating firms' profitability all showed inconsistency in each year and no significant relationship between profitability and diversity.

7.4.3 Measures of Asset Utilisation

Asset utilisation ratios are indicators of the ability to manage assets of the firm effectively. They are designed to show the relationship between an income statement category (usually net sales) and a balance sheet category. 'Turnover to total asset' is a measure of total asset utilisation. It provides information on the effectiveness of the use of the firm's total asset in generating sales. 'Turnover to capital' also means the effectiveness of the use of the firm's capital in generating sales. 'Turnover to working capital' measures how effectively current resources are being used in the operating activities of a firm; that is, how well the firm is generating net sales. A low ratio is indicative of under-utilised working capital. 'Turnover to fixed assets' is a ratio measuring the ability to manage a firm's long term asset.

Table 7-18 Asset utilisation ratio

	1985	1990	1995
Turnover to total asset	1.27	0.89	0.76
Turnover to capital	6.20	4.77	4.92
Turnover to net working capital	6.88	7.81	8.55
Turnover to fixed asset	26.28	22.90	37.42

Table 7-18 shows the asset utilisation ratios in each year. Generally, if the ratio is below one (1), it says assets are not being used efficiently. The values of turnover to total asset were shown as being below one in 1990 and 1995. All the other values showed were above one and the values of turnover to fixed asset showed an especially high ratio. This means that most of the assets are used efficiently and the firms' long term assets are utilised most efficiently. With the exception of turnover to net working capital, the other asset utilisation measures decreased in 1990 but increased again in 1995. Generally all measures showed an increasing trend.

As Table 7-19 shows, even though there were some exceptions, utilisation ratios showed negative relationship with firms' diversity. That is, high-diversity firms had a low utilisation ratio, whereas low-diversity firms showed higher utilisation ratios. The turnover to total asset, turnover to capital in 1990 and turnover to networking capital in 1995 showed significant differences among different diversity groups.

Table 7-19 Two-way ANOVA results between asset utilisation and diversification categories (unit: turnover)

		Cell A	Cell B	Cell C	cell D
Turnover to total asset	1985	1.469	1.211	0.810	0.979
	1990	1.174 a	0.792 b	0.783b	0.726 b
	1995	**0.822**	**0.789**	**0.703**	**0.693**
Turnover to capital	1985	7.012	5.922	4.204	5.188
	1990	5.769 a	4.101b,c	5.142 a,b	3.530 c
	1995	**6.238**	**4.225**	**4.728**	**3.790**
Turnover to net working capital	1985	8.39	5.54	49.84	-13.38
	1990	14.85	4.35	5.34	3.72
	1995	**5.863 a,b**	**21.028 a**	**5.130 a,b**	**3.124 b**
Turnover to fixed asset	1985	37.61	20.26	6.30	12.90
	1990	29.52	25.61	17.10	16.89
	1995	**58.84**	**40.24**	**23.99**	**17.57**

* Same letters denote significantly indifferent pairs of group means.

7.4.4 Measures of Financial Structure

Financial structure measures show the strength of the firm from the investment. There are several ratios to express the relationship between all borrowed funds and ownership fund. 'Net worth to total asset ratio' means that the proportion not financed from equity must come from elsewhere and it must be loan capital. The higher this ratio, the larger the amount of asset being provided by the owner. Debt ratio measures creditors' claims against total assets relative to total claims. It serves as an indicator of the unsecured creditors' margin of safety in the event of a business downturn or liquidation. The higher the ratio, the greater the risk to creditors. 'Current ratio' is a commonly used indicator of short-term solvency. It reflects the ability to cover current liabilities out of current assets. The adequacy of this ratio depends on the type of business, the quality and distribution of the current assets, and the time of year. 200 % may be inadequate in one industry. This is because if a significant portion of accounts receivable is uncollectable or inventories are obsolete, a high current ratio may be misleading. A low value indicates a low level of financial risk and a great degree of flexibility in financial decisions. A high ratio indicates exactly the opposite.

'Fixed ratio' measures the relative degree to which owners have invested their equity in fixed assets (construction plant and equipment). The higher this ratio, the more vulnerable are creditors in the event of a firm liquidation. The lower the ratio, the better the cushion if such an event should occur. 'Fixed assets to long-term capital ratio' is a measure showing the relationship between long-term capital (equity capital + fixed liability) and fixed asset. The lower this ratio, the better the arrangement of firms' capital. The standard ratio as a normal decision basis is less than 100 %. If this ratio is more than 100 %, it means that the investment on fixed assets may be carried out not only by long-term capital but also by current liabilities, that is, short-term debts. It means that the lack of the firm's operating capital may make the affordability of the firm deteriorate. Appendix 5 shows the calculated method of each ratio.

Table 7-20 Financial structure measures

	1985	1990	1995
Net worth to total asset ratio	22.10	48.45	12.01
Debt ratio	77.91	81.55	88.00
Current ratio	133.65	140.38	122.91
Fixed ratio	68.60	119.91	123.47
Fixed assets to long term capital ratio	37.40	32.06	-1.74

Table 7-20 shows the value and trend of financial structure measures. This table shows that the financial structure is generally not in a good condition. 'Net worth to total asset ratio' has increased but decreased again in 1995. 'Debt ratio' has increased steadily, whereas 'current ratio' has decreased. Increasing fixed ratio means that the firms have invested their equity more in fixed assets such as plant, equipment.

Table 7-21 Two-way ANOVA results between financial structure and diversification categories (unit:%)

		Cell A	Cell B	Cell C	Cell D
Net worth to total asset ratio	1985	23.58 a	18.89 a,b	21.07 b	23.98 a,b
	1990	23.75	15.91	10.10	22.64
	1995	**15.13**	**10.76**	**4.26**	**20.10**
Debt ratio	1985	76.46	81.11	78.94	76.02
	1990	46.25 b	84.09 a,b	89.89a,b	77.36 a
	1995	**84.94**	**89.24**	**95.75**	**79.90**
Current ratio	1985	132.33 a,b	128.77 a,b	99.33 b	165.07 a
	1990	141.65	137.64	129.84	153.56
	1995	**119.93**	**126.59**	**116.45**	**133.46**
Fixed ratio	1985	59.62	60.99	119.70	89.01
	1990	129.34	77.81	171.09	51.55
	1995	**144.69**	**95.54**	**164.48**	**58.04**
Fixed assets to long term capital ratio	1985	31.43	39.94	56.28	43.39
	1990	25.00	32.17	49.93	21.98
	1995	**-69.90**	**24.48**	**36.68**	**24.82**

* Same letters denote significantly indifferent pairs of group means.

Table 7-21 shows that highly diversify firms (cell D firms) showed higher net worth to total asset ratio (in 1985,1995), lower debt ratio (in 1990), higher current ratio (in 1985) and lower fixed ratio and lower fixed assets to long tem capital ratio. On the contrary, the unrelated diversified firms (cell C firms) showed higher debt ratio, lower current ratio and higher fixed ratio and fixed assets to long tem capital ratio. Generally low diversity firms (cell A) showed a more stable financial structure than related diversified firms and unrelated diversified firms. However, we were not able to find a consistent relationship between financial structure and the firms' diversity.

7.4.5 Measures of Growth

Growth measures are a kind of measure to analyse the trend of past and present performance of the firms. That is, it is related to find out the change of business performance. Here, total asset growth ratio, equity capital growth ratio, net sales growth ratio, ordinary profit growth ratio and net profit growth ratio were considered. All the ratios were measured by the concepts of increase in each item compared with those in previous years.

Table 7-22 Growth ratios

	1985	1990	1995
Total asset growth ratio	36.63	59.84	24.37
Equity capital growth ratio	21.95	41.97	28.28
Net sales growth ratio	12.52	99.94	28.27
Ordinary profit growth ratio	-51.09	4.93	58.45
Net profit growth ratio	-157.33	358.59	41.97

As shown in Table 7-22, all the measures showed an increasing pattern up to 1990, but a decreasing pattern between 1990 and 1995. This means that housebuilding grew greatly by 1990 but after then, the extent of growth decreased. This is consistent with the fact that the Korean housebuilding industry experienced high growth between 1988 and 1992 and after that the growth of industry decreased. Net sales growth ratio increased outstandingly between 1985 and 1990. The ordinary profit and net profit were - (minus) in 1985, but increased in 1990, especially net profit increased greatly in 1990.

Table 7-23 also shows the result of the ANOVA test and it shows inconsistent relationship between firms' growth ratio and diversity. We were not able to find any pattern or trend in the relationship.

Table 7-23 Two-way ANOVA results between growth ratio and diversification categories (unit : %)

		Cell A	Cell B	Cell C	Cell D
Total asset growth ratio	1985	49.28	19.59	16.67	37.35
	1990	83.17	47.53	52.47	45.26
	1995	**29.61 a**	**10.78 b**	**29.38 a**	**24.30 a,b**
Equity capital growth ratio	1985	15.59	16.26	18.06	57.07
	1990	63.95	23.83	31.23	39.52
	1995	**64.57**	**-2.70**	**19.28**	**17.45**
Net sales growth ratio	1985	24.04	0.97	7.67	3.14
	1990	192.7	41.8	45.0	85.5
	1995	**38.55**	**3.77**	**13.80**	**62.91**
Ordinary profit growth ratio	1985	-28.0	-103.0	-43.8	-26.8
	1990	-165.2	40.7	263.8	-63.1
	1995	**99.85**	**-20.29**	**82.73**	**46.33**
Net profit growth ratio	1985	-71.5	-148.8	-148.6	-461.0
	1990	-258	67	1782	67
	1995	**244.3**	**-154.1**	**-19.5**	**17.8**

* Same letters denote significantly indifferent pairs of group means.

Here we may summarise the relationship between the firms' performance and diversity as follows; first, as firms' business scale increased, the firms' diversity increased. Second, there was no relationship between firms' profitability and diversity. Third, we found negative relationship between asset utilisation and diversity. That is, high-diversity firms showed low utilisation ratio, whereas low-diversity firms showed higher utilisation ratios. This means highly diversified firms do not utilise asset efficiency. Fourth, generally low diversity firms showed more stable financial structure than related diversified firms and unrelated diversified firms, whereas highly diversified firms (cell D firms) showed more stable structure than the low diversity firms. Moreover, we were not able to find a consistent relationship between financial structure and the firms' diversity in every year. Fifth, an inconsistent relationship between firms' growth ratio and diversity was found.

7.5 Findings and Discussion

In this chapter, first, the business areas in which the Korean housebuilding firms were involved and the extent of diversification were investigated with a simple product-count measure. Second, with four-cell matrix measure, the building firms' diversification pattern and the changes were traced out. Third, the relationship between firms' diversity and performance were analysed with the ANOVA method.

Korean housebuilding firms showed a diversified production structure in related and unrelated business. It is noteworthy that Korean housebuilding firms were involved in totally unrelated businesses such as forestry and logging, sales of motor vehicles, hotel and restaurant business, broadcasting, and financial institutions. Type I firms were more involved in the unrelated businesses such as manufacturing, wholesale and retail of motor vehicles, hotel and restaurant business. Type I firms were also participating in labour supply, advertising and broadcasting, even though the number of firms were small. Type II firms showed increasing trends of diversification into other business. It was outstanding that type II firms showed a high involvement ratio in transportation, financial institutions, and supermarket and department stores.

However, housebuilding was found to be a most important business in both types of firms, considering the unit sales share. The sales share in other unrelated business were rather low at about 10 %, but the number of businesses increased every year. Type I firms showed smaller shares of other business in each year, but larger numbers of the businesses than those of type II firms. This means type I firms were involved in a large number of other businesses but the sales shares were smaller than those of type II firms. It is noteworthy that type II firms showed a larger sales share and an increasing trend in the unrelated business.

It was observed that the firms involved in vertical integrated businesses showed a consistently higher extent of diversification in related and unrelated areas. It was also observed that the Korean building firms, even though they were small, diversified from the beginning stage of growth and they have been actively diversified throughout the high growth period. After a high growth period (1988-1992), the housebuilding business has been stagnant and the extent of diversification has decreased since 1990.

The pattern of diversification was found to be different between different types and sizes of firms. Type I firms showed higher diversity than type II firms. Among type I firms, large firms showed higher diversity than small firms but the pattern was similar. Both of them showed high diversity by 1990 and the extent of diversity decreased in 1995. It is a natural result in a view that type I firms are those who started their business in other fields and entered into housebuilding later. That is why they have shown high diversity since the beginning of the 1980s. It was noteworthy that their diversity has decreased since 1990 when growth of the housing market became moderate.

On the other hand, in the case of type II firms, there are some differences in the diversification pattern between two sizes of firms. The large firms showed a sudden increase of diversity after 1980 and they showed the highest diversity in 1995. Their diversity was higher than that of large firms in type I, whereas, small firms among type II showed the lowest diversity and they were diversified mainly into related business. Considering the fact that type II firms are mainly those which started in the housebuilding business, this result suggests that Korean housebuilding firms regard 'business diversification' more importantly than 'specialisation of the business'.

It is generally known that firms diversify to achieve more profit and to grow into a big business group in the long run. However, the analysis between firms' diversity and performance did not give a satisfactory answer. There was a positive relationship between scale of firms and diversity. This was consistent with the interview survey results. However, it was found that there was no consistent relationship between firms' profitability and diversity and between firms' growth and diversity. We also found a negative relationship between asset utilisation and diversity. That is, high-diversity firms showed low utilisation ratio, whereas low-diversity firms showed higher utilisation ratios. This means that highly diversified firms do not utilise asset efficiently. However, highly diversified firms showed the most stable financial structure and low diversified firms showed a more stable financial structure than related diversified firms and unrelated diversified firms.

Here, some questions can be derived. We found that Korean housebuilding firms started to diversify from the beginning of business and most of them diversified into various businesses for the high growth period. However, it was found that there was no relationship between firms' performance and diversity. Then, why do building firms diversify, even though diversification does not guarantee high profit or rapid growth ? Furthermore, among large firms, type II firms whose main business is housebuilding showed higher diversity. What are the motives of the diversification ? Some of the interviewees replied that building firms tend to diversify into counter-cycle business in order to compensate business loss and to reduce uncertainty found in the housebuilding process. Some of them said they just follow the diversification trend of large leading firms. To find the answer, the motives of building firms are to be investigated in detail in the following chapter.

Chapter 8 Motives of Diversification in Korean Housebuilding Firms

The studies on diversification in the Korean economy started in the beginning of the 1980s when the negative effects of big business groups began to be highlighted as an economic issue. The studies have been mainly carried out at business group-level, and focused on economic power, market power and conglomerate power. Most studies aimed to analyse the relationship between the ownership and market power of big business groups. The studies explained diversification as a situation of economic concentration and focused on the effects of diversification on the performance of firms or the competitiveness of firms, not on the motives or causes of diversification.

Most of the Korean housebuilding firms diversified into related and unrelated business. Large firms were more diversified than small firms. They showed some differences in the diversification pattern by type of firms. It is noticeable that large firms among type II showed higher diversity than the large firms of type I, that is, the firms more involved in the housebuilding business, especially large firms, showed the highest diversity. Then, why did the housebuilding firms diversify into various businesses ? Were there some differences in the motives or causes of diversification by type of firms or by nature of firms ?

The objectives of this chapter are to investigate motives of the housebuilding firms' diversification and to examine differences by type of firms and by size of firms. Before investigating the motives of diversification, definition of diversification, measuring indices of diversification which are widely used in previous studies and literature, were reviewed. A diversification index for the Korean housebuilding industry was developed, taking into consideration the Korean housebuilding industry's situations. Using the index, an empirical analysis was carried out to investigate motives of diversification. A series of analyses were followed to find evidence on differences in motives by different types of firms and by type of diversification.

8.1 Measuring of Firms' Diversity

8.1.1 Definition of Diversification

Diversification has long been in the mainstream area of study both in industrial organisation economics and strategic management research areas. Basically the studies have focused on the extent (less/more), direction (related/unrelated) and mode (internal/acquisition). Definition of diversification has been varied in a great deal of literature on diversification. There are many ways diversification is conceptualised, defined and measured.

Ansoff's (1957, 1965) definition of diversification emphasises the entry of firms into new markets with new products. His emphasis is on the diversification act rather than the state of diversity. Gort (1962) defined diversification in terms of the concept of 'heterogeneity of output' based on the number of markets served by that output. According to Berry (1975), diversification represents an increase in the number of industries in which firms are active. Kamien and Schwartz (1975) defined diversification as the extent to which firms classified in one industry produce goods classified in another. In all these early definitions, industry or market boundaries are assumed to be given.

In contrast, Piffs and Hopkins (1982) use the word 'business' rather than 'industry', defining diversification as the extent to which firms operate in different businesses simultaneously. More recent studies attempt to define diversification focused on the multidimensional nature of the diversification phenomenon. Booz, Allen and Hamilton's study (1985) defined diversification as a means of spreading the base of a business to achieve improved growth and/or reduce overall risk.

Here, diversification is defined as the entry of a firm into new lines of activity either by a process of internal business development or acquisition which entail changes in its administrative structure, system and management process. For this perspective, a simple product line extension that is not accompanied by changes in the managerial process is not included in the concept of diversification, even though it is adopted by acquisition or merger.

8.1.2 Measuring Index of Diversification

Several measures have been used in diversification literature. However, there is no formal model that leads to a unique index of diversification. Each diversification measure has strengths and weaknesses. Therefore, some studies have used their own subjective measures based on the study's characteristics. The most frequently used indices are summarised as Table 8-1.

Table 8-1 Diversification indices

Diversification indices	Definition
The number of industry	*Ni*
DR_i : the diversification ratio	$DR_i = \sum_{j=1}^{n} S_j$
Gort Index	$G = N_i \times DR_i$
Herfindahl Index	$H = \sum_{i=1}^{n} (S_i)^2$
Berry index	$B = 1 - H = 1 - \sum_{i=1}^{n} (S_i)^2$
Utton index	$U = 2\sum_{i=1}^{n} r_i S_i - 1$
Entropy index	$E = \sum_{i=1}^{n} S_i \ln(1/S_i)$
Grav index	$G = \sum_{i=1}^{n} S_i \sum_{i=1}^{j} S_i d_{ij}$

Ni is defined as the number of industries in which the firm operates. DR_i is the diversification ratio. This is defined as the share of total production undertaken outside the firm's primary industry. Here, S_j is the share of the j^{th} secondary product in firm shipment and n is the number of industries in which the firms operates. The number of industry (N_I) has a weakness in that it ignores the relative importance of different activities. The diversification ratio (DR_i) takes no account of the spread of activities, that is, it ignores the number of secondary activities and the distribution of sales.

The Gort index (Gort, 1962) is intended to account for the importance and volume of diversification simultaneously in a single index, but it does not reflect the relative importance of the firm's non-primary (secondary) activities. The Herfindahl index (McVay and Berry, 1972) does satisfy both the number and distribution properties, but does not address product heterogeneity. The index takes a decreasing value as the distribution of production becomes more equal. Berry (Berry, 1975) suggested an applied form of this index. The Berry index increases with increasing diversification and it takes an increasing value as the distribution of production becomes more equal.

The Utton index (Utton, 1977) is a form of weighted average with the different activities of the firm, by their relative importance, indicated by their rank. Here r_i is the shipment rank of the i^{th} product. Products are ranked in descending order. Jacquemin and Berry (1979) proposed the Entropy index. This measure weighs each S_i, by the logarithm of $(1/S_i)$. The Utton index and the Entropy index are sensitive to changes in the number and distribution of products. The difference between the Utton index and the Entropy index is as follow; as the simple number of products increases or the distribution of products becomes more equal, the Utton index increases at a constant value, whereas the Entropy index increases at a decreasing rate in product number but at an increasing rate in production distribution (Gallop and Monhan p.320).

The Herfindahl, Berry, Utton and Entrophy indices do not satisfy the heterogeneity property. The Grav index is a modified form of the Herfindahl index. Here, d_{ij} is a distant parameter. For example if $i=j$, then $d_{ij}=0$ (in one 4-digit industry only). If i and j are in the same 3-digit industry $d_{ij}=1$, if i and j are in the same 2-digit industry $d_{ij}=2$, and if i and j are in the different 2-digit industry $d_{ij}=3$. The Grav index reflects the heterogeneity between industries using weighted average. However, it has a weakness in that it is difficult to calculate and interpret the results.

The above eight indices have been mostly used in empirical studies of diversification and they are in general highly correlated. Each index may be better suited for particular analysis of diversification. Several empirical studies about diversification have shown some consensus about the properties of a diversification measure. Gollop and Monahan (1991, p.319) summarised that a well-designed index of diversification should have the following five properties. It should vary directly with the number of different products produced and it should vary inversely with the increasingly unequal distribution of products across product lines. It should vary directly with the dissimilarity or heterogeneity of products and it should have scope, applying equally well to plants, firms and industries. And it should be bounded between zero and unity, if possible.

8.1.3 Limitation of Raw Data

Most empirical studies to measure the extent of diversification of firms assume that a firm diversifies if it expands its business into another 4-digit/3-digit/2-digit industry. The SIC classification is based on the differences in the production process and demand side of the product. In this study, the SIC classification was used as the base of analysis. However, the classification may have some problems; relevant products could be classified into disparate industries according to the criteria for classifying the industry, and the distance between SIC numbers cannot be interpreted as a measure of relation. Therefore, in this study a more developed index is necessary considering the sales share of each business and heterogeneity between businesses.

The raw data has some limitations when another existing diversification index is used, as follows; the original data do not give a separate sales share in each industry. Most sample firms give only three sales shares in housebuilding, construction and lump-sum of other industries. The housebuilding business is classified in the construction industry at 2-digit level. It may be thought that analysis at 2-digit level may be possible. However, the data do not give separate sales ratio of the other industries at 2 digit level, according to the KSIC classification. They only give a lump-sum sale of other industries. However, we were able to get a number of businesses the firms were operating at 2-digit, 4-digit, and even at 5-digit level for the construction section. As we have seen before, the number of businesses in which sample firms were involved was ten at 2-digit level and fifty at 4-digit level. Figure 8-1 shows the detailed business areas in which the Korean housebuilding firms are involved at 2-, 4-, and 5-digit levels.

Firms do not have separate accounting data at each business level. However, the sample firms have the separated financial data between housebuilding business and other construction data, that is, they have distinguished the housebuilding data from the construction data at 5-digit level. However, other construction business data are all aggregated at 5-digit level. In the case of other businesses, data are also aggregated as a lump-sum of nine industries at 2-digit level. Due to the limitations of raw data, we were not able to use existing diversification indices such as Entropy, Herfintahl, and Berry in this study.

2-digit level	4-digit level	5-digit level
1.Forest industry	1. Site preparation	3
2.Mining industry	2. Building of complete construction	2 housebuilding business & 3 other building construction
3.Manufacturing industry		
4.Construction industry	3. Heavy construction general contract	6
5.Wholesale & Retail trade	4. Building construction related special structure	9
6. Hotel & Restaurant		
7.Transport industry	5. Building installation	8
8.Financial Institutes	6. Building completion	8
9.Real estate renting & business	7. Renting of construction or Demolition equipment with operator	1
10.Other business		
1 construction & 9 other industries	7 construction & 43 other industries	40 construction businesses
Total 10 industries	Total 50 industries	total 40 industries

Figure 8-1 Details in business areas of housebuilding firms

8.1.4 Development of Diversification Index

Due to the limitations of data, a subjective diversification index was developed in this study. This was adapted from the Gort and Gravity indices. The index was designed, taking into consideration not only distribution of sales and number of business, but also heterogeneity of the participating industry. It gives different weights in each industry; high weight in unrelated industry and low weight in related industry.

$$\mathbf{DV}= \sum_{i=1}^{n} S_i d_{ij} W_i$$

S_i : sales share of each business to total sales

d_{ij} : distance parameter

$W_i = n_i / n_t$: weighted parameter

n_i : number of businesses in which the firms participate

n_t : total number of businesses at each digit level

S_i means sales share of each business to total sales. d_{ij} is a parameter reflecting the distance from the main business. The distant parameter was adapted from the Gravity index. If i industry is equal to j, d_{ij} is zero. If i is in the same 5-digit industry with j, d_{ij} is 1; if i is in same 4-digit industry with j, d_{ij} is 2; if i is in same 3-digit industry with j, d_{ij} is 3; if i is in same 2-digit industry with j, d_{ij} is 4; and if i is in different 2-digit industry with j, d_{ij} is 5. A large distance parameter means a business which is mutually unrelated and heterogeneous from the main business.

W_i is a weighted parameter reflecting the number of businesses in which the firms participate. The total business number at 4-digit level (n_t) is 50. Among them, 7 businesses are included in construction industry. The other 43 businesses are included in other business. In cases of construction and housebuilding, we cannot use the 4-digit level classification. This is because housebuilding is only distinguished from construction at the 5-digit level, as seen in Figure 25. At the 5-digit level, there are 2 housebuilding businesses, separated from 38 construction businesses. Therefore, we have to use the 5-digit level classification for analysing the housebuilding business. As an example, if a firm is involved in 2 housebuilding businesses, 8 construction businesses and 3 other businesses, the weighted parameters become as follows; housebuilding: 2/40, construction: 8/40, other business: 3/43. By using the above diversification index, the extent of diversification of the Korean housebuilding firms was calculated. Table 8-2 shows the extent of diversification and an increasing trend of diversification in each year. The indices were distributed between 0.05 and 1.31.

Table 8-2 Diversification Index of total firms

	1985	1990	1995
Means	**0.32**	**0.33**	**0.40**
Standard Deviation	0.20	0.22	0.25
Maximum	0.97	1.25	1.31
Minimum	0.06	0.07	0.05

Table 8-3 shows the indices by types of firm and by the firms categorised by the four-cell matrix used in Chapter 7. Generally, type I firms showed higher indices than those of type II firms. Both types of firm showed different patterns from that of total firms, that is, they showed an increasing trend between 1985 and 1990, but decreasing between 1990 and 1995. It showed low indices in cell A firms (firms with very low diversity) and high indices in cell D firms (firms with very high diversity). The indices of Cell B firms (related diversified firms) are shown lower than those of cell C firms (unrelated diversified firms), except in the case of 1985.

Table 8-3 Diversification Index by type of firms

	1985	1990	1995
Total firms	0.32	0.33	0.40
Type I firms	0.50	0.59	0.56
Type II firms	0.21	0.24	0.21
Cell A firms	0.23	0.20	0.25
Cell B firms	0.36	0.29	0.35
Cell C firms	0.35	0.34	0.44
Cell D firms	0.48	0.55	0.68

The subjectively designed diversification index (DV) can be considered as a more improved index. The difference between the four-cell matrix used in chapter 7 and this index is that the former considers only the number of business in which the firms are involved, whereas this index considers the number of business, sales distribution of each business, and heterogeneity of businesses simultaneously.

8.2 Motives of Diversification

In this section, modelling procedures are followed in order to investigate the diversification motives of building firms.

8.2.1 Theoretical Review

Many arguments have been put forward about motives of diversification. A number of individual points can be synthesised by some comprehensive perspectives; market-power view, resource view, transaction cost view, and risk avoidance view.

Market power view

According to the market power view, firms want to achieve a monopoly position by strong market power to get more than regular profit. Mongomery (1994) emphasised three ways in which conglomerates may yield power in anti-competitive ways such as 'cross-subsidisation', 'mutual forbearance' and 'reciprocal buying'. Several studies emphasised a positive relationship between market share and firms' market power. According to Martin (1993. p.167), if firms pursue profit maximisation, maintaining inter-dependency to the response of competitors, the structural relationship between the market share and the firm's market power may be formed. According to Tremblay and Tremblay (1988), market structure as an environment variable may influence the market-power motive of diversification. They argued that market structure - whether it is competitive or not - may be an influential factor to diversification. In general, the studies on market power view have tended to stress the consequences of diversification, rather than its causes. In most of the empirical studies, market share and market concentration in the main business were used as motive variables of diversification.

Besides, growth variable may be considered as another market power variable. This is based on the view that highly growing firms have room to invest into the related business or new business. Chun (1993) used 'growth ratio of demand' to investigate a hypothesis that if 'the growth ratio of sales' in an industry is high, firms may enter into other new industry. It was hypothesised that if housebuilding firms have a high growth ratio, the firm might extend its business into other new business areas.

Resource view

The resource view suggests that a firm's profit and breadth of diversification are a function of its resource stock. The basis of this view is found in the work of Edith Penrose (1959). This view emphasises two important aspects; heterogeneous large diversified firms and theory of growth. She defined 'resources' narrowly to refer to the 'physical things a company buys, leases or produces for its own use and the people hired on terms that make them effectively part of the firms'. However, the resources may be defined in a wider range including factors the firm has purchased in the market, services the firms have created from those factors, and special knowledge the firm has accumulated through time.

According to this approach, if a firm had enough resources, it might diversify in order to use the resources efficiently in the market or in the other market, that is, unused or enough resources may be the rationale for diversification. The diversification process is understood as a rent-seeking process by extending the market or by entering a new market. Caves (1971), Gorecki (1975), Teece (1982) also used excess capacity of productive factors as a motive of diversification as Penrose did.

Chatterjee and Wernerfelt (1991) emphasised that 'flexibility of resources' influenced the extent and the type of diversification. This is based on the view that if a firm shows higher flexibility of resources, it may have a high possibility of expanding its business. As flexibility of resources, 'ratio of current asset' and 'ratio of physical fixed asset' were considered. They found that flexible current resources like financial resources led to both related and unrelated diversification, whereas excess physical fixed resources like plant, fixed equipment etc. led to related diversification. This view is hypothesised in that large firms usually retained more resources and high potential to diversify and scale of firm is a general index to reflect accumulation level of management resources.

Transaction cost view

Transaction cost was considered as a motive of the firms' diversification. That is, firms may diversify with the motive of reducing the transaction cost. This view has mainly developed, focusing on the motives of vertical integration, and has provided a theoretical base on the motives of diversification. According to this view, if the level of uncertainty in the market and/or firms' asset specificity were high, internalisation of the transaction might be efficient.

The motives of diversification can be found in the works of Teece and Kay. Teece (1980, 1982) focused on the common use of know-how and physical asset with high specificity. He explained that it was effective to reduce the cost by diversifying into related business in which the resource could be utilised. Here, know-how means 'learning by doing'. The transaction containing know-how is revealed in opportunism. Therefore, the transaction is motivated to be internalised within the firm. Kay (1982, 1984) argued that the firms using common marketing and technical information such as the same distribution channel or common advertisement could expect a synergy effect between firms. Synergy means the economic effects that firms can get if they diversify into related business (Hills and Hoskinson, 1987). Levy (1985) tried an empirical analysis on vertical integration based on the transaction cost theory. He used 'intensity of advertisement' and 'intensity of research and development (R&D)' as variables reflecting asset specificity. Titman & Wessels (1988) also used 'cost of advertisement' and 'cost of R&D', as asset specificity variables.

The transaction cost view also explains the motive of unrelated diversification, focusing on the financial effect. Williamson (1985, p.284) argued that the M-form firms could assign firm's resources more efficiently; that is, M-form firms could use internal capital market for other business. Based on the arguments of Williamson, Hills and Hoskinson (1987, pp.332-333) explained that as the unrelated diversification enabled firms to pool cash flows and then reallocate them according to strategic criteria, financial economies could be achieved by unrelated diversification. Therefore, diversification enabled firms to overcome the failure of capital market.

Risk avoidance view

The fourth view is a risk-avoidance view that firms' diversification is primarily undertaken to avoid or reduce risk associated with the firms' business. Jensen (1986), Shleifer and Vishny (1989), and others explained that managers pursued risk-reducing strategies to further their own interests at the expense of the firms' owners, that is, managers may pursue diversified expansion as a mean of reducing total firm risk, thus improving their personal position. According to Amihud and Lev (1981, p.606), mergers may be carried out as a form of managerial perquisite intended to decrease the risk associated with managerial human capital. Their consequences may be regarded as an agency cost.

A frequently quotated study based on this view is the one of Hill & Hansen (1991). They investigated the original motives for diversification in order to understand the performance of diversification. They classified the relationship between risk and diversification into two respects; motives of diversification and consequences of diversification. They emphasised the risk avoidance motive. As a result, they explained that the degree of risk was positively related to the level of diversification as a motive of diversification, whereas the degree of risk as a result of diversification was negatively related to the level of diversification. This view did not expect that diversification improves firm' performance.

8.2.2 Modelling

(1) Basic Model

The market power view and the resource view are consistent with profit maximisation, based on the neo-classical economic theory. Moreover, the latter is consistent with the efficient use of resources. The transaction cost view is also consistent with those in pursuing the reduction of cost. The above theoretical arguments about the motives of diversification are summarised into 'profit maximisation' because the arguments are not mutually substitutable, but mutually complementary. The basic structure of analysis to investigate the motives of diversification is described as follows.

DV= f (M. R. T. O)

DV= diversification index as a dependent variable

M= market power variables
R= resources variables → independent variables
T= transaction cost variables
O= risk avoidance variables

The model consists of various independent variables explaining the motives of diversification and diversification index as a dependent variable.

(2) Operational definition of variables

Diversification index as a dependent variable

As a dependent variable, a subjective diversification index which discussed in prior section (1.4) was used. It is a continuous measure considering not only the extent of diversification of the firms by the number of business and sales share, but also heterogeneity of their business.

Market power variables

As the market power variables, market share in the main business (MS) and growth ratio of sales (GROWTH) were considered. Market share in the main business (MS) is defined as the ratio of the firms' main business sales to total sales in the industry. Construction or housebuilding is the major business for most of the Korean building firms. If a firm's main business is construction, MS becomes the market share in the construction industry and if a firm's main business is housebuilding, MS becomes the market share in the housebuilding industry. GROWTH means growth ratio of total sales of building firms and it was calculated first, total sales in each year was divided by previous sales and then, deducted one from the value.

Resource variables

As a variable indicating a firm's scale, many variables may be considered such as total sales, total assets, number of employees etc. Here, total assets (ASSET), number of employees (EMPLOY) were considered. It is assumed that the total assets reflect the scale of firms' resources and number of employees reflects the scale of personal resources. 'Flexibility of resources' was also considered in the model. As variables indicating flexibility of resources, ratio of current assets (CASS), and ratio of fixed assets (FASS) were considered. CASS is defined as a ratio of current assets to total assets. FASS is defined as a ratio of fixed physical assets to total assets.

Transaction cost variables

When we consider asset specificity in the housebuilding and construction industry, 'the intensity of building equipment possession' and 'technical specificity and construction know-how' may be considered. Here, we may define the business specificity in housebuilding as 'the intensity of investment of the firms to the business'. Considering the complexity of the building process and the hierarchical structure of industry, the firm's experience and know-how in the housebuilding business is a very important factor. Firms need special building facilities, heavy and specially designed machines, specially trained labour forces, and a well-established contracting system with small specialised contractors. If they want to operate their business smoothly, they need an initial large investment on the above factors as well as long-time experience.

The problem here was how to measure the 'business specificity'. There were some difficulties in defining and measuring it operationally. In this study, 'business period in the building business'(PEYEAR) was considered as a proxy variable of the business specificity. We assumed that if firms had a long business period in building, they would have high business specificity. They have already invested in construction facilities, professional and technical labour forces, and a systemised contracting relationship. Moreover, if they had long experience in the business, they may have retained a high name value and they did not need additional advertisement toward demanders. Therefore, we may derive a hypothesis that if the firms had a higher business specificity, they may diversify (especially into related areas). PEYEAR is defined as the total business period in their main business.

As another transaction cost variable, financial cost (FC) was considered. Financial cost means the cost of using funds from an external capital market. Korean housebuilding firms normally have very high financial costs. The financial cost is composed of large parts of the transaction costs. If a firm had high financial costs, this means they have some difficulty in financial transactions and they want to internalise the transaction within the firms. The point that internal financing or cross subsidisation is a major motive of diversification was emphasised in various studies. The financial cost (FC) was calculated as the sum of various interest, discount fees and debenture interest. The total financial cost was divided by the total debt of the building firm. This means financial cost per one unit of debt.

Risk avoidance variables

As risk avoidance variables, debt ratio (RISK), profitability (PROF) and market share in the housebuilding business (MSH) were considered. Here, the debt ratio is a business index indicating security of business. If the ratio was high, this means that firms have a high dependency on debts and their business is insecure. This is based on the view that if they faced high risk or uncertainty in their major business, they tend to diversify into other businesses in order to lessen the risk. The debt ratio (RISK) was calculated as the total debt divided by the total capital.

Also, profitability (PROF) and market share in the housebuilding industry (MSH) were considered. There are a lot of studies to investigate the relationship between diversification and performance. However, they do not give consistent results. Here, it is hypothesised that if a firm has a low profitability in business, they may try to diversify into other business to compensate for the loss. According to interviews, Korean housebuilding firms pursue the expansion of their business area in order to compensate for limited profit in housebuilding due to various regulations in the production process.

Profitability (PROF) was calculated as the ratio of ordinary profit to total asset. Low market share in the housebuilding industry means insecurity of the housebuilding business. It was hypothesised that the firms having a low market share in the housebuilding industry want to improve security of the firms and then pursue diversification into other business. MHS is defined as the ratio of each firm's housebuilding sales to total housebuilding sales in the industry.

Table 8-4 Operational Definition of Variables

	Variables	Definition of variables	Operational definition	Expected relations
Independent variable	DV	Diversification index		
Market power variables	MS	Market share in main business	The ratio of each firm's main business sales to the industry's total sales	+
	GROWTH	Growth ratio of sales	(sales/ sales in prior year-1) *100	+
Resource variables	ASSET*	Total assets	Total assets	+
	EMPLOY*	Number of employees	Number of total employees	+
	CASS	Ratio of current assets	Current assets divided by total assets	+
	FASS	Ratio of physical fixed assets	Physical fixed assets divided by total assets	+
Transaction cost variables	FC	Financial cost to total assets	Total financial cost divided by total debts. (This means financial cost per debts.)	+
	PEYEAR*	Business specificity	Business period in main business area	+
Risk avoidance variables	RISK	Debt ratio	Total debt/capital *100	+
	PROF	Profitability ratio	Ordinary profit/total assets *100	-
	MSH	Market share in housebuilding area	The ratio of each firm's housebuilding business sales to total housebuilding sales	-

* used as log form

Table 8-4 shows each variable's name and operational definition and expected relationship with firms' diversity. The market power variables (MS, GROWTH) and resource variables (ASSET, EMPLOY, CASS, and FASS) and transaction cost variables (FC, PEYEAR) may show a positive relationship to a firm's diversity. Among the risk avoidance variable, RISK variable may show a positive relation to firms' diversity, whereas PROF and MSH variables may show a negative relation to firms' diversity, that is, the lower the firms' profitability and market share in the housebuilding business, the more the firms diversify into other business to compensate for the firms' low profitability and the business's low profit. If the firms have high risk in their business, they may therefore diversify into other business in order to divide total risk to various businesses and to keep total security.

In particular, the variables indicating flexibility of resources (CASS and FASS) and transaction cost variables (FC and PEYEAR) may influence the type of diversification, related or unrelated diversification. Flexible current resources such as financial resources may lead both related and unrelated diversification, whereas physical fixed resources like plant and fixed equipment may lead to related diversification. Among transaction cost variables, the financial cost may lead to unrelated diversification, whereas business specificity may lead to related diversification. The firms' high financial cost means financial difficulty of the firms and the firms may diversify to internalise the transaction within the firms. Cross subsidisation from good cash-flow may be a good example. On the other hand, if a firm has a higher business specificity, they tend to diversify into a related business area, as they can utilise the know-how in the related business.

(3) Data sources and methodology

Total numbers of sample firms are 353 as shown in Table 8-5. Three time points; 1985, 1990, and 1995 were considered. The sample firms consist of two types of firms as described in chapter 7. Type I firms are defined as those whose main business is construction and which are also involved in the housebuilding business. Type II firms are those which started their business in housebuilding and their main business is also housebuilding.

Table 8-5 Number of sample firms

	1985	1990	1995	Total period
Total firms	96	114	143	353
Type I firms	40	32	79	151
Type II firms	56	82	64	202

Basically, financial data required in the analysis came from the sample firms' 'Annual Business Report' published by the Korea Stock Exchange. All registered firms have an obligation to report their business performance every year by standard form. According to a standardised form, the firms should report details of annual business; company profile, capital increase, share ownership, officers and employees, major business, sales of major product, balance sheet, income statement, schedule of cost of goods manufactured, statement of cash flow, statement of appropriation of retained earnings, stock price, key securities analysis and investment indices, financial analysis, and CPA's opinion.

Nearly all variables (GROWTH, ASSET, CASS, FASS, FC, RISK, PROF) were got from each building firm's 'balance sheets' and 'income statement' in each year. For the market share in the main business (MS), and the market share in the housebuilding business (MSH), we need separate sales shares. Fortunately, the annual business report gave separate sales share in three businesses; construction, housebuilding and other business. We also could get total sales in the construction industry and the housebuilding industry from formal publications. Total construction sales in the industry was obtained from 'National Economic Statistics' annually published by The Bank of Korea. Total housebuilding sales in the industry was obtained from 'the Housing Economic Statistical Yearbook' from the Korea Housing Bank. Number of employees (EMPLOY) and business period in main business (PEYEAR) were also got from the annual report.

All independent variables were discounted with GNP deflator index based on 1990 in order to reflect price change during the analysis period. In the analysis process, the time lag was considered. All independent variables were used as average values for the previous three years from each year. This is based on the view that diversification is realised 3-5 years later, considering firms' business status. Actually during the interview survey, it was observed that most of the managers in the housebuilding firms consider a diversification strategy in mid-term decision making (between 3 and 5 years). As an independent variable, a total of eleven variables were considered as below.

DV = f (MS, GROWTH, ASSET, EMPLOY, CASS, FASS, FC, PEYEAR, MSH, RISK, PROF)

Among the variables, ASSET, EMPLOY, and PEYEAR are nominal amount variables, whereas the other variables are ratio variables. We need to adjust the unit of variables, therefore the three variables were transformed into logarithmic value.

Ordinary Least Square (OLS) regression method was used to estimate the above model. SAS statistical package was used for the estimation. The estimation was carried out in several stages.

Firstly, the estimation was performed for all sample firms by pooling two types of firms. However, there were some differences between the two types of firms as discussed in chapter 7. Type I firms showed a larger scale in the number of employees, total sales and capital and a longer business period. About 80 percent of these were designated firms. On the other hand, type II firms appeared smaller in the number of employees, total sales and capital and they showed a shorter business period. Only 37.5 percent of type II firms were designated firms.

Due to the difference in scale between firms, it may be inadequate to use pooled data sets. We need to test whether the pooled data can be used or not. A Chow test was carried out as shown in Table 8-6. The test equation is as follows under the hypothesis that there are differences in diversification motive between two types of firms.

$$d = \frac{n_1 + n_2 - 2k}{k} \cdot \frac{SSR_t - (SSR_1 + SSR_2)}{(SSR_1 + SSR_2)}$$

Here, n_1, n_2 are numbers of observations in type I firms and type II firms. k is the number of variables for estimation. SSR_t, SSR_1 . SSR_2 are the sum of error term of the estimated model of total firms, type I firms, and type II firms. The d value was calculated as 18.088 for two types of firms. It is higher than the decision value 2.415 of F distribution (11,318). Table 61 shows the result of the Chow test.

Table 8-6 Calculation of decision value for Chow Test

	Type of firms
n_1,	Type I firms 142
n_2	Type II firms 198
k	11
SSR_1	3.324
SSR_2	1.351
SSR_t	7.600
F value	F(11,318)=2.415
d	18.088

Therefore, the hypothesis that there is no structural difference between two types of firms is rejected. This means it is more adequate to use different data set by type I firms and type II firms. Therefore, estimation was performed by two types of firms. The estimation was also performed from three time points separately (1985,1990, 1995).

Lastly, in order to find out the motives on different types of diversification, the above process was carried out separately in two parts; related diversification and unrelated diversification.

8.3 The Results

8.3.1 Estimation of Diversification Motives

Table 8-7 shows the estimation results by two type of firms. Adjusted R^2 showing explaining degree of explanatory variables are shown as rather high between 0.39 and 0.49. F-values showing the adequacy of the model are shown as being statistically significant. The D-W value of this model was also shown to be between 1.6 and 1.7 and we can say the estimation model used in this analysis is adequate.

Both types of firms showed the same results in market power variable. Type I firms showed expected results in resource variables with ASSET, whereas type II firms showed expected results in resource variables with personal resource variable (EMPLOY). As a flexibility variable of resource, CASS was an influential factor only in type II firms.

As transaction cost variables, business specificity (PEYEAR) was shown as significant in both types of firms and financial cost (FC) was shown as significant only in type I firms. Among risk avoidance variables, MSH was significant variable for both types of firm, but PROF was shown as significant only in type I firms. Even though there are some differences in the explanatory variables, market power variables, resource variables, transaction cost variables and risk avoidance variables were significant motives for both types of firms.

Table 8-7 Estimation results by type of firms

		Total firms	Type I Firms	Type II firms
	Intercept	-1.18086*** ***-10.733***	-1.1679*** ***-5.559***	-0.34201*** ***-3.649***
Market power variables	MS	0.798821*** ***7.579***	0.944216*** ***4.023***	19.93056*** ***3.578***
	GROWTH	-4.6E-05 ***-0.523***	0.000105 ***0.519***	1.12E-05 ***0.195***
Resource variables	ASSET	0.084353*** ***7.038***	0.083338*** ***4.168***	0.014582 ***1.492***
	EMPLOY	0.048049*** ***3.757***	0.030503 ***1.418***	0.036039*** ***3.627***
	CASS	2.23E-05 ***0.051***	0.000959 ***0.935***	0.00087*** ***3.046***
	FASS	0.000401 ***0.536***	0.001642 ***1.08***	0.000688 ***1.374***
Transaction cost variables	FC	7.68E-05 ***1.223***	0.003042** ***2.13***	2.75E-05 ***0.759***
	PEYEAR	0.115263*** ***5.765***	0.140963*** ***3.834***	0.049231*** ***3.322***
Risk avoidance variables	RISK	5.58E-07 ***0.18***	2.76E-05 ***0.994***	-8.7E-07 ***-0.489***
	PROF	-8.8E-05 ***-0.333***	-0.0078** ***-2.077***	-0.00013 ***-0.86***
	MSH	-9.83756*** ***-7.576***	-11.6343*** ***-4.023***	-6.98154*** ***-3.149***
	Adj. R^2	0.5808	0.4940	0.3911
	F-value	43.95***	13.605***	12.563***
	D/W value	1.479	1.601	1.717

Bold figure: standard error
* : significant at 10 % level ** : significant at 5 % level *** : significant at 1 % level

Table 8-8 and Table 8-9 show results of type I firms and type II firms for each of the three years. When considered in separate year, adjusted R^2 became higher between 0.51 and 0.61. F-values showing the adequacy of the model are shown as statistically significant. Durbin-Watson value (D-W) also shows near 2 and it means the model is adequately estimated.

In case of type I firms, there were some differences in the explanatory variables in each year. First, it was found that market power variables (MS), resource variables (ASSET, CASS, FASS), and risk avoidance variables (PROF, MHS) were influential factors in 1985; however, in 1990, only risk avoidance variables (PROF, MSH) were influential motives, and in 1995, resource variable (EMPLOY) and transaction cost variables (FC, PEYEAR) were significant motives of diversification.

Table 8-8 Estimation results of type I firms by year

		Total Period	1985	1990	1995
	Intercept	-1.1679***	-1.83637***	-2.22031***	-0.66758***
		-5.559	***-3.419***	***-3.171***	***-2.209***
Market power variables	MS	0.944216***	-2.41843*	2.185222	0.516884
		4.023	***-2.068***	***0.657***	***1.503***
	GROWTH	0.000105	0.000929	-0.00021	0.000199
		0.519	***1.438***	***-0.484***	***0.749***
Resource variables	ASSET	0.083338***	0.130864**	0.133119	0.005062
		4.168	***2.119***	***1.697***	***0.145***
	EMPLOY	0.030503	0.023202	0.125924	0.093401**
		1.418	***0.402***	***1.44***	***2.358***
	CASS	0.000959	0.004692*	0.003227	0.0004
		0.935	***2.073***	***1.383***	***0.212***
	FASS	0.001642	0.009821**	-0.004	-0.0003
		1.08	***2.687***	***-1.182***	***-0.14***
Transaction Cost Variables	FC	0.003042**	0.000989	-0.01314	0.002622*
		2.13	***0.099***	***-0.972***	***1.669***
	PEYEAR	0.140963***	0.081684	0.142634	0.179371***
		3.834	***0.951***	***1.494***	***3.831***
Risk Avoidance Variables	RISK	2.76E-05	6.81E-05	3.01E-06	1.14E-05
		0.994	***0.945***	***0.062***	***0.349***
	PROF	-0.0078**	-0.00919*	-0.01459*	-0.00433
		-2.077	***-2.006***	***-1.815***	***-1.451***
	MSH	-11.6343***	-13.9836***	-38.3468***	-6.3715
		-4.023	***-3.11***	***-4.097***	***-1.504***
	Adj. R^2	0.4940	0.6134	0.6134	0.5121
	F-value	13.605***	5.616***	5.616***	8.442***
	D/W value	1.601	2.062	2.062	2.161

Bold figure: standard error
* : significant at 10 % level ** : significant at 5 % level *** : significant at 1 % level

Table 8-9 shows the case of type II firms and it also shows different results in each year. In 1985, adjusted R^2 of the model was relatively low (0.1725) and there were no significant variables. However, results in 1990 and 1995 showed higher R^2 and better D-W values. In 1990, only market share variables (MS), business specificity variable (PEYEAR), and market share in the housebuilding business (MSH) were shown as statistically significant. The results in 1995 were better. Market power variables (MS, GROWTH), resource variables (EMPLOY, CASS) and risk avoidance variables (RISK, MSH) showed statistically significant results. However, it is noticeable that risk variables show the opposite sign from the expected one. This means the type II firms show high diversity in the case when they have low risk in their business.

Table 8-9 Estimation results of type II firms by years

		Total period	1985	1990	1995
	Intercept	-0.34201***	0.246462	-0.3609*	-0.33031
		-3.649	***1.017***	***-1.896***	***-1.672***
Market power variables	MS	19.93056***	5.663716	39.53815***	19.959*
		3.578	***0.564***	***3.089***	***1.977***
	GROWTH	1.12E-05	-0.00025	-2.6E-05	0.000431**
		0.195	***-1.464***	***-0.358***	***2.481***
Resource variables	ASSET	0.014582	0.011903	0.006814	0.000383
		1.492	***0.485***	***0.269***	***0.016***
	EMPLOY	0.036039***	0.009104	0.041929	0.071321***
		3.627	***0.481***	***1.566***	***3.046***
	CASS	0.00087***	-0.0016	0.000863	0.000969***
		3.046	***-1.319***	***0.925***	***2.979***
	FASS	0.000688	-0.00121	0.000855	0.001122
		1.374	***-0.835***	***0.795***	***1.48***
Transaction cost variables	FC	2.75E-05	-2E-05	0.000136	0.000498
		0.759	***-0.472***	***1.011***	***0.421***
	PEYEAR	0.049231***	-0.01884	0.07107**	0.037518
		3.322	***-0.56***	***2.385***	***1.648***
Risk avoidance variables	RISK	-8.7E-07	7.25E-06	2.83E-07	-1.3E-05**
		-0.489	***0.141***	***0.147***	***-2.062***
	PROF	-0.00013	-6.2E-06	-0.00023	-0.00125
		-0.86	***-0.033***	***-0.792***	***-0.481***
	MSH	-6.98154***	-0.85179	-11.1243**	-10.4674*
		-3.149	***-0.221***	***-2.628***	***-1.923***
	Adj. R^2	0.3911	0.1725	0.4408	0.5454
	F-value	12.563***	2.061**	6.517***	7.87***
	D/W value	1.717	2.029	2.01	1.922

Bold figure: standard error

* : significant at 10 % level ** : significant at 5 % level *** : significant at 1 % level

8.3.2 Estimation of Motives of Related and Unrelated Diversification

In this section, an attempt was made to examine whether there was any difference in influential variables between related and unrelated diversification. The diversification index needs to be divided into related index and unrelated index. As shown in the previous section, the diversification index designed in this study is composed of three parts; housebuilding, construction and other business. As the housebuilding business is placed in the same two-digit industry with the construction business, we can consider the two businesses as being related. As other business is included in a different two-digit industry from housebuilding, it is considered as being unrelated businesses. We may divide the diversification index into two parts as below;

DV= related diversification index + unrelated diversification index

$$\sum_{i=1}^{n} S_i d_{ij} W_i = (S_H\, d_{ij}\, w_{ij} + S_C\, d_{ij}\, w_{ij}) \qquad + (S_O\, d_{ij}\, w_{ij})$$

S_H : the sales share of housebuilding business to total sales
S_C : the sales share of construction business to total sales
S_O : the sales share of other businesses to total sales

d_{ij} : a distance parameter
$W_i = n_i \,/\, n_t$: weighted parameter

After dividing the diversification index into two parts, the estimate was carried out by type of firms. There were some differences in the influential factors.

Type I firms' case

The estimation results by type of firms were carried out. Tables 65 and 66 showed the estimated results of related diversification and unrelated diversification in the case of type I firms.

Table 8-10 showed the case of related diversification. First, market power variable (MSC), resource variables (ASSET, CASS), and transaction cost variable (PEYEAR) were influential motives of the related diversification. Risk avoidance variables (PROF, MSH) were shown as a negative influential factor as expected. There were some differences in each year but the signs are all consistent. In 1985, resource variables (ASSET and CASS) and market share in the housebuilding industry (MSH) were shown as being influential motives. In 1990, market power variables (MS), resource variable (ASSET), risk avoidance variable (PROF) were significant motives. In 1995, resource variable (EMPLOY), transaction cost variable (PEYEAR) and market share in the housebuilding business (MSH) were shown as being significant.

Table 8-10 Estimation results of type I firms in related diversification

	Related	Total period	1985	1990	1995
	Intercept	-1.0436***	-2.08222***	-2.06862***	-0.51999
		-4.638	***-3.093***	***-2.907***	***-1.466***
Market power variables	MS	0.879837***	-1.42811	6.054939*	0.412554
		3.5	***-1.034***	***1.792***	***1.118***
	GROWTH	-6.5E-05	2.16E-06	-0.00032	7.04E-05
		-0.3	***0.003***	***-0.721***	***0.275***
Resource variables	ASSET	0.076557***	0.169693**	0.168143**	-0.00925
		3.575	***2.289***	***2.109***	***-0.239***
	EMPLOY	0.020217	-0.00829	0.041629	0.07957*
		0.878	***-0.123***	***0.468***	***1.813***
	CASS	0.002091*	0.008351**	0.003983	0.001763
		1.904	***2.286***	***1.679***	***0.765***
	FASS	-0.0011	0.00699	-0.00385	-0.0018
		-0.678	***1.631***	***-1.117***	***-0.717***
Transaction cost variables	FC	0.002273	-0.01272	-0.01576	0.00171
		1.486	***-0.963***	***-1.146***	***0.826***
	PEYEAR	0.121577***	0.048812	0.108381	0.174556***
		3.088	***0.471***	***1.117***	***3.247***
Risk avoidance variables	RISK	3.66E-05	-1.6E-05	1.58E-05	3.02E-05
		1.232	***-0.155***	***0.319***	***0.67***
	PROF	-0.00814**	-0.01604	-0.01752**	-0.0068
		-2.024	***-1.499***	***-2.143***	***-1.109***
	MSH	-10.8417***	-13.9536**	-40.5308***	-5.08669
		-3.501	***-2.523***	***-4.261***	***-1.119***
	Adj. R^2	0.3960	0.5181	0.6384	0.3663
	F-value	9.462***	4.127***	5.815***	5.1***
	D/W value	1.573	2.242	1.824	2.098

Bold figure: standard error
* : significant at 10 % level ** : significant at 5 % level *** : significant at 1 % level

Table 8-11 showed the case of unrelated diversification in type I firms. Mainly market power variables (MS, GROWTH) and resource variables (ASSET, EMPLOY, FASS) were significant variables to the unrelated diversification. It is outstanding that FASS showed positive relation with related diversification unlikely as expected. We expected that if the firms have high fixed assets (FASS), the firms tend to diversify into related business. The MS variable showed the opposite sign (-) and PROF showed (+) sign differently from that expected.

Table 8-11 Estimation results of type I firms in unrelated diversification

	Unrelated	Total period	1985	1990	1995
	Intercept	-0.09767	0.359036	-0.12278	-0.34194**
		-0.936	**1.114**	**-0.416**	**-2.178**
Market power variables	MS	0.039222	-1.22191*	-3.99044**	0.108609
		0.325	**-1.741**	**-2.831**	**0.618**
	GROWTH	0.000231**	0.0012***	-3.8E-05	3.74E-05**
		2.16	**3.095**	**-0.105**	**2.105**
Resource variables	ASSET	0.004472	-0.07914**	-0.02681	0.029502*
		0.442	**-2.136**	**-0.733**	**1.847**
	EMPLOY	0.009702	0.069373*	0.07764*	-0.00736
		0.893	**2.001**	**1.883**	**-0.413**
	CASS	-0.00122***	-0.00104	-0.00199	-0.00027
		-2.445	**-0.767**	**-1.72**	**-0.268**
	FASS	0.002545***	0.003843*	-0.00037	0.002724**
		3.372	**1.752**	**-0.227**	**2.299**
Transaction cost variables	FC	0.000596	0.00777	0.006896	0.001052
		0.799	**1.294**	**1.145**	**1.045**
	PEYEAR	0.021625	0.019695	0.030475	0.016292
		1.167	**0.382**	**0.758**	**0.679**
Risk avoidance variables	RISK	-6.8E-06	5.31E-05	-3.5E-05	7.22E-06
		-0.464	**1.229**	**-1.421**	**0.312**
	PROF	0.000548	-0.00249	0.007403*	-0.00018
		0.364	**-0.905**	**2.015**	**-0.079**
	MSH	-0.48283	1.573369	2.962431	-1.33847
		-0.325	**0.583**	**0.717**	**-0.618**
	Adj. R^2	0.2382	0.5996	0.3457	0.2425
	F-value	5.036***	5.356***	2.441**	3.27***
	D/W value	1.944	1.921	2.347	2.41

Bold figure: standard error
* : significant at 10 % level ** : significant at 5 % level *** : significant at 1 % level

Summarising the results of type I firms, there were some differences in the motives of diversification between related diversification and unrelated diversification. Related diversification was mainly performed by market power view, resource view and transaction cost view and risk avoidance variables. When flexibility of current asset (CASS) was higher and business specificity (PEYEAR) was higher, but profitability (PROF) was lower as expected, they diversified into related business areas; whereas unrelated diversification was mainly carried out by market power view and resource view. When firms had a higher growth ratio (GROWTH) and excess personal resource (EMPLOY), they diversified into unrelated business as expected. Especially, it is noteworthy that when they had a higher ratio of physical fixed assets (FASS) and higher profit (PROF), they diversified into unrelated business unlike the expected.

Type II firms' case

Table 8-12 and 8-13 show the estimation results of type II firms.

Table 8-12 Estimation results of type II firms in related diversification

	Related	Total Period	1985	1990	1995
	Intercept	0.041977	0.344507	0.149227	-0.09932
		0.549	***1.534***	***0.966***	***-0.579***
Market power Variables	MS	19.62519***	9.182609	22.37885**	32.62992***
		4.188	***0.986***	***2.154***	***3.722***
	GROWTH	-1.1E-05	-0.00019	-3.2E-05	0.000373**
		-0.367	***-1.226***	***-0.553***	***2.474***
Resource variables	ASSET	-0.00997	-0.00586	-0.01702	0.006159
		-1.225	***-0.258***	***-0.829***	***0.302***
	EMPLOY	0.030015***	0.019708	0.025927	0.026183
		3.586	***1.123***	***1.193***	***1.288***
	CASS	0.000642***	-0.00135	0.000468	0.001168***
		3.734	***-1.201***	***0.617***	***4.133***
	FASS	-0.00036	-0.00214	-0.00068	0.000531
		-1.057	***-1.589***	***-0.776***	***0.807***
Transaction cost variables	FC	2.18E-05	-2.5E-05	4.98E-05	-0.00088
		1.124	***-0.629***	***0.457***	***-0.859***
	PEYEAR	0.015383	-0.02117	0.018219	-0.00326
		1.232	***-0.679***	***0.753***	***-0.165***
Risk avoidance variables	RISK	-3.9E-06	2.43E-06	-5.6E-07	-9.5E-06
		-1.254	***0.051***	***-0.357***	***-1.757***
	PROF	-0.00016*	3.7E-05	-0.0004*	0.000614
		-1.847	***0.214***	***-1.675***	***0.273***
	MSH	-5.3873***	-2.4924	-4.26902	-13.4239***
		-2.884	***-0.696***	***-1.243***	***-2.84***
	Adj. R^2	0.3082	0.069	0.215	0.5356
	F-value	9.02***	1.377	2.917***	7.605***
	D/W value	1.553	2.157	2.344	1.947

Bold figure: standard error
* : significant at 10 % level ** : significant at 5 % level *** : significant at 1 % level

In the case of related diversification, market power variables (MS, GROWTH), resources variables (EMPLOY, CASS) and risk avoidance variables (PROFIT, MSH) were significant motives. There were also some differences within each year. In 1985, there were no being significant factors at all and, in 1990 only two variables (MS, PROF) were estimated as significant variables. In 1995, besides MS, GROWTH variables, CASS was shown as influential factors. We can interpret this as follows; if they had higher market power in the main business and if they had higher flexibility of current assets, and lower profitability and lower market share in the housebuilding business, they diversified into related diversification.

Table 8-13 shows the case of unrelated diversification. The results of the estimation were not so good. Adjusted R^2 value was rather low between 0.15 and 0.20. There were few significant variables. The scale variables of resources (ASSET, EMPLOY, FASS), and business specificity (PEYEAR) were influential motives. It is noticeable that business specificity (PEYEAR) was an influential factor in unrelated diversification. It is the opposite result to that expected. We expected that if the firms had long experience in the business, they diversified into related business not unrelated business.

Table 8-13 Estimation results of type II firms in unrelated diversification

	Unrelated	Total year	1985	1990	1995
	Intercept	-0.34652***	-0.09805	-0.51013***	-0.23099
		-4.687	***-0.985***	***-2.836***	***-1.359***
Market power variables	MS	0.209414	-3.51889	17.15931	-12.6709
		0.048	***-0.852***	***1.418***	***-1.458***
	GROWTH	1.18E-05	-5.5E-05	6.49E-06	5.8E-05
		0.263	***-0.795***	***0.096***	***0.388***
Resource variables	ASSET	0.023193***	0.017764*	0.023832	-0.00578
		3.008	***1.762***	***0.997***	***-0.286***
	EMPLOY	0.006464	-0.0106	0.016002	0.045137**
		0.825	***-1.363***	***0.632***	***2.239***
	CASS	-2.1E-05	-0.00025	0.000396	-0.0002
		-0.091	***-0.5***	***0.448***	***-0.708***
	FASS	0.000925**	0.000927	0.001532	0.000591
		2.339	***1.553***	***1.507***	***0.906***
Transaction cost variables	FC	1.47E-05	4.82E-06	8.61E-05	0.001377
		0.513	***0.271***	***0.677***	***1.356***
	PEYEAR	0.032356***	0.00233	0.05285*	0.040777**
		2.768	***0.168***	***1.876***	***2.081***
Risk avoidance variables	RISK	1.65E-07	4.82E-06	8.41E-07	-3.3E-06
		0.119	***0.229***	***0.462***	***-0.623***
	PROF	3.99E-05	-4.3E-05	0.000167	-0.00186
		0.337	***-0.563***	***0.6***	***-0.835***
	MSH	-1.44568	1.640616	-6.85524*	2.956426
		-0.827	***1.034***	***-1.713***	***0.631***
	Adj. R^2	0.1664	0.1746	0.2036	0.15
	F-value	4.592***	2.077**	2.79***	2.011**
	D/W value	1.726	1.628	2.155	1.744

Bold figure: standard error
* : significant at 10 % level ** : significant at 5 % level *** : significant at 1 % level

Summarising the results of type II firms, there were also some differences in motive between related and unrelated diversification. Related diversification was performed by market power view, resource view, and risk avoidance view. Especially when the flexibility of current asset (CASS) was higher, the profitability (PROF) was lower and market share in the housebuilding business (MSH) was lower, they diversified into related business areas. Unrelated diversification was carried out mainly in resource view and transaction cost view. When flexibility of physical fixed asset (FASS) is higher and business specificity (PEYEAR) was higher, they diversified into unrelated business areas. The noticeable point was business specificity (PEYEAR) which is an influential motive in unrelated business, not related business. This is the opposite results to that of type I firms.

8.3.3 Summary of the Results

So far, we have examined the estimation results on the motives of diversification. We can summarise the results as in the following three tables (Tables 8-14,). They showed influential variables and relations with diversification in each case.

Table 8-14 Summary table by type of firms

	Total years	Type I firms	Type II firms
MS	+	+	+
GROWTH			
ASSET	+	+	
EMPLOY	+		+
CASS			+
FASS			
FC		+	
PEYEAR	+	+	+
RISK			
PROF		-	
MSH	-	-	-

Table 8-14 shows the differences between two types of firm. Both types of firms showed similar results. Even though there were some differences in the explanatory variables, market power variables, resource variables, transaction cost variables and risk avoidance variables were significant motives for both types of firms. We can interpret this as follows; if the firms had high market power in their main business, they may diversify to strengthen their power and to grow further. The resource variables were also a significant motive of diversification, that is, if the firms had more resources both in physical and personal assets, they may diversify in order to utilise their resources fully. Furthermore, transaction cost variables and risk avoidance variables were significant motives of diversification. It was observed that if the firms had higher financial costs and longer business experience, they tended to diversify, and if the firms' profitability and market share in the housebuilding business were lower, the firms tended to diversify.

Type I firms showed expected results in resource variables with ASSET and type II firms showed expected results with personal resource variable (EMPLOY). As a flexibility variable of resource, current asset ratio (CASS) was an influential factor only in type II firms. However, financial cost (FC) and profitability variable (PROF) were significant motives only in type I firms.

When we considered the type of diversification separately in investigating the motives of diversification, it was found that there are some differences between related diversification and unrelated diversification. To investigate the difference between types of diversification, the same estimation process was carried out by type of firms. Tables 8-15 and 8-16 summarise the results in the case of type I and type II firms.

Table 8-15 Summary table in type I firms (related/ unrelated diversification)

	Related diversification				Unrelated diversification			
	Total period	1985	1990	1995	Total period	1985	1990	1995
MS	+		+			-	-	
GROWTH					+	+	+	+
ASSET	+	+	+			-		+
EMPLOY				+		+	+	
CASS	+	+			-			
FASS					+	+		+
FC								
PEYEAR	+			+				
RISK								
PROF	-		-				+	
MSH	-	-	-	-				

In case of type I firms, there were some differences in the motives between related diversification and unrelated diversification. Related diversification was mainly motivated by market power view, resource view, transaction cost view, and risk avoidance view, whereas unrelated diversification was mainly carried out by market power view and resource view. In particular, when flexibility of current assets (CASS) was higher and business specificity (PEYEAR) was higher, and profitability (PROF) was lower, they diversified into related business areas. On the other hand, when the firms had a high growth rate (GROWTH), large personal resource (EMPLOY) and higher ratio of physical fixed asset (FASS), they diversified into unrelated business.

Table 8-16 shows the type II firms' case. There were also some differences in motive between related and unrelated diversification. Related diversification was carried out by market power view, resource view, and risk avoidance view. Especially when the flexibility of current asset was higher, when the MSH and PROF was lower, they diversified into related business area. It was estimated that unrelated diversification was carried out mainly in resource view and transaction cost view. When flexibility of physical fixed assets (+FASS) was higher and business specificity (+PEYEAR) higher, they diversified into an unrelated business area. These were also different results as expected.

Table 8-16 Summary table in type II firms (related/ unrelated diversification)

	Related diversification				Unrelated diversification			
	Total period	1985	1990	1995	Total period	1985	1990	1995
MS	+		+	+				
GROWTH				+				
ASSET					+	+		
EMPLOY	+							+
CASS	+			+				
FASS					+			
FC								
PEYEAR					+		+	+
RISK								
PROF	-		-					
MSH	-			-			-	

We found that the variables indicating flexibility of resources (CASS and FASS) and transaction cost variables (FC and PEYEAR) were influential variables to the type of diversification we expected. However, we found some differences. First, we expected that flexible current resources like financial resources may lead both related and unrelated diversification, whereas physical fixed resources like plant and fixed equipment may lead to related diversification. However, the results showed the opposite. When FASS was higher, they diversified into unrelated business and when CASS was higher, they tended to diversify into related business. Second, among transaction cost variables, the financial costs may lead to unrelated diversification, whereas business specificity may lead to related diversification. As the firms' high financial cost means financial difficulty they may diversify to internalise transaction within the firms. Cross subsidisation from good cash-flow business may be a strong motive. On the other hand, if a firm had a higher business specificity, they tended to diversified into a related business area, as they could utilise the know-how in the related business. However, FC did not appear as an influential variable and PEYEAR showed opposite results, that is, if the firms showed higher business specificity, they diversified into a related business only in case type I firms. Type II firms diversified into unrelated business as they showed higher business specificity.

8.4 Findings and Discussion

In this chapter, the diversification motives of Korean housebuilding firms were investigated by using more than 300 firms' data. For this, a more sophisticated diversification index than 'the product-count measure' and 'the four-cell matrix measure' used in the previous chapter was designed, considering the limitations of the raw data. The diversification index was a more improved measure considering both the extent of diversification and heterogeneity. When we considered the status of the Korean housebuilding industry, four views were considered as the motives of the diversification.

The results showed that the Korean housebuilding firms' diversification was motivated by market power view, resource view, transaction cost view, and risk avoidance view as we expected. We expected that there may be some differences in the diversification motives between type I firms and type II firms. It is natural that type I firms showed diversified structure from the beginning when they started the housebuilding business. Type II firms are those who started their business in housebuilding first and expanded into other areas. However, there were no differences in the diversification motives between types of firm.

There were some differences between types of diversification. Related diversification was motivated by market power view, resource view, transaction cost view and risk avoidance view, whereas unrelated diversification was motivated by different views by type of firms. Unrelated diversification was motivated by market power view and resource view in the case of type I firms, whereas it was motivated by resource view, transaction cost view, and risk avoidance view in case of type II firms. This means that type I firms diversify into unrelated business in order to grow further and to utilise their large capital and resources efficiently. Type II firms diversify into unrelated business in order to use their resources efficiently and to avoid risk from the housebuilding business. They also pursue diversification in order to reduce transaction costs by using their long experience and know-how in the business. This is a consistent result with the interview survey indicating that housebuilding firms want to diversify into different business showing 'counter-cycle' to mitigate risk and uncertainty and to compensate for business loss from housebuilding.

It is interesting that there were some differences in the motives of each type of diversification between types of firm. The variables indicating flexibility of resources (CASS and FASS) and transaction cost variables (FC and PEYEAR) were influential variables for type of diversification as we expected. The differences from those we expected were first, flexible current resources (CASS) such as financial resources led to related diversification, whereas physical fixed resources (FASS) like plant and fixed equipment led to unrelated diversification. This was an opposite result from that we expected. High ratio of current asset (CASS) was a significant motive in the related diversification for both type of firms, whereas a high ratio of physical fixed asset (FASS) was a significant motive in unrelated diversification. We interpret from this that if building firms retained more fixed physical assets such as buildings, land or construction facilities, they may get easier access to outside financial loans. This is because most of the financial institutes want more physical assets as security for the financial transaction, that is, if the building firms had more physical assets, they may diversify more into unrelated business. This was supported by the interview results that most of the building firms were using outside financing as the security of the fixed asset.

The second difference was that among the transaction cost variables, the financial cost (FC) variables did not appear to be influential and only business specificity (PEYEAR) variable was chosen. The business specificity was an influential motive in related diversification for the type I firms, whereas it was a significant motive in unrelated diversification for the type II firms. If a building firms showed a higher business specificity, type I firms diversified into related business and type II firms diversified into unrelated business. It means if type I firms had long experience in their main business, and therefore had a good name in the area, they tend to diversify into related business areas by using their own experience and know-how without any additional investment. On the other hand, if type II firms had long experience in their main business, they tended to diversify into unrelated business, not in the related diversification. We may think that type II firms diversify into related business first, when they are small and don't have long experience in the business. After they get some experience and know-how in the business, they diversify into unrelated business. This indicates a process of the type II firms' diversification.

The results gave an important meaning as to why building firms pursue 'diversification' rather than 'specialisation' in the main business. It is a natural phenomenon that large-scale firms having large physical and human resources want to extend their business to use the excess resources efficiently and to heighten market power in the industry. In fact, the Korean government encouraged the large contracting firms to participate in housebuilding in a high growth period. The government supported the large firms in various ways. However, type II firms showed that they diversified into related business and unrelated business to avoid risk and uncertainty from housebuilding and to compensate for low profit from the business. Most of the hypothesised motives based on the interview survey and literatures were verified, however, the results could not show priority of the various motives.

Chapter 9 Economic Efficiency of Multi-Product Firms

9.I Introduction

The application of economic theory to the housebuilding industry is rather limited by the many different ways in which large housebuilding firms can maximise profits. Profit of the building firms can come from housing construction or from land dealing or from investment made by the firm in other sectors. Furthermore, building firms are involved in various businesses simultaneously through the diversification strategy.

In most modern large firms, a single output is exceptional. In particular, large firms in most industries are producing multi-products. The competitive advantage of the typical multi-products firms comes from the fact that they have economy of scale in every stage of production. The relationship between average costs and output can be explained by the relation between physical quantities of input and output summarised in production function. At given factor prices, as output rises, some firms use more inputs or some firms use fewer inputs per unit of output. This is a kind of technical issue about efficient production technique. We may say that there are economies of scales when long-run average costs decreases as output rises. In this context, scale refers to the size of the firm as measured by its output. If a specific industry were observed having 'increasing returns to sale', it means firms can heighten cost efficiency through the extension of their size. The large firm also was distinguished by higher profits resulting from economy of scale.

In addition to economies of scale, cost savings may result from simultaneous production of several different outputs in a single firm. That is, there may exist economies resulting from the scope of firm's operation. Economy of scope means when a firm produces more than one product, total cost is lower than that when individual firms produce the product separately. Therefore, a single firm can provide them at a lower cost than several other firms, which specialised and attempted to produce and sell the outputs individually. Formally economies of scope can be interpreted as a restricted form of subadditivity. In an industry that does not achieve economies of scope, a multi-product firm can be broken up into several specialised firms without any increase in cost.

The objective of this chapter is to analyse the economic efficiency of the diversified Korean housebuilding firms. It aims to investigate business scale, structure of cost and profit in each business and to analyse the efficiency of the multi-production structure. For this, we need to estimate the cost function of multi-product firms and then, to derive various efficiency measures from the estimated function.

9.2 Estimating Cost Function of Multi-Product Firms

The cost function shows the relationship between various input and output assuming that firms produce a single product. Multi-product cost theory has been developed by Baumol, Panzar and Willig (1982). They explain that it is obvious that a multi-product cost function possesses no natural scalar quantity over which costs may be 'averaged'. We cannot construct a measure of the magnitude of multi-product output by simply adding those of different products. They explain that an alternative method is to fix output proportions and consider the behaviour of costs as the size of the resulting output package is varied. The estimations of the economy of scale and economy of scope developed by Baumol *et al* in 1982 have been widely used in the study about the efficiency and productivity of multi-product firms.

It is necessary to estimate the production function in order to analyse the efficiency of production behaviours in a specific firm or industry. In empirical analysis, however, it is difficult to estimate the production function, because it needs to observe all prices of input factors and output. Therefore, under a hypothesis that the production function is homogeneous, the cost function is estimated alternatively, using Samuelson-Shephard Duality Theorem (Diewert, 1971). In order to measure the scale economies and scope economies, we first need to estimate the multi-product cost function of the housebuilding firms.

9.2.1 General Form of Translog Cost Function[1]

To estimate economies of scale and economies of scope in the multi-production structure, the most frequently used function is the Translog cost function. This function has a weakness in that it cannot explain the case that the value of output is zero. Regardless of the weakness, the Translog cost function has been most frequently used, because the other functions like the Cobb-Douglas cost function and the CES cost function can apply only to the single-product case.

The optimised cost function is expressed with output quantity and input factor's costs. On the base of homogeneous production function, the Translog cost function is essentially a Taylor series expansion in output quantities and input prices and the function can be written as follows.

$$\log TC = \alpha_0 + \sum_{i=1}^{n} \alpha_i (\log y_i) + \frac{1}{2} \sum_{i}^{n} \sum_{k}^{n} \theta_{i,k} (\log y_i)(\log y_k)$$
$$+ \sum_{j=1}^{n} \beta_j (\log w_j) + \frac{1}{2} \sum_{j}^{m} \sum_{h}^{m} \gamma_{j,h} (\log w_j)(\log w_h) + \sum_{i}^{n} \sum_{j}^{m} \delta_{i,j} (\log y_i)(\log w_j) \tag{1}$$

TC= total cost
y_i = output of i^{th} product, i=1,2,3,------,n
w_j = cost of j^{th} input factor j=1,2,3,------,m

Basic assumptions of the cost function, equation (1), are; first, the function should be linearly homogeneous in all input prices, second, should be concave in costs of input factors (w_j), third, output (y_I) and costs of input factors (w_j.) should increase. The linearly homogeneity condition is satisfied when

i) $\sum_{j=1}^{n} \beta_j = 1$

ii) $\sum_{h=1}^{m} \gamma_{j,h} = 0$ j=1,….., m

iii) $\sum_{j=1}^{m} \delta_{i,j} = 0$ i =1,…….,n

[1] For a discussion of the Translog functional form, see Christensen, Jorgensen and Lau (1973), Denny and Pinto (1978) or Diewert (1971).

and symmetry conditions are as follows;

iv) $\theta_{i,k} = \theta_{k,i}$ i , k=1,2,.....,n
$\gamma_{j,h} = \gamma_{h,j}$ j , k=1,2,.....,m

Equation (1) is quadratic in logarithms and linear in the unknown parameters, permitting easy estimation. This cost function can be estimated alone or factor share equations can be derived using Shephard's lemma and the system equations can be estimated simultaneously. When we estimate the equation (1) under the restrictions by the OLS method, OLS provides a simple means of deriving unbiased estimates. However, it fails to incorporate ray extra information which might be extracted from a restricted system of cost equations. For this reason, it is deemed desirable to estimate the single cost equation and a set of cost share equations simultaneously.

A system of cost share equations can be derived directly from the Translog cost function by differentiating equation (1) with respect to w_j.

$$SH_j = \frac{\log TC}{\log W_j} = \beta_j + \sum_{h=1}^{m} \gamma_{j,h}(\log W_h) + \sum_{i=1}^{n} \delta_{ij}(\log y_i) \qquad (2)$$

SH_j is cost share on the j^{th} input factor in total cost. Because of the restriction of linear homogeneity in input prices, the factor share equations must sum to one to avoid singularity problems. One of the share equations must be excluded from the estimation process. Christensen, Jorgensen, and Lau (1973) explain that the parameter estimates are invariant with respect to which equation is excluded from the estimated system. We can gain additional degrees of freedom by estimating the cost function and the derived cost share equations together as a multivariate regression system. Since the cost share equations do not introduce any additional unknown parameters into the estimation, it is known that the system estimates should be more efficient than the single equation estimates generated by the cost function alone (SAS User's guide, 1985).

9.2.2 Modelling for estimation

The specific equations to be estimated are as follows;

$$
\begin{aligned}
&\log TC = \alpha_0 + \alpha_1 \log y_1 + \alpha_2 \log y_2 + \alpha_3 \log y_3 \\
&+\frac{1}{2}\theta_{11}(\log y_1)^2 + \theta_{12}\log y_1 \log y_2 + \theta_{13}\log y_1 \log y_3 + \frac{1}{2}\theta_{22}(\log y_2)^2 + \theta_{23}\log y_2 \log y_3 + \frac{1}{2}\theta_{33}(\log y_3 \\
&+\beta_1 \log w_1 + \beta_2 \log w_2 + \beta_3 \log w_3 + \beta_4 \log w_4 \\
&+\frac{1}{2}\gamma_{11}(\log w_1)^2 + \gamma_{12}\log w_1 \log w_2 + \gamma_{13}\log w_1 \log w_3 + \gamma_{14}\log w_1 \log w_4 \\
&+\frac{1}{2}\gamma_{22}(\log w_2)^2 + \gamma_{23}\log w_2 \log w_3 + \gamma_{24}\log w_2 \log w_4 \\
&+\frac{1}{2}\gamma_{33}(\log w_3)^2 + \gamma_{34}\log w_3 \log w_4 + \frac{1}{2}\gamma_{44}(\log w_4)^2 \\
&+\delta_{11}\log y_1 \log w_1 + \delta_{12}\log y_1 \log w_2 + \delta_{13}\log y_1 \log w_3 + \delta_{14}\log y_1 \log w_4 \\
&+\delta_{21}\log y_2 \log w_1 + \delta_{22}\log y_2 \log w_2 + \delta_{23}\log y_2 \log w_3 + \delta_{24}\log y_2 \log w_4 \\
&+\delta_{31}\log y_3 \log w_1 + \delta_{32}\log y_3 \log w_2 + \delta_{33}\log y_3 \log w_3 + \delta_{34}\log y_3 \log w_4
\end{aligned}
$$

The equation includes three output variables (y_i; housebuilding, construction and other business outputs) and four input factor costs (w_j; material, labour, contracting and fixed factor cost), therefore, a total of 36 coefficients should be estimated.

Cost share equations to be estimated are expressed as follows;

$$
\begin{aligned}
SH_1 &= \beta_1 + \gamma_{11}\log w_1 + \gamma_{12}\log w_2 + \gamma_{13}\log w_3 + \gamma_{14}\log w_4 + \delta_{11}\log y_1 + \delta_{21}\log y_2 + \delta_{31}\log y_3 \\
SH_2 &= \beta_2 + \gamma_{21}\log w_1 + \gamma_{22}\log w_2 + \gamma_{23}\log w_3 + \gamma_{24}\log w_4 + \delta_{12}\log y_1 + \delta_{22}\log y_2 + \delta_{32}\log y_3 \\
SH_3 &= \beta_3 + \gamma_{31}\log w_1 + \gamma_{32}\log w_2 + \gamma_{33}\log w_3 + \gamma_{34}\log w_4 + \delta_{13}\log y_1 + \delta_{23}\log y_2 + \delta_{33}\log y_3 \\
SH_4 &= 1 - (SH_1 + SH_2 + SH_3)
\end{aligned}
$$

As one of the share equations has to be excluded in the estimation process, single cost function equation and three cost share equations are to be estimated simultaneously.

The restrictions given to the cost function are expressed as follows;

$$\beta_1 + \beta_2 + \beta_3 + \beta_4 = 1$$

$$\gamma_{11}+\gamma_{21}+\gamma_{31}+\gamma_{41}=0$$
$$\gamma_{12}+\gamma_{22}+\gamma_{32}+\gamma_{42}=0$$
$$\gamma_{13}+\gamma_{23}+\gamma_{33}+\gamma_{43}=0$$
$$\gamma_{14}+\gamma_{24}+\gamma_{34}+\gamma_{44}=0$$

$$\delta_{11}+\delta_{12}+\delta_{13}+\delta_{14}=0$$
$$\delta_{21}+\delta_{22}+\delta_{23}+\delta_{24}=0$$
$$\delta_{31}+\delta_{32}+\delta_{33}+\delta_{34}=0$$
$$\delta_{41}+\delta_{42}+\delta_{43}+\delta_{44}=0$$

Once the multi-product cost function is estimated, we can gain various efficiency measures from that estimated function.

Economy of scale

The relationship between average costs and output must be explained by the relation between physical quantities of inputs and outputs summarised in the production function. At given factor prices, some firms use more inputs or some firms use fewer inputs per unit of output, as output rises. This is a kind of technical issue about efficient production technique. We may say that there are economies of scales when long-run average costs decrease as output rises in the fixed product mix. In this definition, scale refers to the size of the firm as measured by its output. If a specific industry was observed as having 'increasing returns to scale', firms can heighten cost efficiency through the extension of firms' size.

The overall economies of scale are realised when all outputs are increased by a common factor, and it is obtained by differentiating equation (1) in section 2.1 with respect to all y_i

$$S_e=\sum_{i=1}^{n}\frac{\partial C(y_i).y_i}{\partial y_i.C(y)}$$
$$=\sum_{i=1}^{n}\frac{\partial \log C(y)}{\partial \log y_i}=\sum_{i=1}^{n}\alpha_i+\sum_{i=1}^{n}\sum_{k=1}^{n}\theta_{i,k}(\log y_k)+\sum_{i}^{n}\sum_{j}^{m}\delta_{i,j}(\log w_j) \quad (3)$$

If S_e is greater than one, firms could experience 'decreasing return to scale', as costs rise proportionately more than output. S_e equal to one indicates 'constant returns to scale' and the value less than one indicates 'increasing returns to scale'.

The scale economies of individual products are estimated in the same way. It can be gained by dividing each product's marginal production cost by each product's average incremental cost (AICi).

$$SA_e = \frac{\frac{\partial C(y)}{\partial C(y_i)}}{AICi} = \frac{\frac{c(y)}{y_i}\frac{\partial \log C(y)}{\partial \log y_i}}{AICi} \qquad (4)$$

In equation (4), average incremental cost is gained as follows;

$$\mathrm{AIC_i} = \frac{\mathrm{C(y) - C(y_{-i})}}{\mathrm{y_i}} \qquad (5)$$

In equation (4), $C(y_i)$ means the cost occurred when the firm produced only y_i. In equation (5), $C(y_{-i})$ means the cost occurred when the firm produced the other products except y_i. However, the Translog cost function used in this study could not explain the situation when any one of outputs is zero (y_i=0). Therefore, we need an approximation in estimating AIC_i. That is, when we calculate $C(y_{-i})$, the smallest output in each sample is used instead of zero, as Goldberg, Hanweck, Keenan and Young (1991) did. If the estimated SA_e is less than one, it means that there is economy of scale in producing i^{th} output.

The degree of scale economies specific to product i are said to be increasing, decreasing, and constant as SA_e is greater than, less than, or equal to unity, respectively.

Economy of scope

In addition to the economy of scale, cost savings may result from simultaneous production of several different outputs in a single firm. There may be economy resulting from the scope of the firm's operation. Economy of scope may be achieved when a firm produces more than one product within a firm; the total cost is lower than that when individual firms produce the product separately. A single firm can provide several products at a lower cost than the aggregated cost of other firms which specialised and attempted to produce and sell the outputs individually. Formally economies of scope can be interpreted as a restricted form of subadditivity. In an industry that does not achieve economies of scope, a multi-product firm can be broken up into several specialised firms without any increase in cost. This suggests why economies of scope are related to analysis of multi-product industry structure. For example, common utilisation of existing human resources and facilities, fixed assets like building equipment, know-how about contracting system used in the construction business, information about market and customer information etc. may be important factors in reducing average costs of the multi-products firms. The estimated results on 'economy of scope' may give useful information for the readjustment of the business areas of housebuilding firms and some guidelines to the direction of diversification.

Overall economies of scope can be derived as follow;

$$SC_e = \frac{\sum_{i=1}^{n} C(y_i) - C(y)}{C(y)} \qquad (6)$$

Equation (6) is calculated using the estimated value from the cost function equation (1). $C(y_i)$ means cost occurred when a firm produces only y_i. C(y) means cost occurred when the firm produces all products. The equation (6) can be rewritten specifically when the firms produce three outputs as follows;

$$SC_e = \frac{(c(y_1, 0,0) + c(0, y_2, 0) + c(0,0, y_3) - c(y_1, y_2, y_3))}{c(y_1, y_2, y_3)}$$

If the estimated value is less than zero, firms may experience 'diseconomies of scope', whereas, if it is greater than zero, firms may experience 'economies of scope'.

$SC_e < 0$: diseconomies of scope

$SC_e > 0$: economies of scope

The economies of scope in the individual product are estimated in the same way.

$$SC_{ei} = \frac{C(y_i) + C(y_{-i}) - C(y)}{C(y)} \quad i = 1,2,\ldots\ldots m \qquad (7)$$

If SC_{ei} is greater than zero, it means there is economy of scope in the multiproduction. It means that to produce i^{th} products additionally within a firm with the other products can reduce total cost and, therefore, it is more profitable than producing i^{th} products in other individual firms.

In equation (7), $C(y_i)$ means cost were incurred when a firm produces only y_i. $C(y_{-i})$ means cost occurred when the firm produced the other products except y_i. The equation (7) can be rewritten specifically as follows;

$$SC_1 = \frac{(c(y_1,0,0) + c(0,y_2,y_3) - c(y_1,y_2,y_3))}{c(y_1,y_2,y_3)}$$

$$SC_2 = \frac{(c(0,y_2,0) + c(y_1,0,y_3) - c(y_1,y_2,y_3))}{c(y_1,y_2,y_3)}$$

$$SC_3 = \frac{(c(0,0,y_3) + c(y_1,y_2,0) - c(y_1,y_2,y_3))}{c(y_1,y_2,y_3)}$$

As discussed before, the Translog cost function cannot explain the case even though any one of the outputs is zero. An approximation must be used to estimate economies of scope with this functional form. When we calculate the SC_{ei} and SC_1, SC_2, SC_3, instead of zero value, the smallest output values in each sample have to be used.

From the definition of economies of scope, it is clear that the presence of such economies creates an incentive for specialised firms to extend their business areas. In practice, as the sources of economies of scope, three cases can be considered. The first arises where some factors of production are public. This means the case when some factors have been acquired for use in producing one good, they are costlessly available for use in producing others. The second source is the case that an input or inputs can be shared by the processes utilised to produce several outputs. This depends on the presence of inputs that are readily shared by the processes used to produce several different outputs. The third source arises from cost complementarities which means that the marginal cost of producing one product falls as the output of another increases. This is an auxiliary index for evaluating the effect of scope economy.

Cost Complementarity

We may consider estimated cost complementarity as an auxiliary index for evaluating the effect of scope economy. The values of so called 'inter-product cost complementarity' measure the change in marginal cost of one product as a result of a change in another jointly produced product. 'Inter-product cost complementarities' are defined as follow;

$$CM_{ij} = \frac{\partial^2 c(y)}{\partial y_i \partial y_j} = \frac{c(y)}{y_i y_j}\left(\frac{\partial^2 \ln c(y)}{\partial \ln y_i \partial \ln y_j} + \frac{\partial \ln c(y)}{\partial \ln y_i} \cdot \frac{\partial \ \ln c(y)}{\partial \ln y_j}\right) \qquad (8)$$

$i \neq j$

A twice differentiable multi-product cost function exhibits cost complementarities over the product set. If CM_{ij} is less than zero (-), we may say there exists an inter-product cost complementarity. The sign of CM_{ij} depends on the sign of the first term within the brackets. This term is the estimated coefficient of the output interaction terms in cost function equation (1). As the other terms are restricted to be positive on theoretical grounds, a negative value for the first term in the brackets is a necessary condition, but not sufficient condition for the existence of inter-product cost complementarities between each product.

The results of cost complementarities between businesses may be used as a guideline of decision making when the firms choose cost efficient business areas, that is, they may give some information about the direction of business expansion. For example, if the cost complementarity between businesses is less than zero, a joint production strategy is regarded as more cost efficient. According to the estimates of the cost complementarity, the firms may evaluate whether they operate multi-business efficiently. Based on the information, they may decide to expand the scale of business further or specialise in the original business.

9.3 Description of Data

9.3.1 Data Sources

The sample firms used in this analysis were limited designated firms and registered firms. The total number of samples was 318 firms as shown in Table 9-1.

Table 9-1 Number of samples

Type of firms	No. of sample
Designated firms	234
Registered firms	84
Total	318

The data used were taken from 'Annual Business Report' of each building firm published by the Korea Stock Exchange. All registered firms have an obligation to report their business performance every year by standard form. According to a standardised form, the firms should report details of annual business; company profile, capital increase, share ownership, officers and employees, major business, sales of major product, income statement, schedule of cost of goods manufactured, statement of cash flow, statement of appropriation of retained earnings, stock price, key securities analysis and investment indices, financial analysis, and CPA's opinion.

The variables required for estimation of the cost function of multi-product firms are; total cost as a dependent variable, output variables from different business, and input factor variables as independent variables. We could get the necessary variables from the 'Annual Business Report'. Each firms' income statement provides all costs and profits occurring in each year. Output variables of major business could be obtained from sales of major products. Even though housebuilding is classified in the construction business by KSIC code, building firms usually aggregate the housebuilding data separately from the construction data. However, the output variables were available only for three years, from 1993 to 1995. Therefore, the analysis period in this chapter was limited to three years from 1993 to 1995.

The three-year period is regarded as a 'stable period' for the analysis in some points of view. First, the outcome of housebuilding during the period was in 'stable status' at about 600,000 dwellings per year since 1992 when 'the construction programme for two million dwellings' was finished. During the mass construction periods, the output of housebuilding was not stable[2]. Second, during this period, the government's investment level on housing stayed at 7 percent which is a similar level to that of most of the advanced countries. Third, housing prices also stabilised during that period. Korea experienced housing speculation in the late 1980s and house prices decreased after the beginning of the 1990s and then stabilised during the period of analysis. Considering the above three points, the three-year period is not long enough to reflect all business conditions of building firms; however, the period is regarded as 'the most stable period' after experiencing a fluctuating housebuilding cycle between the mid 1980s and the beginning of the 1990s.

Table 9-2 shows the various costs and profits used in this analysis. As the variables reflecting scale of the firms, number of employees, capital, and total sales were considered. Total sales, cost of goods sold, and profits of sales are classified into three businesses; construction, housebuilding, and the other businesses.

The cost of goods sold (2) means 'on-site building cost' as a direct cost in the housebuilding business. Overhead costs (4) means indirect costs to perform the business. This includes all the wages of employees from the managerial level to the daily employed, bonus and welfare costs. All kinds of other costs incurred for operating the business are also included. For example, employees' training costs, depreciation, insurance, advertising, transportation, travelling, and various kinds of taxes and fees payable etc. are included in the overhead costs. Extra costs (6) mean those not directly related to the year's business but which should be paid. For example, interest from borrowed money, loss on disposal of marketable securities, loss of foreign currency transaction, donation costs, and other miscellaneous losses are included. In the case of Korean housebuilding firms, interest costs make up a large proportion (about 88 %) of extra cost.

The difference between total sales (1) and cost of goods sold (2) of each year is 'profit of sales' (3). When the overheads costs (4) are deducted from the profit of sales (3), operating profits (5) are calculated. Operating profits mean that which resulted from

[2] No. of new construction of houses (unit: dwellings)

1980	1985	1988	1989	1990
211,537	227,362	**316,570**	**462,159**	**750,378**
1991	1992	1993	1994	1995
613,083	**574,492**	695,319	622,854	619,057

Source: Ministry of Construction and Transportation the firms' original business. Extra profits (6) are considered as that not directly related to the business, that which happened during the operating year. It includes interest received, gain on disposal of marketable securities, rent received and dividend income etc. If extra profit is added to, and extra cost is deducted from the operating profit, ordinary profit (8) is calculated.

Table 9-2 Items for analysis

		Total firms	
		N=318	%
Scale of business	No. of employees	901	
	Capital	58,673	
	Total sales	267,452	
Total sales (1)	**Total**	**267,452**	**100.00**
	Construction	161,256	
	Housebuilding	79,730	
	Others	26,466	
Cost of goods sold (2)	**Total**	**229,782**	**85.91**
	Construction	141,330	
	Housebuilding	66,670	
	Others	21,781	
Profit of sales (3)	**Total**	**37,671**	**14.09**
	Construction	19,926	
	Housebuilding	13,060	
	Others	4,685	
Overhead cost (4)		**15,980**	**5.97**
Operating profits (5)		**21,691**	**8.11**
Extra profits (6)	**Total**	**8,773**	**3.28**
	Interest profit	5,899	
	Other profit	2,874	
Extra costs (7)	**Total**	**27,344**	**10.02**
	Interest cost	24,093	
	Other cost	3,251	
Ordinary profits (8)		**3,472**	**1.30**

According to Table 9-2, the direct cost of the firms' operation is about 86 % of total sales and overhead cost is about 6 % on average. Operating profit is about 8 % of total sales. However, if the extra cost and extra profit are deducted and added, ordinary profit of the firms decreased into 1.3 % of the total sales. The table shows that extra cost consists of quite a high proportion at about 10 % of total sales.

9.3.2 The Structures of Cost and Production in the Sample Firms

Before estimating cost function, in this section we examined whether the sample firms' business scale, structure of production, sales profit and the structures of cost and profit are different by size of firms. To describe the structures of cost and production by the different sizes of the firms, the sample was divided into four groups based on firms' total sales. As a cut-off point, quarter values of sales were used. If the firms' sales were less than a quarter of total sales, the firms were classified as small firms. If the firms' sales were between a quarter and a half of total sales, the firms were classified as medium firms. If the firms' sales were between a half and three-quarters of total sales, the firms were classified as large firms. If the firms' sales were over three quarters of total sales, the firms were classified as very large firms. Table 9-3 shows the classification and number of samples in each group.

Table 9-3 Classification of firms

Group	Size of Firms	No. of samples
Small firms	Total sales <45,577 million won	76
Medium firms	45,577 million won <= total sales <126,000 million won	81
Large firms	126,000 million won <= total sales <300,000 million won	82
Very large firms	300,000 million won <= total sales	79
Total firms		318

Table 9-4 shows the business scale, structure of costs and profits by different sizes of firms.

Business Scale

As we can see in Table 9-4, there were quite big differences in business scale among different sizes of firms (small, medium, large and very large firms). As the variables reflecting firms' business scale, we used number of employees, capital and scale of total sales. When we compared these variables based on the value of very large firms, the differences were shown in Figure 26. The number of employees of the other three groups were quite small compared to that of very large firms. It is noticeable that medium firms' capital was smaller that of small firms. Figure 27 shows the scale of total sales. Sales of the small firms was only 2.76 % of that of very large firms. Those of medium firms and large firms were each 10.05 % and 22.71 % to that of very large firms.

Table 9-4 Structure of cost and profit by size of firms (unit: million won, %)

		Small Firms		Medium firms		Large firms		Very large firms	
		N=76	%	N=81	%	N=82	%	N=79	%
Scale of business	No. of employees	88	3.21	231	8.36	530	19.23	2,757	100.00
	Capital	5,192	2.63	1,151	0.58	31,726	16.10	197,073	100.00
	Total sales	21,778	2.76	79,243	10.05	179,075	22.71	788,505	100.00
Total sales (1)	**Total**	**21,778**	**100.00**	**79,243**	**100.00**	**179,075**	**100.00**	**788,505**	**100.00**
	Construction	9,883		44,413		107,982		481,980	
	Housebuilding	11,122		31,747		59,652		215,772	
	Others	774		3,082		11,441		90,753	
Costs of goods sold (2)	**Total**	**18,781**	**86.24**	**67,856**	**85.63**	**151,346**	**84.52**	**680,209**	**86.27**
	Construction	8,738		38,981		93,890		423,069	
	Housebuilding	9,482		26,391		48,642		181,699	
	Others	561		2,484		8,814		75,441	
Profit of sales (3)	**Total**	**2,997**	**14.25**	**11,387**	**14.25**	**27,729**	**15.48**	**108,296**	**13.73**
	Construction	1,145		5,433		14,092		58,911	
	Housebuilding	1,639		5,356		11,011		34,073	
	Others	213		598		2,627		15,312	
Overhead costs (4)		**1,816**	**8.34**	**6,582**	**8.31**	**11,504**	**6.42**	**43,886**	**5.57**
Operating profits (5)		**1,181**	**5.42**	**4,805**	**6.06**	**16,225**	**9.06**	**64,409**	**8.17**
Extra profits (6)	**Extra profits (6)**	**558**	**2.56**	**2,477**	**3.13**	**5,629**	**3.14**	**26,395**	**3.35**
	Interest profits	441		1,822		4,115		17,182	
	Other profits	117		655		1,514		9,213	
Extra costs (7)	**Extra costs (7)**	**1,851**	**8.50**	**8,131**	**10.26**	**17,799**	**9.94**	**81,476**	**10.33**
	Interest costs	1,639		7,139		15,494		72,004	
	Other costs	213		992		2,305		9,472	
Ordinary profits (8)	**Ordinary profits (8)**	**-115**	**-0.53**	**527**	**0.67**	**4,056**	**2.26**	**9,335**	**1.18**

Figures 9-1 and 9-2 show that there are big differences in business scale of the Korean housebuilding firms by size of firms. The differences between large firms and very large firms are much bigger (more than 70 % point) than those among small, medium and large firms. It suggests that the very large firms may show some differences in the structures of cost, production, and profits from those of the other group of firms.

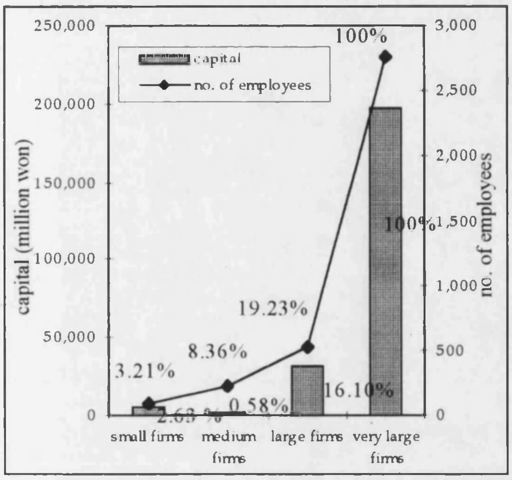


Figure 9-1 Scale of business by size of firms

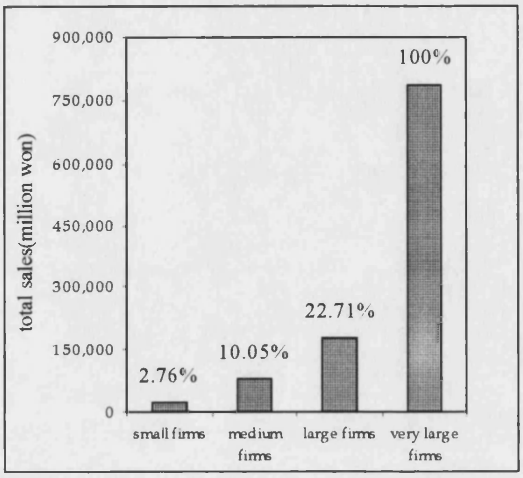


Figure 9-2 Scale of total sales by size of firms

Structures of Production and Sales Profit

We found that all sample firms were performing construction business and other unrelated business, besides housebuilding. Table 9-5 and Figure 28 showed the structure of production of each group of firm.

Table 9-5 Structure of production (Unit: million won, %)

	Small firms		Medium firms		Large firms		Very large Firms	
	N=76	%	N=81	%	N=82	%	N=79	%
Total Sales	21,778	100.00	79,243	100.00	179,075	100.00	788,505	100.00
Construction	9,883	45.38	44,413	56.05	107,982	60.30	481,980	61.13
Housebuilding	11,122	51.07	31,747	40.06	59,652	33.31	215,772	27.36
Others	774	3.55	3,082	3.89	11,441	6.39	90,753	11.51

We may find a trend in Figure 9-3. As the size of firms increases, the proportion of housebuilding business decreases and the proportions of construction and other business increase. Large and very large firms show a similar pattern in the structure of production. They were carrying out about 60 percent of construction business and very large firms showed a rather high proportion of other business (12%). Small firms were carrying out the highest proportion of the housebuilding business (51 %) and the ratio of other business was rather low.

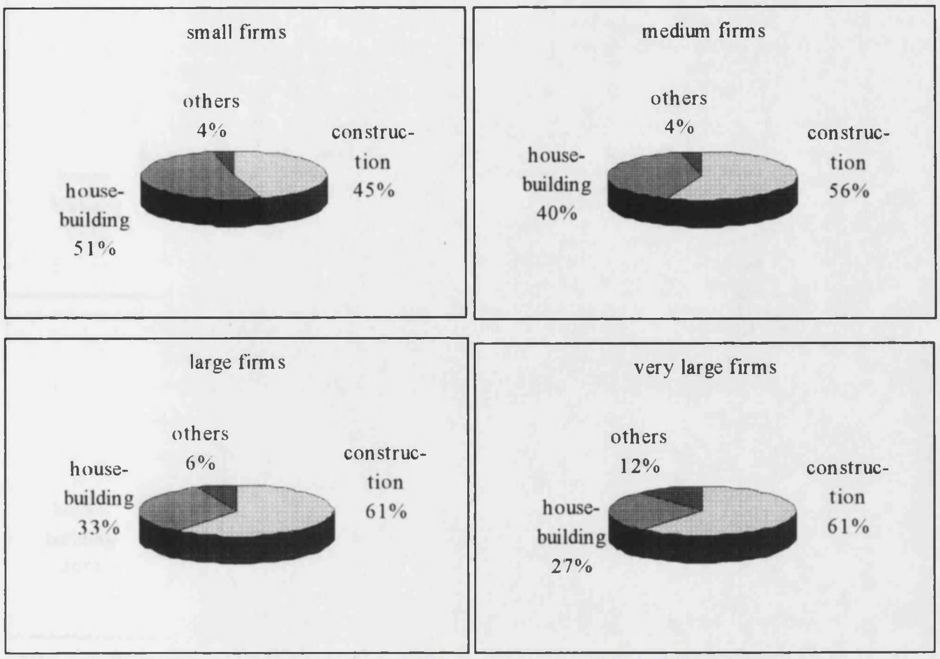


Figure 9-3 The structure of production

The structure of sales profit was also similar to that of production. Table 9-6 and Figure 9-4 showed the structure of sales profit. As the size of firms increases, they achieved higher a proportion of profits from construction and other business and a lower proportion of profit from housebuilding. In the case of very large firms, about 55 % of total profit resulted from the construction business, and 30 % from housebuilding and 14 % from other business. In the case of small firms, about 55 % of total profit resulted from housebuilding.

Table 9-6 The structure of sales profit (unit: million won, %)

	Small Firms		Medium firms		Large firms		Very large firms	
	N=76	%	N=81	%	N=82	%	N=79	%
Total profit of sales	2,997	100.00	11,387	100.00	27,729	100.00	108,296	100.00
Construction	1,145	38.19	5,433	47.71	14,092	50.82	58,911	54.40
Housebuilding	1,639	54.69	5,356	47.03	11,011	39.71	34,073	31.46
Others	213	7.12	598	5.26	2,627	9.47	15,312	14.14

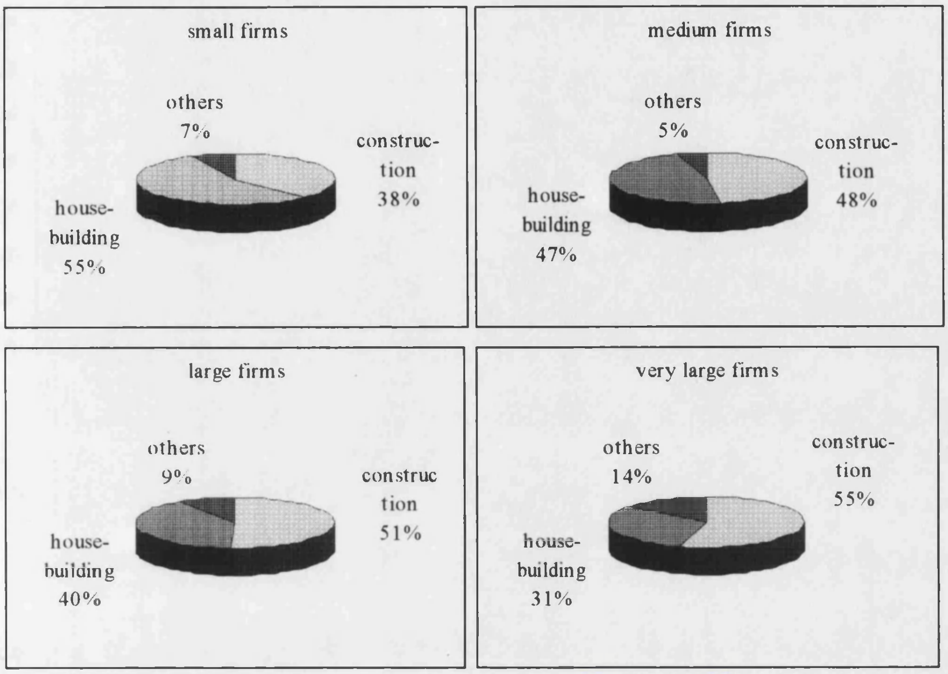


Figure 9-4 The structure of sales profit

Every group of firms achieved some profits from other business. Very large firms showed the highest profit (14 %) from other businesses. Small and medium firms also showed a high profit (5-7 %) compared to the sales scale of the other business.

When we compare the scales of sales and profit of each business, we found interesting figures. Relatively high profits were realised from housebuilding, whereas relatively low profits were realised from construction. Figure 9-5 showed the proportions of sales and profit realised in construction. Every group of firms showed that the proportion of sales is higher than those of profit (very large firms: 54.40% profit/ 61.13 % sales; large firms: 50.82 % profit/60.30 % sales; medium firms: 47.71 % profits/ 56.05 % sales; small firms: 38.19 % profits/ 45.38 % sales).

Figure 9-6 also shows the case in the housebuilding business. Every group of firms shows that proportions of profit are higher than those of sales in housebuilding (very large firms: 31.46% profit/27.36% sales; large firms; 39.71% profit/33.31 % sales; medium firms: 47.03 % profit/ 40.06 % sales; small firms: 54.69% profit/51.07 % sales). This means that when we consider only direct production costs, housebuilding is more profitable than construction.

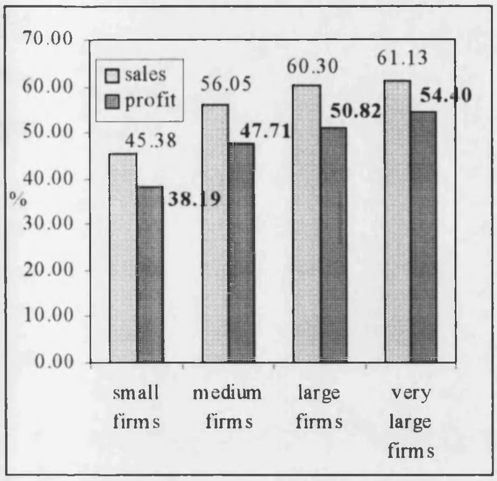


Figure 9-5 Ratio of sales and profit in the construction business

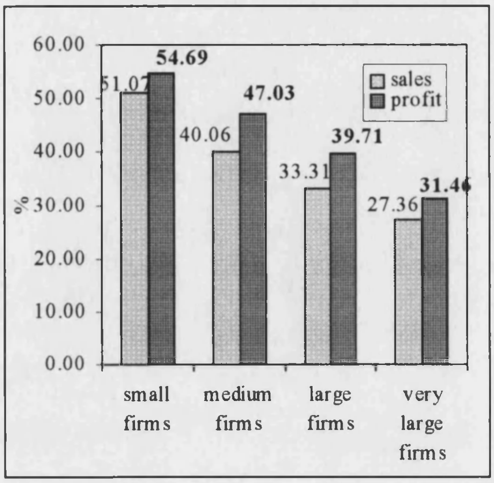


Figure 9-6 Ratio of sales and profit in the housebuilding business

Structure of Cost and Profit

Table 9-4 also shows the ratio of various costs and profits to total sales. Cost of goods sold as a direct production cost were commonly about 85 % of total sales. As a result, profits from the direct sales were shown as 13-15 percent to total sales in every group of firms.

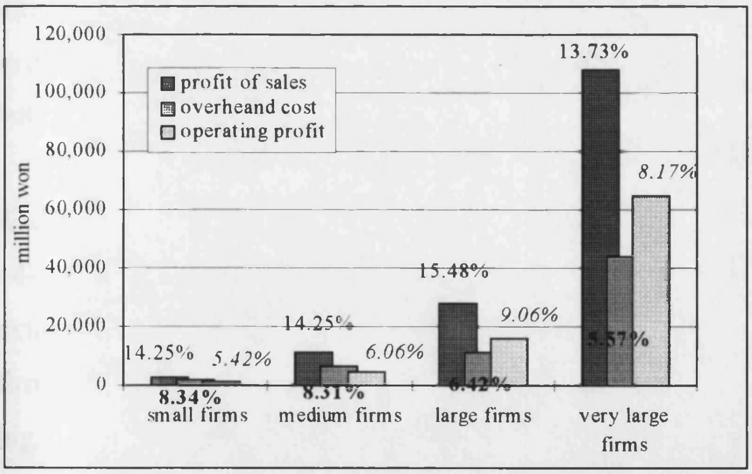


Figure 9-7 Ratio of profit of sales, overhead costs and operating profit to total sales

Figure 9-7 shows profit of direct sales, overhead costs and operating profit in every group of firms. First, it shows that as the size of firms increases, the ratios of sales profit decreases. Second, it shows that the ratio of overhead costs decreases, as the size of firms increases (8.34 % -> 5.57 %). As a result, relatively high operating profit was realised in large firms and very large firms (9.06 %, 8.13 %) compared with small and medium firms (5.4 %, 0.06 %). That is, large scale firms achieved higher operating profits due to small overhead costs.

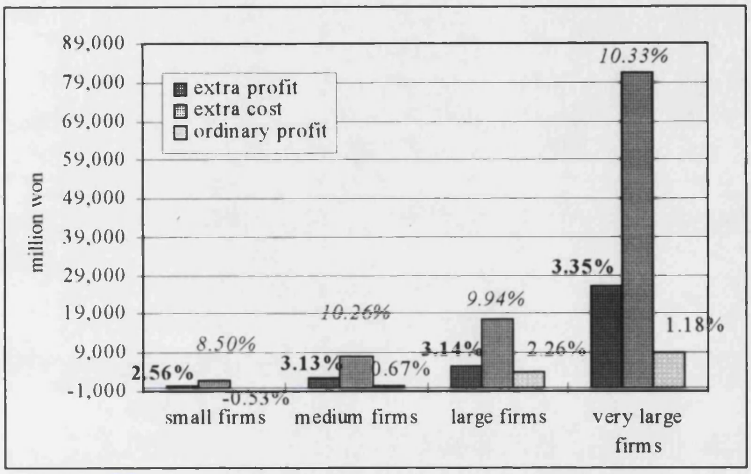


Figure 9-8 Scale of ordinary profit by size of firms

Figure 9-8 shows the scale of extra cost, extra profit and ordinary profit in each group of firms. Extra profits were realised on a similar level (2.5-3.3 % to total sales). Extra costs were about 8-10 % of total sales. It is known that most of the extra costs are interest costs which ensued from borrowed funds. After considering the extra cost and extra profit, small firms achieved some loss, whereas the other firms achieved positive but rather low ordinary profit (0.27-2.26 %).

Summarising the structure of cost and profit, there were no big differences in the direct production costs and direct profits among firms. They achieved commonly 14-15 % profit from direct production. However, as indirect costs, overhead costs and extra costs showed some different ratio among groups. In large firms and very large firms, relatively low overhead cost and relative high extra profits resulted in relatively high ordinary profit. In the case of medium and small firms, relatively high extra costs and high overhead costs may be major reasons to reduce the level of ordinary profit.

9.3.3 Differences by Type of Firms

To examine the structure of cost and production from another point of view, the sample firms were divided into two groups by different type of firms. Table 9-7 shows business scale, the structure of costs and profits by different type of firms.

Table 9-7 The structure of cost and profit by type of firms

(unit: million won, %)

		Type I firms		Type II firms	
		N=207	%	N=111	%
Scale of business	No. of employees	1,163	100.00	415	35.66
	Capital	78,729	100.00	21,273	27.02
	Total sales	318,419	100.00	172,406	54.14
Total sales (1)	**Total**	**318,419**	**100.00**	**172,406**	**100.00**
	Construction	217,231		56,872	
	Housebuilding	65,601		106,079	
	Others	35,587		9,455	
Costs of goods sold (2)	**Total**	**273,697**	**85.96**	**147,885**	**85.78**
	Construction	189,877		50,797	
	Housebuilding	54,309		89,722	
	Others	29,511		7,366	
Profit of sales (3)	**Total**	**44,722**	**14.04**	**24,521**	**14.22**
	Construction	27,354		6,075	
	Housebuilding	11,292		16,357	
	Others	6,076		2,089	
Overhead costs (4)		**18,841**	**5.92**	**10,643**	**6.17**
Operating profits (5)		**25,881**	**8.13**	**13,878**	**8.05**
Extra profits (6)	**Total**	**10,932**	**3.43**	**4,747**	**2.75**
	Interest profits	7,314		3,261	
	Other profits	3,618		1,486	
Extra costs (7)	**Total**	**32,106**	**10.08**	**18,464**	**10.71**
	Interest costs	28,532		15,815	
	Other costs	3,573		2,650	
Ordinary profits (8)		**5,248**	**1.65**	**158**	**0.09**

Business Scale

Figure 9-9 and Figure 9-10 show business scale of two types of firms. Type II firms were smaller than type I firms in the scale of business. The size of employees of type II firms was about 36 % of the one of type I firms. The scales of capital and sales of type II firms were about 27 % and 54 % of those of type I firms.

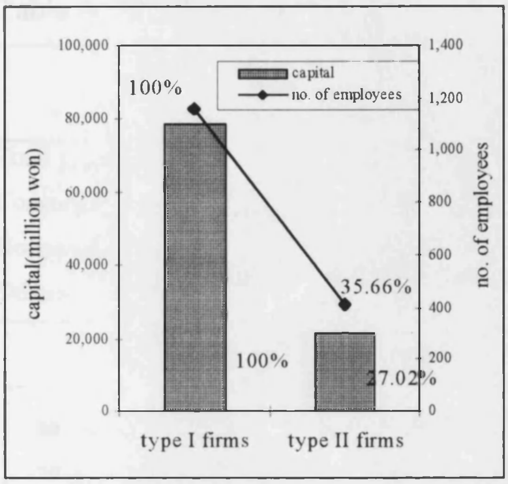


Figure 9-9 Scale of business by type of firms

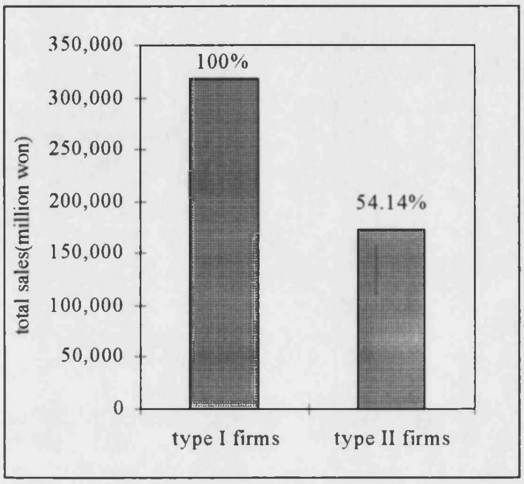


Figure 9-10 Scale of total sales by type of firms

Structure of Production and Sales Profit

As shown in Table 9-8, type I firms performed mainly in the construction business (68.22 %) and a rather high proportion of other business (11.83 %). Type II firms carried out mainly housebuilding (61.53 %) and relatively a low proportion of other businesses (5.48 %) than type I firms.

Table 9-8 Structure of production (unit: million won)

	Type I firms		Type II firms	
	N=207	%	N=111	%
Total sales	318,419	100.00	172,406	100.00
Construction	217,231	68.22	56,872	32.99
Housebuilding	65,601	20.60	106,079	61.53
Others	35,587	11.18	9,455	5.48

Table 9-9 shows the structure of sales profit and it shows a similar pattern to that of production. Both types of firm achieved relatively high profits from housebuilding compared to the profits from construction. This explains that why, when we consider only direct production costs, housebuilding is more profitable than construction. Figures 9-11 and 9-12 shows the contents.

Table 9-9 Structure of sales profit (unit: million won)

	Type I firms		Type II firms	
	N=207	%	N=111	%
Total profit of sales	44,722	100.00	24,521	100.00
Construction	27,354	61.16	6,075	24.77
Housebuilding	11,292	25.25	16,357	66.71
Others	6,076	13.59	2,089	8.52

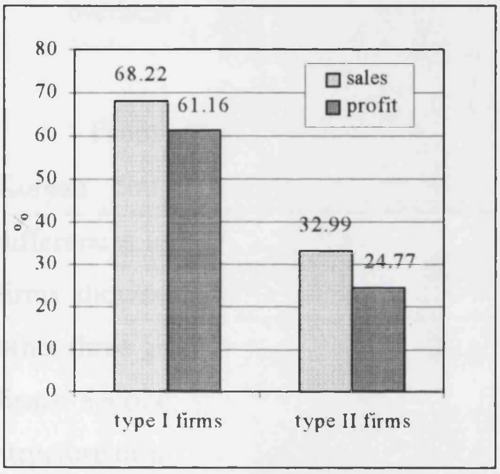


Figure 9-11 Ratio of sales and profit in the construction business

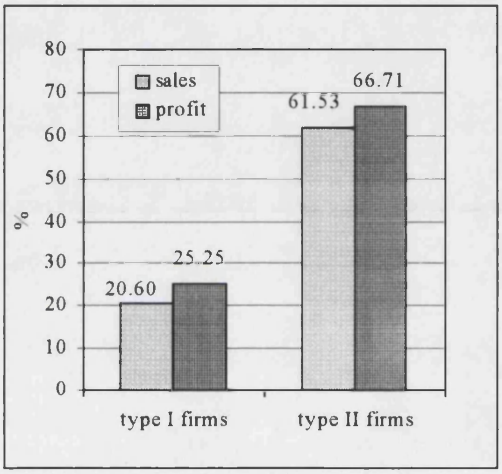


Figure 9-12 Ratio of sales and profit in the housebuilding Business

Structure of Cost and Profits

Table 9-7 also shows various costs and profits in each type of firm. There were no big differences between firms in the ratios of sales, cost of goods sold, profit of sales, overhead costs and operating profits. Type II firms show a slightly high ratio of overhead cost and extra cost and a slightly low ratio of extra profit. As a result, the level of ordinary profit of type II firms was nearly 0 % of total sales. Figure 38 and Figure 39 show ratios of each cost and profit to total sales.

Summarising the above, there were no big differences in the structures of production and cost between type of firms. The difference was that the scale of business in type II firms was about 30 -50 percent of those in type I firms and type II firms achieved a lower level of profits despite the high profitability of housebuilding.

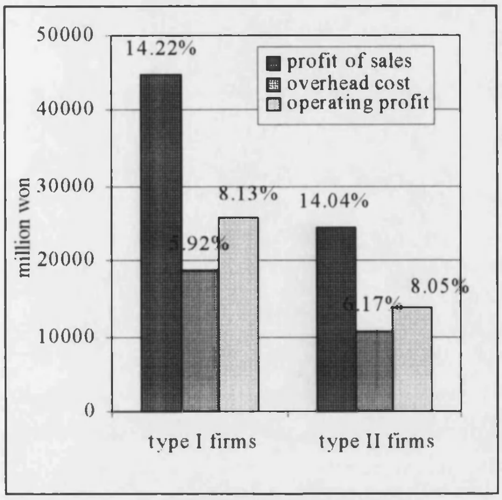


Figure 9-13 Ratios of profits of sales, overhead costs and operating profits

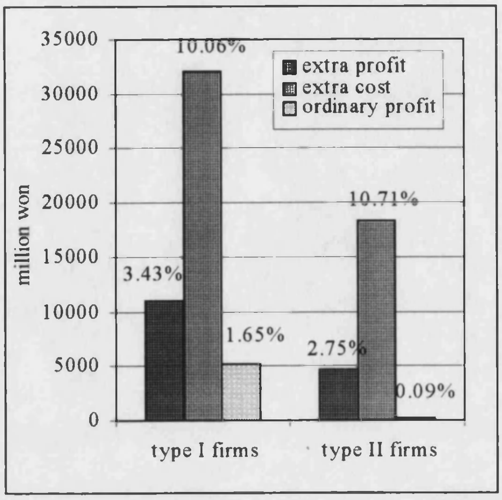


Figure 9-14 Ratios of extra profits, extra costs and ordinary profits

From the simple descriptive analysis on the structures of production and costs of Korean housebuilding firms, we found some attributes. First, there were some differences in business scale between type of firms and by size of firms. The very large firms showed larger business scale in number of employees, sales and capital than the other three groups of firms. There were no big differences among the other three sizes of firms. Second, there were no differences in the structure of production among firms. The structure of production and the structure of profit were similar among each type of firms and each size of firms. Nearly all the firms were involved in various businesses. The difference was that medium, large and very large firms all showed a higher proportion of construction business, whereas small firms showed high depending ratio on housebuilding business. Large firms and very large firms were more diversified into unrelated businesses than medium and small firms. Third, when we considered only direct production costs, housebuilding was more profitable than construction. However, finally large firms and type I firms showed higher profits. The reason that smaller firms and most of the type II firms achieved lower ordinary profits may be due to the higher ratio of overhead costs, extra costs and relatively lower ratio of extra profits. It is noteworthy that Table 4 shows that large firms achieved a higher ratio of ordinary profits to sales (2.26 %) than very large firms (1.18 %).

9.4 Estimation of Model

9.4.1 Number of Sample and Operational Definition of Used Variables

For estimation of the model, a total of 36 coefficients need to be estimated. To compensate for shortage of numbers of samples, pooled data of time-series data and cross-sectional data were used and the total number of samples was 318. However, only 201 firms' data were included in the regression due to missing data. As many missing data were found in small and medium group firms, the two groups, small firms and medium firms, were united into one group as shown in Table 9-10.

Table 9-10 Number of samples used for estimation of cost function

	Sample used
Small and medium firms	55
Large firms	71
Very large firms	75
Total	201

The operational definitions of the variables are as shown in Table 9-11. All variables were expressed in nominal monetary terms and all prices were discounted with GNP deflator index based on year 1993. The total cost included all costs which accrued in each year. The output in each year was divided into three groups, on the basis of sales; construction, housebuilding, and other businesses. As input factor variables, four costs were considered. As the main composition of direct cost, material factor costs, labour factor costs and contracting factor cost were considered. Fixed factor cost was considered as an indirect cost. The fixed factor costs include overhead costs in both main office and building site, leasing cost for building plant and facilities, extra cost such as interest cost happened from borrowed fund.

If we use nominal monetary data, the problem of multicollinearity may arise. If high multicollinearity was observed in the model, the estimated coefficient was unstable. The results of economies of scale and economies of scope estimated from the model may be different, according to the variables chosen in the model. To minimise the multicollinearity between variables, input factor costs were standardised by the variables indicating total operating scale as shown in Table 9-11. Then input factor variables were used as ratio variables, not nominal variables. According to this, correlations between variables became low and multicollinearity problem could be improved.

Table 9-11 Operational definitions of variables

	Variables	Operational definition
Dependent variable	Total cost (TC) All the cost arising for business in each year	-on-site building costs (direct cost) +overhead costs (indirect cost) + interest cost
Output variables	-y1: construction output -y2: housebuilding output -y3: other business output	-construction sales per year -housebuilding sales per year -other business sales per year
Input factor variables	-w1: material factor cost -w2: labour factor cost -w3: contracting factor cost -w4: fixed factor cost	-material factor price/total costs -labour factor price/ no. of employees -contracting price/total costs -fixed factor price/ total costs

9.4.2 Estimation Method

The estimations were performed using SAS programme (6.08 version). The Translog cost function has to be estimated with the cost share equations as a multiple regression system. In this case, current endogenous variables in the equation (1) are used as regressors in other cost share equations (2). OLS estimates are biased and inconsistent, because a critical assumption of OLS is that the regressors are not correlated with the residual. Therefore, the Seemingly Unrelated Regressions (SUR) method was used to estimate the system of equations. It is known that the Seemingly Unrelated Regression (SUR) estimation method is useful when we believe that error terms are contemporaneously correlated across equations. The SUR estimation method uses the estimates of the covariance of residuals across equations in an attempt to improve the efficiency of estimates[3].

Furthermore, we can gain additional degrees of freedom by estimating the cost function and the derived cost share equations together as a multiple regression system, because the cost share equations do not introduce any additional unknown parameters into the estimation. Therefore, it is known that the system estimates method is more efficient than the single equation estimates generated by the cost function alone.

[3] SAS Users' Guide, 5th Edition.

The 'syslin' procedure in SAS statistical programme was used in estimating parameters in the system of equations composed with equation (1) and (2). Estimation was carried out with total firms and by size of firms separately. The estimation results were reported in Appendix 7, because the estimated results of cost function are not the main concern in this study. The estimations of the model by the SUR technique were statistically significant

Adjusted R^2 showing explaining degree of explanatory variables are shown as high (0.987 for total firms, 0.9571 - 0.9748 for different size of firms). F-values showing the adequacy of the model are shown as statistically significant. Most of the estimates were statistically significant, despite the fact that the large number of variables to be estimated were included in the regression. Among 36 coefficients, 24 were found to be statistically significant at 1% probability level and the goodness of fit (the associated standard errors and T values of these estimates) were satisfactory.

Durbin-Watson valued showing adequacy of the model were estimated as about 1.4 except in the very large firms (1.06). If D-W value is near 2, it means error terms are normally distributed and there is no relationship between residuals. If the D-W value is near to 0 or 4, it means there is positive or negative relations between residuals, therefore, the model is not adequate. We can say the estimation model used in this analysis is adequate.

In order to examine whether the estimated cost function shows an adequate cost structure or not, we investigated Allen's own substitution elasticities. The elasticities must be estimated negative to satisfy the condition. The elasticities can be calculated as below;

$$\sigma_{ii} = \gamma_{ii} / SH_i - 1$$

γ_{ii}= estimated coefficient of i^{th} input factor

SHi=average share ratio of i^{th} factor in the cost function

Table 9-12 Allen's own substitution elasticities of each input factor

	Total Firms	Small/Medium Firms	Large Firms	Very large Firms
Material factor	-0.0989	-0.1322	-0.0868	-0.0747
Labour factor	-0.8037	-0.9580	-0.9662	-0.8126
Subcontracting factor	-0.1160	-0.0935	-0.1264	-0.1692
Fixed factor	-0.1105	-0.1438	-0.0501	-0.1018

The substitution elasticities by groups are shown in Table 9-12. The substitution elasticities in each group were all observed to be negative. Therefore, we may consider the cost function was estimated adequately and we can estimate the further efficiency measures from the cost function.

9.5 Results

9.5.1 Economies of Scale

In the total sample, overall economy of scale was estimated as 0.98 and it is statistically significant at one percent level. However, as the value is nearly one, we can interpret it as 'constant returns to scale' in the Korean housebuilding industry. However, when we divided the sample into three groups by size of firms, the results were slightly different. For all groups of firms, 'increasing returns to scale' was observed as shown in Table 9-13. Especially in the case of a large group of firms, highest increasing returns to scale was detected (0.86). The economies of scale were all statistically significant at one percent level.

Table 9-13 Economies of scale

	Total firms (201)	Small/Medium Firms (55)	Large firms (75)	Very large firms (71)
Means of total sales (million won)	267,452	51,426	179,075	788,505
Overall economy of scale (Se)	**0.98*** (0.002)**	**0.94*** (0.013)**	**0.86*** (0.014)**	**0.97*** (0.006)**
- construction business	6.04 (4.413)	8.63 (6.441)	5.96*** (0.697)	9.44*** (0.242)
- housebuilding business	30.36 (32.318)	-78.94 (84.991)	23.48 (18.633)	8.37*** (2.289)
- other business	8.47 (12.609)	-7.81*** (9.370)	3.94 (4.289)	4.19*** (0.189)

( ) : standard error * : significant at 10 % level *** : significant at 1 % level
Se< 1:increasing returns to scale, Se=1:constant returns to scale, Se>1:decreasing returns to scale

When we considered the economy of scale in the individual business, every case showed 'decreasing returns to scale' except the case of housebuilding and other business in small/medium firms. The construction business in particular, showed significant 'decreasing returns to scale' in both large and very large firms. In the case of very large firms, all individual businesses showed statistically significant 'decreasing returns to scale'. To find out any difference between type of firms in each size of firms, the sample was divided into subgroups. Table 9-14, 9-15, 9-16 gave us economies of scale by type of firms in each size of firms.

Table 9-14 Economies of scale in small/medium firms

	Small/medium firms (55)	Type I firms (27)	Type II firms (28)
Means of total sales (million won)	51,426	54,004	48,459
Overall economy of scale (Se)	**0.94*** (0.013)**	**0.89*** (0.015)**	**0.98*** (0.0170)**
- construction	8.63 (6.441)	5.27*** (0.276)	11.88 (12.732)
- housebuilding	-78.94 (84.991)	-173.42 (172.832)	12.15*** (3.775)
- other business	-7.81*** (9.370)	1.20*** (0.229)	-16.51 (18.416)

( ) : standard error *** : significant at 1 % level
Se< 1:increasing returns to scale, Se=1:constant returns to scale, Se>1:decreasing returns to scale

Table 9-15 Economies of scale in large firms

	Large firms (71)	Type I firms (52)	Type II firms (19)
Means of total sales (million won)	179,075	175,339	189,929
Overall economy of scale (Se)	**0.86*** (0.014)**	**0.88*** (0.016)**	**0.79*** (0.026)**
- construction	5.96*** (0.697)	4.49*** (0.161)	10.21*** (2.452)
- housebuilding	23.48 (18.633)	30.51 (25.437)	4.25*** (0.280)
- other business	3.94 (4.289)	8.66*** (2.619)	-8.73 (14.012)

( ) : standard error *** : significant at 1 % level
Se< 1:increasing returns to scale, Se=1:constant returns to scale, Se>1:decreasing returns to scale

Table 9-16 Economies of scale in very large firms

	Very large firms (75)	Type I firms (58)	Type II firms (47)
Means of total sales (million won)	788,505	817,433	683,001
Overall economy of scale (Se)	**0.97*** (0.006)**	**0.98*** (0.007)**	**0.93*** (0.011)**
- construction	9.44*** (0.242)	8.65*** (0.190)	12.31*** (0.353)
- housebuilding	8.37*** (2.289)	8.61*** (2.975)	7.52*** (0.363)
- other business	4.19*** (0.189)	4.02*** (0.181)	4.73*** (0.551)

( ) : standard error *** : significant at 1 % level
Se< 1:increasing returns to scale, Se=1:constant returns to scale, Se>1:decreasing returns to scale

These results gave some interesting information to us. In the case of small/medium firms, type I firms showed slightly higher 'economies of scale' than type II firms. It is also noteworthy that for construction business, significant 'decreasing returns to scale' was detected in type I firms, whereas for housebuilding business, significant 'decreasing return to sale' was detected in type II firms. In case of large firms and very large firms, type II firms showed higher economies of scale than type I firms. For all individual business, 'decreasing returns to scale' were commonly detected.

Summarising the above results, we can say 'increasing returns to scale' were observed in the Korean housebuilding industry. This means that if a firm extended its business scale, the firm could expect cost efficiency by reducing its average cost. This suggests an enlargement strategy of business size was advantageous under the current cost structure. The degree of scale economies were slightly different in each size of firm. Large firms whose total sales was about 179,075 million won showed the highest scale economy (0.86). Small/medium firms showed higher economy scale (0.94) than very large firms (0.97). When we considered it by type of firms in each size of firms, the sub-samples showed slightly different estimates. In small/ medium firms, type I firms showed higher economies of scale, whereas in large and very large firms, type II firms showed higher economies of scale. This suggests that there may be optimum scale showing highest economy of scale.

9.5.2 Economies of Scope

All the results of overall economies of scope and economies of scope in the individual product were estimated as being greater than zero as shown in Table 9-17. This means strong economies of scope were detected in the most businesses. In particular, economies of scope in construction (1.01) and housebuilding (0.90) were somewhat higher than other unrelated business (0.46). All the results were also statistically significant at one percent level. This means that diversifying into other businesses -related or unrelated - may be efficient in the Korean housebuilding industry. Table 90 also shows economies of scope in each size of firms. There was no difference between large firms and medium/small firms. However, very large firms showed higher economies of scope (1.71). Individual scope economies were shown differently by size of firms. All individual scope economies were detected as being highest in very large firms. It is outstanding that in the case of large firms, overall scope economy and individual scope economies are observed as being lower than those of small/medium firms (except for the case of other business).

Table 9-17 Economies of scope

	Total firms (201)	Small/medium firms (55)	Large firms (71)	Very large firms (75)
Overall economy of scope (Sce)	**1.49*** (0.005)**	**1.33*** (0.009)**	**1.30*** (0.007)**	**1.71*** (0.005)**
- construction (SC1)	**1.01*** (0.008)**	0.88*** (0.011)	0.79*** (0.008)	0.89*** (0.002)
- housebuilding (SC2)	**0.90*** (0.006)**	0.87*** (0.011)	0.81*** (0.008)	0.89*** (0.002)
- other business (SC3)	**0.46*** (0.004)**	0.46*** (0.004)	0.51*** (0.002)	0.82*** (0.004)

( ) : standard error *** : significant at 1 % level
$SC_e < 0$: diseconomies of scope, $SC_e > 0$: economies of scope

When we measured the economies of scope by type of firms, we found similar results to the above. Both firms showed statistically strong economies of scope. Type II firms showed higher overall scope economy. Type I firms showed higher individual scope economy in the construction business, whereas type II firms showed higher individual scope economy in housebuilding and other business. This means that type II firms can get higher cost efficient effect from diversification strategy.

Table 9-18 Economy of scope by type of firms

	Type I firms (137)	Type II firms (64)
Overall economy of scope(SCe)	**1.43*** (0.005)**	**1.59*** (0.005)**
- construction	1.01*** (0.008)	0.90*** (0.006)
- housebuilding	0.88*** (0.006)	0.92*** (0.007)
- other business	0.50*** (0.003)	0.68*** (0.008)

( ) : standard error *** : significant at 1 % level
$SC_e < 0$: diseconomies of scope, $SC_e > 0$: economies of scope

Economies of scope by type of firms in each size of firm were tried; however, there is no difference in economies of scope between type of firms.

9.5.3 Inter-product Cost Complementarity

Table 9-19 shows cost complementarity of total sample firms and of each size group of firms. In total firms, significant inter-product cost complementarity was observed between construction and other business. This suggests that building firms got cost efficiency when they carried out construction and other business at the same time.

Table 9-19 Cost complementarity

Output combination (CM_{ij})	Total firms (201)	Small/Medium firms (55)	Large firms (71)	Very large firms (75)
-construction /housebuilding	-8.55E-10 (5.79E-10)	-8.73E-10 (3.49E-08)	-6.56E-10*** (2.57E-10)	-1.30E-11 (2.89E-11)
-construction /other business	-1.41E-08* (9.54E-09)	-5.24E-08** (7.45E-07)	-3.15E-08 (4.43E-08)	1.24E-10*** (2.04E-11)
-housebuilding /other business	-6.69E-10 (4.91E-09)	3.56E-09** (1.90E-10)	-5.92E-08* (2.21E-08)	1.93E-10*** (3.35E-11)

$CM_{ij} < 0$: cost complementarity between y_i and y_j.
$CM_{ij} > 0$: cost non-complementarity between y_i and y_j.
* : significant at 10 % level ** : significant at 5 % level *** : significant at 1 % level

There were some differences in each size of firms. In the case of small/medium firms, significant cost complementarity was observed only between construction and other business. A significant cost complementarity between housebuilding and other business was not observed. In the case of large firms, significant cost complementarity was detected between construction and housebuilding and between housebuilding and other business. In the case of very large firms, significant cost complementarity was lacking between construction and other business and between housebuilding and other business.

The results mean that if small firms performed construction and other business simultaneously, they could get cost complementarity. It also says that large firms could get cost efficiency through diversification into related business (between construction and housebuilding) and unrelated business (between housebuilding and other business). In the case of very large firms, the firms could not get any cost efficiency from unrelated diversification.

To find any difference between types of firms in each size of firms, the sample was subdivided. The results are shown in Table 9-20, 9-21, 9-22. In the case of small/medium firms, the results were different between types of firms. Both types of firm could achieve cost complementarity only between construction and other business.

This shows that type II firms could not achieve cost complementarity between housebuilding and other business significantly. This result suggests that in small/medium firms, joint production of housebuilding and unrelated other business is not cost efficient. It is an unexpected result that type II firms having a high ratio in the housebuilding can achieve a cost efficient effect from joint production between construction and other business.

Table 9-20 Cost complementarity in small/medium firms

Output combination (CM_{ij})	Small/medium firms (55)	Type I firms (27)	Type II firms (25)
-construction /housebuilding	-8.73E-10 (3.49E-08)	2.03E-10 (3.92E-09)	-1.91E-09 (2.10E-09)
-construction /other business	-5.24E-08** (7.45E-07)	-6.48E-09** (6.08E-09)	-9.67E-08** (4.53E-08)
-housebuilding /other business	3.56E-09** (1.90E-10)	8.60E-09 (4.26E-08)	1.53E-08** (6.94E-09)

$CM_{ij} < 0$: cost complementarity between y_i and y_j.
$CM_{ij} > 0$: cost non-complementarity between y_i and y_j.
* : significant at 10 % level   ** : significant at 5 % level

Table 9-21 Cost complementarity in large firms

Output combination (CM_{ij})	Large firms (71)	Type I firms (60)	Type II firms (26)
-construction /housebuilding	-6.56E-10*** (2.57E-10)	-4.41E-10*** (1.38E-10)	-1.25E-09* (8.60E-10)
-construction /other business	-3.15E-08 (4.43E-08)	-4.24E-08* (4.26E-09)	-1.60E-09 (1.08E-09)
-housebuilding /other business	-5.92E-08** (2.21E-09)	-8.03E-08 (7.02E-08)	-1.48E-09** (0.27E-10)

$CM_{ij} < 0$: cost complementarity between y_i and y_j.
$CM_{ij} > 0$: cost non-complementarity between y_i and y_j.
* : significant at 10 % level ** : significant at 5 % level *** : significant at 1 % level

Table 9-22 Cost complementarity in very large firms

Output combination (CM_{ij})	Very large firms (75)	Type I firms (47)	Type II firms (26)
-construction /housebuilding	-1.30E-11 (2.89E-11)	-4.54E-11 (3.67E-11)	-5.48E-12 (1.21E-11)
-construction /other business	1.24E-10*** (2.04E-11)	6.35E-11*** (1.86E-11)	1.42E-10** (6.48E-11)
-housebuilding /other business	1.93E-10*** (3.35E-11)	1.49E-10*** (4.08E-11)	1.13E-10** (4.81E-11)

$CM_{ij} < 0$: cost complementarity between y_i and y_j.
$CM_{ij} > 0$: cost non-complementarity between y_i and y_j.
* : significant at 10 % level ** : significant at 5 % level ***: significant at 1 % level

In large firms, both type of firms showed significant cost complementarity between construction and housebuilding. It is noticeable that type I firms achieved significant cost complementarity between construction and other business, whereas type II firms achieved significant cost complementarity between housebuilding and other business. We may confirm that large firms achieve cost efficiency from diversification into related business and unrelated business.

Very large firms could expect cost complementarity between construction and housebuilding, but not significantly. They did not show cost complementarity between construction and other business and between housebuilding and other business. This means diversification into various unrelated businesses did not bring cost efficient effects for the very large firms. Considering the situation that most of the large building firms are highly diversified into various unrelated business, these results gave meaningful implications.

The results of cost complementarity between businesses may be used as a guideline of decision making whether the building firms decide business strategy; further expansion or reducing business or specialisation on main business.

9.5.4 Optimum Scale of the Building Firms

Considering the results of the efficiency measures, there were some differences between size of firms. Large firms showed higher 'increasing returns to scale' than any other groups and small/medium firms showed higher 'increasing returns to scale' than very large firms. This suggests that there may be optimum scale showing highest economy of scale.

In order to observe the relationship between the estimated economies of scale and firms' sales scale, a graphic approach was tried. Figure 9-15 shows the trend of scale economies of small/medium firms. From the point where total sales is more than 50,000 million won, 'increasing returns to scale' were realised. As the sales increased, scale economies appeared to be higher.

Figure 9-16 shows the cases of large firms. It shows a fluctuating trend. We may observe that the scale economies were higher than those of small and medium firms. From the point where the total sales was greater than about 100,000 million won, 'increasing returns to scale' are realised and as the size of sales increased, the scale economies increased. Especially from the point that sales increased greater than 180,000 million won, scale economies increased into 0.7.

Figure 9-17 shows the case of very large firms. In this case, the scale economies were observed but they were nearly approaching one which means ‘constant return to scale’. From the point where the sales were greater than 1,000,000 million won, scale economies could not be expected.

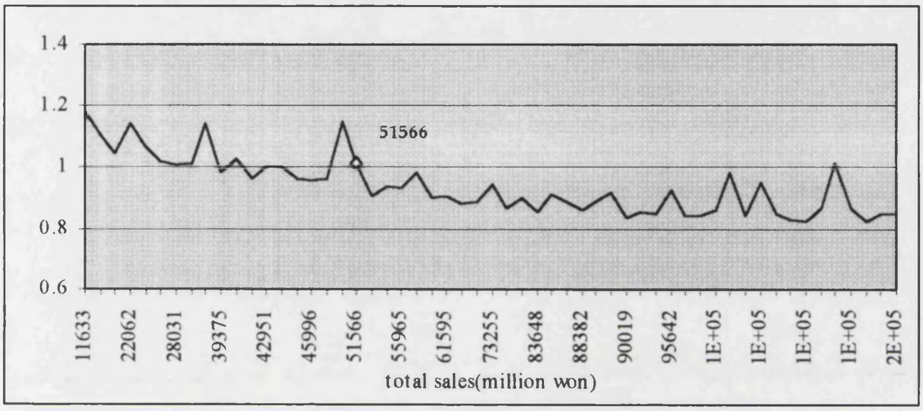


Figure 9-15 Scale economies in small/medium firms

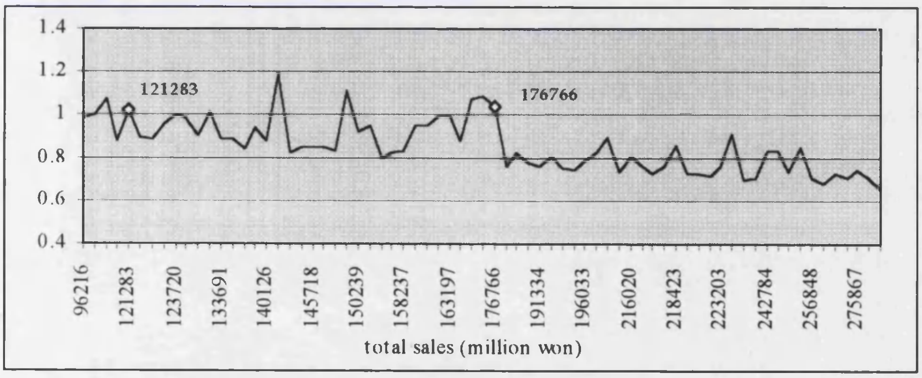


Figure 9-16 Scale economies in large firms

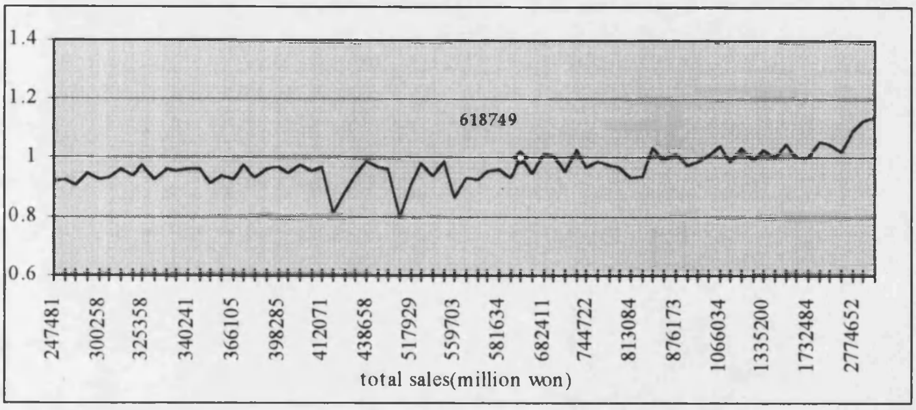


Figure 9-17 Scale economies in very large firms

Summarising the results in the Korean housebuilding industry, at the point where total sales were between 50,000 million won and 1,000,000 million won, economies of scale were observed. In particular, where the sales were between around 180,000 and 300,000 million won, the scale economies were shown as being highest. This level is similar to the average sales of the sample firms (267,452 million won). From the point where total sales were greater than 300,000 million won, the scale economies started to decrease.

It has been regarded that there is no specific relationship between economy of scale and economy of scope. The economy of scale and economy of scope can exist independently or at the same time. Panzar and Willig(1981) explained the relationship between economy of scale and economy of scope as follows; even though there does not exist economy of scale in the individual products, it can expect the overall economy of scale in multi-production, if there exist strong economy of scope and high cost complementarity. In order to examine the relationship between scale economies and scope economies, another graphical examination was tried.

Figures 9-18, 9-19, and 9-20 show the trend. The white line showed the estimated economies of scale and the black line showed the estimated economies of scope. As the size of total sales increased, the scope economies increased (1.3-1.7). In the case of small/medium firms and large firms, consistent increasing scope economies were shown. Figure 45 shows the case of very large firms. In this figure, we may notice that as sales increased, scope economies gradually decreased but were still very high between 1.8 and 1.6.

The graphical analyses give some interesting information. Economies of scope show a consistent trend with the economies of scale. In the graphs, the trends of scope economies were moving in a contrary direction to scale economies. This means that scale economies increase with the increase of scope economies. In the case of economies of scale, the decision-making point is one. If the estimated scale economy is approaching one, it means that the scale economy is decreasing. If the scale economy is more than one, it means there is no economy of scale. Therefore, the fact that the graphic trends of scale economies are moving contrary to scope economies means that as economies of scale increase, economies of scope also increase. That is, at the points where scale economies are high, scope economies also appear high, whereas at the points where scale economies are low, scope economies appear low in the Korean housebuilding industry.

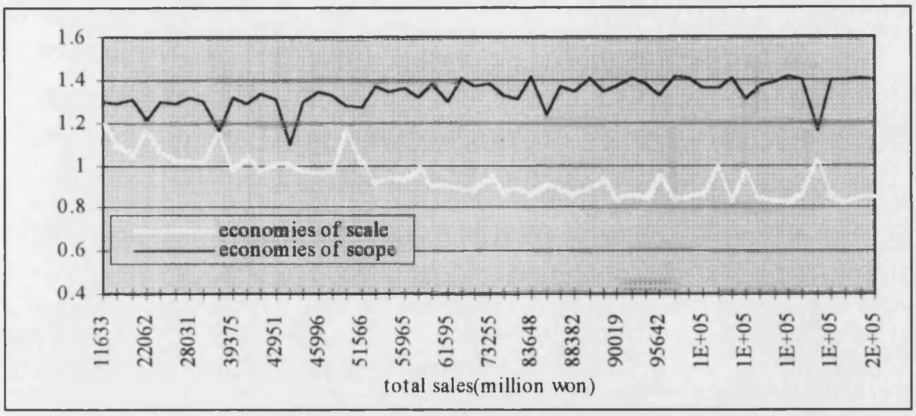


Figure 9-18 Scope economies in small/medium firms

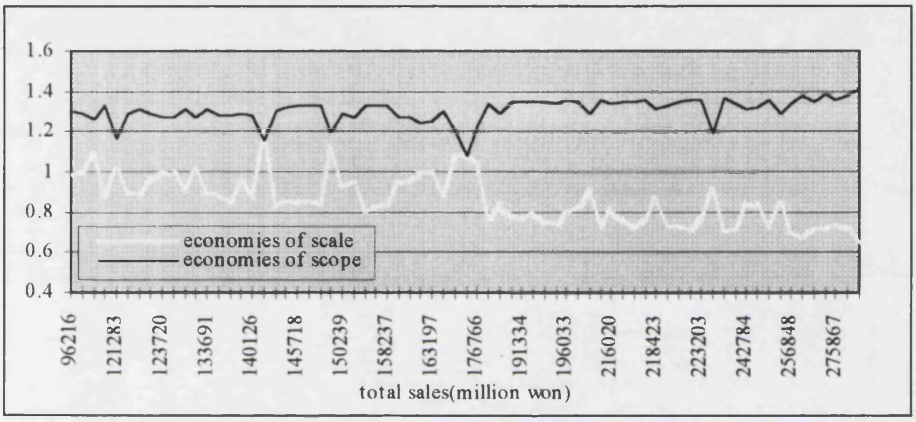


Figure 9-19 Scope economies in large firms

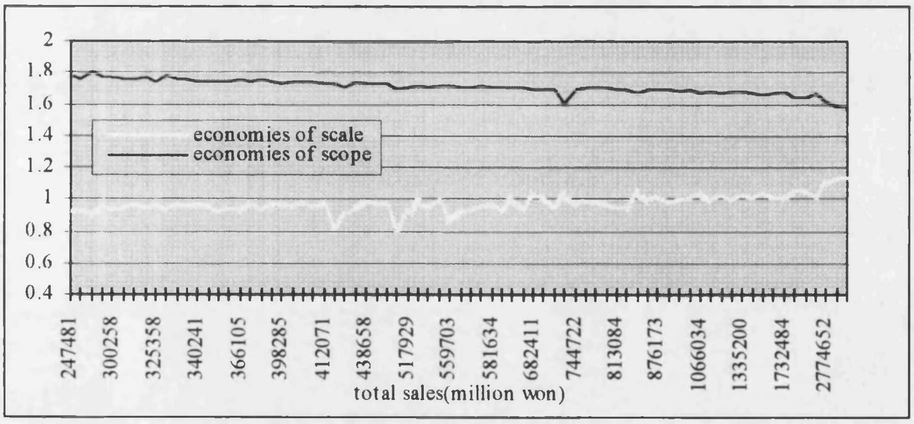


Figure 9-20 Scope economies in very large firms

So far we have examined the firms' optimum scale showing highest scale economies and the relation between scale economies and scope economies. Among different sizes of firm, the efficiency measures showed different values. Scale economies were shown to be highest in the large firms and scope economies were highest in the very large firms. Cost complementarities gave a different result. Small and medium firms showed cost complementarities only between construction and other business. Large firms showed cost complementarities between construction and housebuilding and between housebuilding and other business. The group of very large firms did not show cost complementarities between any business.

To summarise the results in small and medium firms, only the firm having more than 50,000 million won sales achieved scale economies. Scope economies were observed but cost complementarities were found only between construction and other business. In very large firms, nearly 'constant returns to scale' were found and cost complementarities could not be found. Only scope economies were observed. On the other hand, large firms among the total sample firms showed the most efficient production structure, that is, the large firms showed the highest scale economies, good scope economies and cost complementarities between related and unrelated business. The estimated efficiency measures give an idea that too large scale and the too large scope never brings 'efficiency'. The results suggest that the current scale of the Korean housebuilding firms is rather large.

9.6 Findings and Discussion

In this chapter, we examined the efficiency of the multi-production structure of the Korean housebuilding firms. From the analysis, we found the following outstanding attributes.

There were some differences in business scale among different size and types of firm. Large and very large firms showed a larger business scale in number of employees, sales, and capital than the small/medium firms. However, all firms showed a similar production structure. Nearly all of the firms were involved in various businesses besides housebuilding. The difference was that large firms show a high proportion of the construction business, whereas small firms showed high depending ratio on the housebuilding business. Another finding was that the housebuilding business was more profitable than the construction business, when we considered only direct production costs. However, large firms showed a higher profit than those of small and medium firms. The reason that small firms, which were more involved in the profitable housebuilding business, achieved lower ordinary profit was due to higher overhead costs, higher extra costs, and relatively lower extra profits. The result implies that large firms get economies of scale in operating business. Type I firms showed larger scale in business than type II firms. The production structure between type I firms and II firms were similar with the differences among different size of firms.

According to the efficiency measures estimated from the cost structure of multi-production firm, the Korean housebuilding firms showed overall economies of scale, but no individual economies of scale in each business. Strong economies of scope in every case were observed, and cost complementarity was observed only between construction and other business. Further analysis based on different size of firms showed more information. First, the group of large firms showed higher 'increasing returns to scale' than any other size of firms. Small/medium firms showed higher 'increasing returns to scale' than very large firms. This implies that there may be optimum scale showing highest economy of scale. Second, strong economies of scope (between 1.3 and 1.7) were examined. Besides overall economies of scope among various businesses and individual economies of scope between paired businesses were found to be significant. In particular, when the construction business was performed with the other businesses, the economies of scope value were estimated to be highest (1.01). When housebuilding was performed with other business, the economies of scope value were also estimated high. This supports the fact that the diversification strategy of Korean housebuilding firms is an efficient strategy in this cost structure. There was no difference or any trend in economies of scope by different size of firms. Third, cost complementarities between paired businesses showed different results among different sizes of firm. In the case of small/medium firms, cost complementarity was observed only between construction and other business. In the case of very large firms, cost complementarity was not observed in any pair of businesses. However, in large firms, significant cost complementarity between construction and housebuilding business was observed. Among them, type I firms showed significant cost complementarity between construction and other business and type II firms showed significant cost complementarity between housebuilding and other business.

In previous chapter 7, we observed that there was positive relationship between firms' size and the extent of diversification. The result together with all the results estimated in this chapter give important implications. First, the Korean housebuilding firms' diversification is cost efficient. Second, the government's policy to encourage large construction firms to participate in the housebuilding industry in high growth period was a right decision from a cost efficiency point. Third, there is 'optimum scale' showing highest scale economy, scope economy and cost complementarities between businesses. Estimated results showed that large firms among different size of firms were operating the multi business most cost efficiently.

Taking into consideration the situation that most of the Korean large building firms are highly diversified into various related and unrelated businesses, these results give another implication. We may say that the current scale of the Korean housebuilding firms is rather big. As discussed before, the very large firms showed quite a big difference in business scale from the large firms. The large firms showed highest scale economies, good scope economies and cost complementarities between related and unrelated business and the average size of the large firms was about 179,075 million won based on average sales. However, the very large firms showed constant returns to scale, and a lack of cost complementarity with related and unrelated business. They showed only scope economies. The average size of the very large firms was much larger than that of large firms (788,505 million won, about 4 times larger that that of large firms). This result says that the very large firms were operating their business less efficiently than the large firms. This implies that the current size of the building firms participating in housebuilding is too big, that is, the multi-production structure of the very large firms was not cost efficient. It also suggests that the very large firms need to change their strategy toward 'specialisation' rather than 'diversification' or further 'expansion into new business'.

Chapter 10 Conclusions

This research aimed to investigate the structure of the Korean housebuilding industry and the building firms and to evaluate the efficiency of production structure. The growth of the Korean housebuilding industry and resultant changes observed in the growth process were investigated in chapter 2. In chapter 3, the nature of housebuilding industry and the current structure of modern housebuilding industry firms were explored. With the emergence of large building firms in the industry, some changes were observed in the production process and the production structure. More advanced governance structures were introduced in the production process such as long-term contracting, partnering systems, and quasi-firm type structures. There was a change in building firms' production structure; a trend of diversification was observed. These trends were expressed on the four-cell matrix in chapter 4. From the framework, several research questions were derived: do the Korean housebuilding firms either follow the trend in the production process and the production structure or show other trends ? Is the trend of the building firms' production structure fit to the efficiency framework ? Throughout the five empirical chapters (chapters 5-9), the research questions were explored and answered from several points of views.

Starting with a summary of the main findings of this research, this chapter unpacks the specialities of the Korean housebuilding industry, the determinants, and implications from the empirical results. Policy conclusions and further research follow.

Main findings

The Korean housebuilding industry is an example of how the government initiated growth and intervened in all development stages. The government's intervention in private industry produced rather different attributes in product, production structure, and building firms' strategies. The main findings of this research can be summarised as follows.

First, most building firms were dependent on traditional 'market structure' throughout the development process, that is, 'contracting' was observed to be the prevalent production structure in land acquisition and development, materials purchasing, and labour purchasing. Some of the large leading firms showed 'partnering' relationships with specialised contractors or materials manufacturers or 'vertical integrated structure' in materials purchasing. However, this was limited to a small number of large building firms and relation with subcontractors was not trust-based and not long-term.

Second, based on the cost structure of housebuilding, the production process, being highly dependent on contracting, was observed as being inefficient. The substitution elasticities and price elasticities of demand between input factors were estimated as being very inelastic. Low productivity was observed and technical progress was not found in the Korean housebuilding sector. However, substitution elasticities between contracting and labour, and between contracting and material were observed as being comparatively high. The result shows that building firms use 'contracting' as a flexible alternative to manage labours and materials. Another outstanding result was that economy of scale was observed in Korean housebuilding. Normally Korean building firms have built high-rise apartment houses (about 15-25 floors) on a large scale (on average 300-400 dwellings per project and a maximum 2000-3000 dwellings in 1980s).

Third, Korean housebuilding firms have pursued a 'diversification' strategy to a greater degree than 'specialisation' in housebuilding business. Korean housebuilding firms did not show high diversity in product and regions, whereas they were diversified into other business areas, that is, most of the Korean housebuilding firms focused on Seoul and the capital region as their main market and they produced mainly apartment houses. The extent and pattern of diversification were found to be different between different types of firm and different sizes of firm. Type I firms are those whose main business was construction and later entered housebuilding business, whereas type II firms are those whose main business was originally housebuilding. Type I firms showed greater diversity than type II firms and large firms showed greater diversity than small firms. These are natural results, as type I firms were operating other business before entering the housebuilding business. However, it is noteworthy that large firms among type II firms showed the greatest diversity among the groups. Taking into consideration that type II firms are those whose main business is housebuilding, this result supported the fact that Korean housebuilding firms emphasised more on 'business diversification' than 'specialisation' in housebuilding business.

Fourth, Korean housebuilding firms' diversification could be explained from various different perspectives. It is a natural phenomenon that large firms having large physical and human resources tend to extend their business to use the excess resources efficiently and to heighten market power in the industry. In fact, the Korean government encouraged the large contracting firms to participate in the housebuilding business in a high growth period and supported the large firms in various policy measures. It was an outstanding attribute that type II firms diversified into related business in order to compensate for their low profit. It was also noteworthy that among type II firms, those who have much experience in the housebuilding business were more diversified into unrelated business to restore a low market share of the housebuilding business.

Fifth, as a result of firms' diversification strategy, the housebuilding firms showed multi-production structure and it was observed as being efficient. It was estimated that there were overall economies of scale, strong economies of scope, and cost complementarities between some pair of business. The estimations were different against firms' size. It was observed that as the size of firms increased, the extent of diversification was also increased. However, the efficiencies were estimated differently among four groups of firms. The group of large firms showed the most cost-efficient production structure. That is, the group of large firms showed the highest scale economies, good scope economies, and cost complementarities between related business and between unrelated business. The group of very large firms showed only scope economies. The group of small and middle firms showed higher 'increasing to scale' than the group of very large firms. The results say that there is an optimum scale of business showing highest efficiency estimates.

Specialities of the Korean housebuilding industry and the determinants

The Korean housebuilding industry has grown with the government's intervention and under the regulatory circumstance it showed several different attributes from those of the advanced other countries. First, Korean housebuilding firms produced mainly standardised apartment houses and the apartment house became a prevalent type of house in the modern housing market. In advanced countries, the detatched house is the most favourite house type for family and standardisation has gradually been carried out in various types of house. Unlike other countries, prevalence of apartment houses occurred in response to the demand concentration for apartment houses supported by the government. In the mid 1980s, housing shortage was severe in Seoul and the capital region. The government encouraged building firms to build apartment houses to solve the shortage problem in a short time. It was an effective way to build many houses in high density, as there was lack of residential land. Moreover, most house buyers wanted apartment houses as they could buy them at a lower price than the market price due to the sales price regulation. The sales price regulation for apartment houses played a role in guaranteeing demand to the building firms. Eventually, the government's regulation on the housing market, i.e. land use regulation, house price regulation, affected the product type in the housing market with increased demand for apartment houses.

Some differences were observed in the production process and building firms' production structure. Based on a four-cell matrix, specialities of the Korean housebuilding industry are shown as a dotted line in Figure 10-1. The building firms depended on simple 'contracting' structure and more improved contracting structure was not shown in the production process. On the other hand, they were pursuing diversification. This is expressed as dotted line. It is quite a different trend from the curved arrow line observed in other advanced countries.

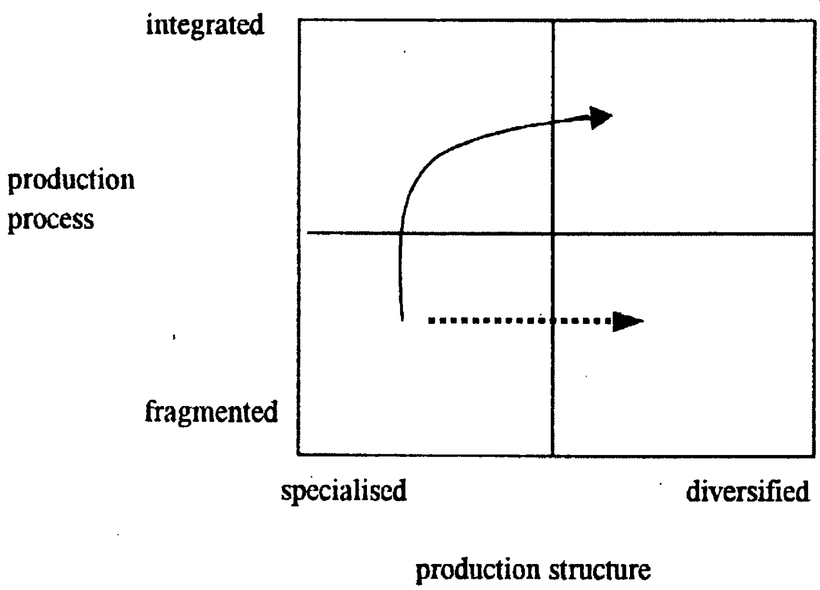


Figure 10-1 Production pattern of Korean housebuilding firms

The Korean building firms mainly depended on a simple contracting structure in the production process. In advanced countries, building firms were very specialised in housebuilding and large firms usually made a high investment in specific building assets or human resources. A specific relationship was formed between building firms and subcontractors, and new types of governance structure such as 'partnering' system, 'quasi-firm' type, or 'vertical integration' have stabilised in the production process.

The determinant of the speciality can be considered as different environment of Korean housebuilding firms. The Korean government provided various regulations throughout the whole development process: regulations on the input factors, especially land development regulation and public allocation system of the developed land directly limited business chance of the firms. They brought about high uncertainty for the business. Even though building firms applied for a building project, they could not anticipate whether they could participate or keep the business till the public land was allocated to them by a pre-decided procedure. As a result, building firms could not gain profit from land development; furthermore, the firms not gaining the public land were not able to keep the housebuilding business. House price regulation limited the building profits, therefore, increased the risk of the business. The regulated circumstances provided high uncertainty to the building firms. Most of the interviewees pointed out that various regulations in the housebuilding industry generated 'enforced uncertainty' as well as the uncertainty which naturally existed in the building process.

One of the classic responses to uncertainty was that building firms organised their businesses in a way maximising flexibility. That is, the circumstance led building firms to choose 'flexibility' rather than 'efficiency'. In the uncertain circumstance, building firms wanted to reduce building costs by a contracting alternative. They tended to contract out the works requiring high technique, professional know-how, and expensive machines and equipment, rather than to invest for them. The perceived uncertainty let building firms to behave more opportunistically in the contracting process. As a result, simple contracting structure was observed as a governance structure in the production process.

Another outstanding difference was that Korean housebuilding firms were operating housebuilding business in 'contracting type', unlike the 'development type' of other countries in which private building firms are involved in land development and building process of dwellings. Since the 1980s when the government initiated the housebuilding plan and developed residential land and infrastructure, housebuilding firms' business has been restricted. Housebuilding firms could participate in only one or two stages, i.e. the construction stage and the sales and maintenance stage. The Korean government's regulation on the private housing sector restricted building firms' business boundary and affected the overall behaviour of the Korean housebuilding firms. The building firms participated in housebuilding as a contractor, not as a developer.

Korean housebuilding firms' high diversity was another difference from those of advanced countries. It was observed that speculative building firms in the advanced countries focused on specialisation in housebuilding business and in recent years they were pursuing a diversification strategy. This was expressed as a curved arrow curve in Figure 10-1. The Korean building firms' diversity happened during a short growth period and the diversification pattern was rather different from other countries. The US and UK housebuilding firms showed high diversity in house products and regions, whereas the Korean housebuilding firms showed high diversity in business. This means Korean housebuilding firms pursued a diversification strategy before specialisation in housebuilding.

Interview survey and empirical analysis commonly showed that most of the Korean housebuilding firms pursued business diversification rather than specialisation. Most interviewees emphasised that uncertainty in housebuilding was the major motive for the building firms to divert or diversify into other businesses. Diversification was chosen as a 'survival strategy' not as a 'growth strategy' in conditions of government regulation. If the building firms operated other businesses besides housebuilding, they could survive, even though they could not operate in the housebuilding business for some time. They could make profits from other businesses in case they could not continue housebuilding due to land development regulation or public allocation system of land. This was one of the reasons why most of the housebuilding firms showed high diversity and even small firms tried to diversify into other businesses.

The multi-production theory and various diversification motive views supported the building firms' diversification strategy. Generally, large firms expanded their business easily with enough capital and manpower. In fact, the Korean government encouraged large construction firms to participate in housebuilding to achieve the mass construction plan effectively and efficiently. The emergence of large firms in the housebuilding industry was a motivating force for the firms' diversification. Empirical results from estimating diversification motives supported the fact that the large building firms diversified more in related and unrelated business to use their resources more efficiently. The building firms could compensate for the loss which resulted from one business with profits from the other business and they could get a synergy effect from the large-scale multi-businesses. It is noteworthy that among large firms, type II firms whose main business is housebuilding showed higher diversity. It supported the fact that the building firms diversified to avoid uncertainty and risk in the housebuilding business. In fact, many of the interviewees replied that the housebuilding firms tended to diversify into counter-cycle business in order to compensate for reduced profit from housebuilding and to keep business in case they could not continue housebuilding. Multi-production made it possible for the building firms to operate flexibly to varying demand.

Summarising the discussion, Korean housebuilding firms show different production pattern from the advanced countries; depending on simple 'contracting' in the production process, on the other pursuing diversification before being specialised in housebuilding. Government's various regulations observed throughout the development process and firms' opportunistic behaviour responding to the circumstance were considered as main determinants of the production pattern.

Implications

As the main findings of this research, we may summarise the following five factors; prevalence of contracting structure in housebuilding business, inefficiency of the housebuilding business, high diversity of the building firms, different pattern and motive of the diversification, and efficiency of the multi-production firms.

The contracting structure seems to contribute to the rapid growth of the industry quantitatively; however, there are some doubts about whether the structure contributes to the development of the industry in the longer term. Throughout the interview, it was confirmed that widespread contracting in the production process reduced direct labour forces and the firms who employ reduced direct labour forces had little incentive to engage apprentices or to concern themselves with training issues. They also had no interest in investment on technical innovations both in products and the production process. The housebuilding firms did not want to invest in fixed capital on building sites. The relations with their contractors were observed to be mere competitive or opportunistic ones, not trust-based relations like the other advanced counties. The dependency on 'contracting' and low investment on the relationship may have resulted in inefficiency of production and may have exacerbated a skill crisis in the building industry in the long run. Most of the interviewees were worried about shortage of skilled labour in the construction industry.

Empirical results on the extent of efficiency of the housebuilding business supported the arguments by showing low substitution between input factors, no technical progress, and low productivity in the housebuilding business. This means the building firms did not manage input factors flexibly and did not react smoothly against the unexpected situations such as input factors' price change, lack of supply quantity. The fact that technical progress was not observed and productivity was low indicated inefficiency of housebuilding operation. One of the outstanding results was economy of scale observed in the business. This indicated that even though the Korean building firms could not expect high profits from land development (due to land development regulation), the firms could achieve profits from standardised large-scale operation. The economy of scale must be a main force to lead mass production of the standardised apartment houses in 1980s and must be an important motive for a large number of firms to enter into the industry.

The Korean housebuilding firms' high diversity was supported by various theories, i.e. economies of scale and scope, various motive theories of diversification. The efficiency measures of the multi-production structure indicated that the Korean housebuilding firms' diversification was a cost efficient strategy. From the multi-production structure, most of the building firms could get a cost savings and synergy effect by showing high scale economy, scope economy and cost complementarities between businesses. The estimated efficiency measures also suggested that there was optimal scale. It was observed that as the firms' size increased, the extent of diversification increased; however, the efficiency measures were differently estimated among different size of firms. The group of large firms showed the highest diversity. The group of very large firms showed higher diversity than the group of large firms, but their business was operated less efficiently than that of the group of large firms.

This means that current housebuilding firms' business scale is too large. Taking into consideration that most of the designated firms are included in the very large group, the designation system that the Korean government operated was not an effective policy. The government should have not endeavoured for large construction firms to participate in the housebuilding industry. It was observed that the group of small firms had operated business more efficiently than the very large group of firms. This suggests that the group of very large firms need to change their strategy towards 'specialisation' or 'reducing their business scale' rather than further 'diversification' to achieve more cost efficiency.

Here, we need to consider the building firms' production structure and diversification patterns more carefully. It is necessary to note the timing of the building firms' diversification. The Korean housebuilding firms diversified into other businesses from the beginning of growth and the extent of diversity has gradually decreased since 1990 when the growth of the housing market became moderate. This means that diversification of the Korean housebuilding firms was carried out simultaneously during the industry's high growth period. This result means that Korean housebuilding firms pursued diversification into other business, depending on contracting out most of the housebuilding works to the other smaller firms or contractors. They sought diversification before they were specialised in housebuilding. The building firms' behaviour, such as low investment in building technology, lack of innovation in production process, lack of labour training, high dependence on contracting, and high diversification can be interpreted as a preparatory process to divert to other business when the housebuilding cycle is in recession. The building firms' strategy may be considered as a short-term strategy in changing environments before specialisation in housebuilding has been achieved. It may be considered as an inadequate strategy. Some of the interviewees said they just followed the diversification trends of large firms. This is a 'copying' behaviour to leading firms' behaviours in the same industry. It is not considered as a desirable one and it may lead to delay of the development of the industry. In order to achieve development of the housebuilding industry, more investment is necessary in technology and human resources. Now, housebuilding firms have to pay strong attention to finding more efficient governance structure and to diagnosing their current strategy.

This research contributed to the understanding of the housebuilding industry in principle and also contributed to the understanding of the Korean housebuilding sector. Korean society underwent some drastic changes, and so did the housing sector. Housing demand changed in both quantity and quality and housing consumption accelerated with rising income. During the changing circumstance, the government intervened at all development stages. The Korean housebuilding industry is an example of regulated industries.

A number of lessons can be learned from this research. First, the government intervention seems to contribute to the rapid growth of the industry, however, strong regulations on the industry such as land use control, land development regulation, and sales price regulation negatively affected efficiency of the overall industry. Under the various regulations in housebuilding, housebuilding firms did not invest on technical innovations both in products and the production process. The relations with their contractors were observed to be mere competitive or opportunistic and the cost structure was found to be inefficient. Current housebuilding firms' business scale was observed as too large and their business was assessed as economically inefficient. Furthermore, participation of large building firms in housebuilding resulted in rapid diversification in production structure, before specialisation in housebuilding. Taking all these matters into account, the government's direct intervention in the Korean housebuilding industry seems to be an ineffective way to deal with sound development of the industry. This means that the housebuilding industry would be better developed, if it were minimally controlled. The government should make good guidelines for development. If necessary, intervention in the industry should be done by indirect ways such as taxation and financing. Second, the Korean housing industry has to be actively motivated. Participation of the small and medium housebuilders should be encouraged. To help small and medium firms' active participation, enough residential land should be supplied by easy land conversion. The housing finance system has to be strengthened for building firms. The key strategy is to make business circumstances so that many small, but capable, firms compete with each other for high-quality housing production. If all these efforts of the government were made, modernisation of the Korean housebuilding industry and efficient functioning of the industry could be achieved.

Further research

This thesis was restricted to two types of analysis; descriptive analysis and evaluative analysis at both project level and firm level. Descriptive analysis was carried out based on secondary data and the interview survey's results. Evaluative analysis was performed with publicly produced data. However, there were some limitations in getting adequate data for the evaluative analysis. First, efficiency analysis for the housebuilding project was performed by cost analysis. In the analysis, land factor was not included as we could not get land costs in each project. If all input factor's data had been available, more sophisticated analysis could have been possible. Besides the cost analysis, further detail analysis on efficiency of the production process is necessary. If some adequate data were available, quantitative analysis to investigate the extent of technical innovation and organisational innovation, the extent of investment on building plant and equipment would be possible.

Second, in analysing the building firms' multi-production structure, not enough data were available. We needed more detail sales data in the construction business and other businesses. If we could have got more detail data from the businesses, we would have used the existing diversification indices to describe the extent and pattern of building firms' diversification and compared them to those of other industries or those of other countries. Furthermore, we could get the data only for three years from 1993 to 1995; therefore, the analysis was limited to recent three years. If we could get data for a longer period, we could observe some trends and changes of the efficiency.

Third, it will be desirable to try a comparative research on the efficiency of housebuilding between regulated cases and deregulated cases. Since 1993, there have been some changes in the policy of the Korean housebuilding industry. Price regulation was applied only in Seoul and some large cities. In rural areas and small cities or town, sale price of houses was gradually liberalised. Land development regulation has been rather mitigated since 1992. Private building firms can develop small-scale projects even in the city and are allowed to develop residential land in the semi-agricultural and semi-forest areas. With the deregulated policies, the Korean housebuilding firms' business behaviours might be rather different. If the Korean building firms could develop residential land by themselves and could build any size of dwellings and sell the products at autonomous prices by their own decision, they could have got more profit from housebuilding and building firms' behaviour might be different. Deregulation in the housebuilding industry gives possibility for further research. Depending on data availability, we may try a comparative research on the efficiency of housebuilding between regulated cases and deregulated cases and between the public sector and the private sector. Regulated projects before 1993 and deregulated projects after 1993 would be comparative cases for efficiency analysis. Furthermore, after the policy changes, study on the differences of the building firms' strategy at business level and at firm level would be another research area. The same research can be tried as a comparative study between Korea and other countries, if adequate data are available in both countries.

This thesis may be considered as an initiative research to analyse the relationship between growth of industry, firms' behaviour, and the government's role. Starting from this study, more improved research can be expected.

Appendixes

Appendix 1 The government intervention in the housebuilding business

	Objectives	Enforcement year	Influences on the housebuilding business
(1) Regulation on the qualification of the housebuilding firms			
• registration system	-to persuade the construction firms to participate in the housebuilding industry	**1979**	
• designation system	-to specialise the firms and to improve the quality of houses	**1981** 1990 (stop to designate)	**entry barrier** **→ to enlarge the size of firms and scale of business**
(2) Intervention on input factors			
-land input			
• land use regulation	-to protect the environment and to prohibit the haphazard development of land	**1971** 1991(revised) -to enlarge the residential area and to improve the efficiency of the land use	-entry barrier into the housebuilding industry -delay the business
• public land development	-to make large scale residential development easier	**1980** -the government started to involve in the residential land development 1988 (strengthened) -to prohibit the private land development except the case of small scale development	-to provide residential land to the firms and enlarge the construction of houses .high land cost .high overhead cost (interest cost etc) ->influence on profitability
• public allocation system of the developed land		**1989** 1993 (abolished)	-interruption of business chance -influence on marketability of the houses built on the bad location

-capital input			
• pre-selling of houses	-to encourage the private construction firms to participate in the housebuilding business	**1978** 1993 (revised)	-to mitigate firms' financial difficulty
• issuance of debentures	"	**1989**	"
(3) Regulations on production process			
• installation of arterial facilities	-to protect society from the activities of opportunistic firms	**1978-** 1988-	-delay of business -interruption of business chance **entry barrier**
• regulations on the scale of houses	-to expand the small-scale house for low-income household	**1973** 1988 (strengthened)	-increase of overhead cost -influence on profitability
• obligatory supply ratio of small-scale houses	- "	**1979** 1981, 1993 (strengthened)	-influence on cost & profitability -influence on marketability of the houses -interruption of business chance
(4) Regulation on the product			
• sale price regulation house price ceiling system	-to stabilise housing price	**1977** 1982 (strengthened)	-interruption of business chance -influence on profit -influence on housing quality and R&D investment
• adjusted construction cost system	-to expand the production of housing -to persuade the housebuilding firms participating in the housing project	**1989+**	-influence on profitability

* bold year means firstly enforced year of each regulation.

Appendix 2 Contents of research, data source and research methodology

Research areas	Contents	Data source and research methodology
Housebuilding business (business level analysis)	-business objectives -business strategies -governance structure .in-house activity/ subcontracting	-interview survey .total 24 firms (10 designated firms, 12 registered firms, and 2 small housebuilders) -secondary data
Cost efficiency of the housebuilding business (business level analysis)	-cost structure analysis	-statistical analysis from secondary data .total 823 firms .6 time period (1986-1994)
Diversification strategy (firm level analysis)	-diversification status .the extent of diversification .the pattern of diversification -performance analysis -relationship between diversity and performance -development of diversification index -motivation of diversification	-descriptive analysis from secondary data (KSIC data) .total 143 firms .4 time period (1980-1995) -financial ratio analysis from secondary data .total 143 firms .3 time period (1985, 1990, 1995) -ANOVA analysis from secondary data -same as the above -statistical analysis from secondary data .total 143 firms .3 time period (1985, 1990, 1995)
Economic efficiency of diversified firms (firm level analysis)	-cost structure analysis of multi-product firms .economies of scale .economies of scope .cost complimentarity .optimum scale	-statistical analysis from secondary data .total 318 firms .3 time period (1993, 1994, 1995)

Appendix 3 Interviewed firms

Designated firms

	Establi-shed year	Main business regions	Nature of firm	Capital (100million won)	Total sales (100million won)	Housebuilding sales (100million won)	Average number of houses built (3 years)
1.Hyundai Sanup	1986	Seoul	Subsidiary of big business group	720	15,457	10,000	23,000
2.Daewoo	1984	Seoul	Subsidiary of big business group	5,654	21,082	4,026	20,700
3.Samick	1968	Seoul	Independent firm	240	4,250	1,216	2,935
4.Kaeryong	1970	Daejeon	Subsidiary of big business group	343	1,610	520	620
5.Chunggu	1973	Daegu	Subsidiary of big business group	700	5,734	3,589	5,146
6.Sunkyung	1962	Seoul	Subsidiary of big business group	554	8,218	2,085	4,580
7.Sinhan	1968	Seoul Kyunggi	Independent firm	395	2,168	896	985
8.Daedong	1987	Seoul, Chang-won	Independent firm	100	2,239	733	2,360
9Woobang	1978	Daejeon Seoul	Subsidiary of big business group	265	5,728	3,766	7,800
10.Dongsin	1977	Seoul	Independent firm	700	1,988	1,395	2,000

Registered firms

	Establi -shed year	Main business regions	Nature of firm	Capital (100million won)	Total sales (100million won)	Housebuilding sales (100million won)	Average number of houses built (3 years)
1.Korea S	1989	Seoul	Subsidiary of big business group	572	4,324	2,372	7,768
2.Duckwon	1983	Seoul	Independent firm	25	4	2	223
3Woolim	1991	Seoul, Kyunggi	Independent firm	53	420	420	1,002
4.Kumsung backjo	1984	Daejeon	Independent firm	36	254	150	50
5.Sinho	1987	Daejeon	Independent firm	155	980	700	615
6.Dongmoon	1984	Seoul Kyunggi	Independent firm	50	651	584	564
7. Booyoung	1983	Seoul Kyunggi	Independent firm	110	1,191	877	6,800
8.Taesan	1985	Seoul Kyunggi	Independent firm	52	462	438	789
9.Soehae	1984	Seoul, Kyunggi	Independent firm	37	733	715	568
10.Dongsung	1984	Seoul, Kyunggi	Subsidiary of big business group	150	2134	1,106	1,580
11.Saewon	1980	Chungju Kyunggi	Independent firm	-	446	381	68
12.Saekyung	1946	Seoul, Kyunggi	Independent firm	-	128	28	97

Appendix 4 Questionnaire for Interview Survey

I. Output

1.How many houses did you build in recent years ?

(unit: dwellings, starting base)

	1990	1991	1992	1993	1994	1995
Apartment						
Row house						
Multi family unit in a private house						
Single detached house						

2. How much were total sales in 1985, 1990, 1995 ? (million won)

3. How much were housebuilding sales in 1985, 1990, 1995 ? (million won)

4. How much were net profits in housing sales in 1985, 1990, 1995 ? (million won)

5. What were the ratios of 'development type work' and 'contracting type work' among the total sales ?

(unit: %)

	1985	1990	1995
Development type work			
Contracting type work			
Total sales			

II. Labour force and contracting

1. How many employees do you have at present ?

	Office manpower	On-site manpower	Total manpower
Main office -office -on-site			
Local subsidiaries -office -on-site			

2. Approximately what percentage (%) of your work is normally carried out by

(a) labour-only-contractors?

(b) supply-fix-contractor ?

3.What is contracting ratio in each work ?
Please choose major contract type in each work.
(labour-only-contract or supply-fix-contract)

(unit: %)

	Contracting ratio	Supply-fix-contract	Labour-only-contract
Foundation work (& piling work)			
Excavation work			
Reinforcing concrete work (steel work)			
Brick laying & stone work			
Plaster & water proof work			
Internal work (heat insulation, windows, glazing, furniture)			
Painting & colouring work			
Landscaping			

4. Are you operating a 'partnering system' with your subcontractors ?

5.How many 'collaborators' do you have ?

6. Who is the most influential decision maker in choosing collaborators ?

(1) top manager
(2) housebuilding division manager
(3) on-site manager

7.What are the items you consider when you choose collaborators?

(1) construction output /experience
(2) management skill (financial state, labour management, safety management)
(3) technology /skill retained (number of technicians, skilled labour)
(4) equipment and plant retained
(5) ability of manager and human relationship
(6) others ?

8. How long have you worked with your collaborators (on average) ?

9. What kind of support are you providing to your collaborators?

(1) favourable payment method (i.e. cash payment, financial support)
(2) transfer and provision of technology
(3) employees' training or education
(4) others

10.What kind of pricing method do you usually use when you contract with your collaborators ?

(1) private contract
(2) estimated cost or average cost
(3) competitive bidding among nominated bidders
(4) competitive bidding(lowest tendering method)

11. How satisfied are you with your collaborators or subcontractors ?

III. Residential Land

1. How much residential land have you retained ?

(pyong)

	Area
Seoul	
Capital region	
Largest 5 cities	
Other areas	
Total	

1 pyong=3.3 m^2

2.What is the ratio of public/private land which you have worked ?

	1990	1991	1992	1993	1994	1995
Public land						
Private land						

3. What is the most important thing to be considered when you buy land ?

4. Do you have an opinion about the government's land regulation ?

IV. Construction Materials

1. What is the purchasing source of each of the construction materials? (please show in percentage)

	Purchase directly from manufacturers	Retailers/ agency	Contracting	In-house production	Production within own business group
Cement					
Remicon					
Reinforcing bar					
Aggregates					
Concrete file					
Panel wood					
Sanitary fixture					
Window, glazing					
Cement block					

2. Who is the person in charge of purchasing materials?

(1) material division in main office under purchase plan.
(2) on-site manager whenever necessary.
(3) others

3. How frequently do you purchase materials ?

(1) Daily/weekly
(2) Monthly
(3) Bi-annually
(4) annually
(5) anytime when necessary

4. Are there any materials you produce within your firms or within your business group ?
If yes, what kind of materials?

5.Do you have any manufacturing factory for pre-fabricated materials?
If yes, how much are you producing per year?

6. Are you operating a 'partnering system' with material manufacturers ?

7.How many material collaborators do you have ?

8. How long have you worked with your collaborators (on average) ?

9. What kind of support are you providing for your collaborators?

V. Business Objectives and Strategies

1. What are the objectives of the housebuilding business ?
   Please choose two items in order of priority.

(1) profit maximisation	
(2) high growth	
(3) sales maximisation	
(4) increase of market share	
(5) extension of business areas	
(6) continuous growth	
(7) acceptable return	
(8) quality of performance	
(9) honesty and high reputation in the business	
(10) good relationship with other workforce, modernisation of production etc.	

2. What are the strategies you are pursuing in order to achieve the business objectives ?
   Please write two in order of priority.

3. Was there any change in the business objectives and strategies during the 1980s and 1990s ?

VI. Future plan

1.If your firm is a subsidiary of a business group, are there any other businesses within your group related to housebuilding?
If yes, what business ?

2.Are you operating any other businesses within your firm ?

3. Do you have any plans to start new business in the future ?
If you have such plans, what kind of business are you interested in ?

4. What is the reason ?

VII. Do you have any opinions about the government's regulation ?

Appendix 5 Estimated cost function and share equations of apartment housebuilding

1 Estimated cost function of apartment building

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	1.47406	0.018143	81.248	0.0001
Log Y	-0.000355	0.001972	-0.18	0.8573
LogW1	0.255903	0.006954	36.798	0.0001
LogW2	0.222174	0.006459	34.397	0.0001
LogW3	0.311128	0.007857	39.597	0.0001
LogW4	0.160967	0.00602	26.74	0.0001
LogW5	0.049828	0.00339	14.699	0.0001
$\frac{1}{2}(\log W1)^2$	0.168297	0.002026	83.082	0.0001
LogW1*LogW2	-0.057319	0.001326	-43.227	0.0001
LogW1*LogW3	-0.075768	0.001306	-58.015	0.0001
LogW1*LogW4	-0.034469	0.001295	-26.622	0.0001
LogW1*LogW5	-0.000741	0.000718	-1.032	0.3023
$\frac{1}{2}(\mathrm{Log}W2)^2$	0.125464	0.001437	87.298	0.0001
LogW2*LogW3	-0.048385	0.001157	-41.835	0.0001
LogW2*LogW4	-0.017178	0.001007	-17.065	0.0001
LogW2*LogW5	-0.002582	0.000541	-4.774	0.0001
$\frac{1}{2}(\mathrm{Log}W3)^2$	0.143171	0.001355	105.652	0.0001
LogW3*LogW4	-0.014313	0.001108	-12.914	0.0001
LogW3*LogW5	-0.004704	0.000629	-7.474	0.0001
$\frac{1}{2}(\mathrm{Log}W4)^2$	0.06742	0.001361	49.529	0.0001
LogW4*LogW5	-0.001461	0.000571	-2.557	0.0108
$\frac{1}{2}(\log W5)^2$	0.009487	0.000392	24.2	0.0001
LogY*LogW1	**0.00033**	0.000522	0.633	0.5273
LogY*LogW2	**0.000904**	0.000471	1.92	0.0553
LogY*LogW3	**-0.002182**	0.000598	-3.647	0.0003
LogY*LogW4	**0.001235**	0.000419	2.943	0.0034
LogY*LogW5	**-0.000286**	0.000238	-1.202	0.2297
$(\mathrm{Log}Y)^2$	**0.000263**	0.000237	1.109	0.2676
T	**-0.006849**	0.003701	-1.851	0.0647
LogY*T	**0.000243**	0.00021	1.159	0.2468
LogW1*T	**-0.003566**	0.000451	-7.913	0.0001
LogW2*T	**0.001789**	0.000377	4.748	0.0001
LogW3*T	**0.003152**	0.000479	6.587	0.0001
LogW4*T	**-0.001503**	0.000353	-4.257	0.0001
LogW5*T	**0.000127**	0.000204	0.623	0.5337
T*T	**0.000885**	0.000459	1.93	0.054
Adjusted R^2		0.9927		
Durbin-Watson		1.668		

Y: sales
W1:materials W2:labour W3:subcontracting W4:overhead W5:plant
T: Time

2 Material factor share equation estimation

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	0.255903	0.006954	36.798	0.0001
LogW1	0.168297	0.002026	83.082	0.0001
LogW2	-0.057319	0.001326	-43.227	0.0001
LogW3	-0.075768	0.001306	-58.015	0.0001
LogW4	-0.034469	0.001295	-26.622	0.0001
LogW5	-0.000741	0.000718	-1.032	0.3023
LogY	0.00033	0.000522	0.633	0.5272
T	-0.003566	0.000451	-7.913	0.0001
Durbin Watson	1.475			

3 Labour factor share equation estimation

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	0.222174	0.006459	34.397	0.0001
LogW1	-0.057319	0.001326	-43.227	0.0001
LogW2	0.125464	0.001437	87.298	0.0001
LogW3	-0.048385	0.001157	-41.835	0.0001
LogW4	-0.017178	0.001007	-17.065	0.0001
LogW5	-0.002582	0.000541	-4.774	0.0001
LogY	0.000904	0.000471	1.92	0.0553
T	0.001789	0.000377	4.748	0.0001
Durbin-Watson	1.532			

4 Overhead factor share equation estimation

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	0.160967	0.00602	26.74	0.0001
LogW1	-0.034469	0.001295	-26.622	0.0001
LogW2	-0.017178	0.001007	-17.065	0.0001
LogW3	-0.014313	0.001108	-12.914	0.0001
LogW4	0.06742	0.001361	49.529	0.0001
LogW5	-0.001461	0.000571	-2.557	0.0108
LogY	0.001235	0.000419	2.943	0.0034
T	-0.001503	0.000353	-4.257	0.0001
Durbin-Watson	1.56			

5 Plant factor share equation estimation

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	0.049828	0.00339	14.699	0.0001
LogW1	-0.000741	0.000718	-1.032	0.3023
LogW2	-0.002582	0.000541	-4.774	0.0001
LogW3	-0.004704	0.000629	-7.474	0.0001
LogW4	-0.001461	0.000571	-2.557	0.0108
LogW5	0.009487	0.000392	24.2	0.0001
LogY	-0.000286	0.000238	-1.202	0.2297
T	0.000127	0.000204	0.623	0.5337
Durbin-Watson	1.78			

Appendix 6 Operational definition of financial ratios

		Calculation method
Profitable ratio	Net profit to total assets	Net profit before tax/ average assets between beginning and end of year
	Ordinary profit to total assets	Ordinary profit / average assets between beginning and end of year
	Net profit to equity capital	Net profit before tax/average equity capital between beginning and end of year
	Ordinary profit to equity capital	Ordinary profit /average equity capital between beginning and end of year
	Net profit to total sales	Net profit before tax/ total sales
	Ordinary profit to total sales	Ordinary profit / total sales
	Interest cost to sales	Financial expenses/ sales
Asset utilisation ratio	Turnover to total assets	Net sales/ total assets
	Turnover to capital	Net sales/ capital
	Turnover to net working capital	Net sales/ net working capital (current assets + current debt)
	Turnover to fixed assets	Net sales/ net fixed assets
Financial structure measures	Net worth(equity) To total assets ratio	Equity capital / total assets* 100
	Debt ratio	Total liability/ total assets* 100
	Current ratio	Current assets/ current liabilities * 100
	Fixed ratio	Fixed assets/ capital *100
	Fixed assets to long term capital ratio	Fixed assets/ (capital +fixed liabilities) *100
Growth measures	Total assets growth ratio	((total assets in the end of year/ total assets in the end of preceding year)-l)* 100
	Equity capital growth ratio	((equity capital in the end of year/ equity capital in the end of preceding year)- 1)* 100
	Net sales growth ratio	((net sales in the end of year/ net sales in the end of preceding year)-l)* 100
	Ordinary profit growth ratio	((ordinary profit in the end of year/ ordinary profit in the end of preceding year)- I)* 100
	Net profit growth ratio	((net profit in the end of year/ net profit in the end of preceding year)-1)* 100

Appendix 7 Estimated multi-product cost functions

1 Cost function of total firms

- Seemingly unrelated regression estimation

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	0.499082	0.475209	1.05	0.2951
LogY1	0.565653	0.050474	11.207	0.0001
LogY2	0.684407	0.07028	9.738	0.0001
LogY3	-0.111638	0.030302	-3.684	0.0003
$1/2(\log Y1)^2$	0.167961	0.004727	35.534	0.0001
LogY1*logY2	-0.175835	0.005025	-34.993	0.0001
LogY1*logY3	0.001335	0.002031	0.657	0.5118
$1/2(\log Y2)^2$	0.155188	0.006739	23.029	0.0001
LogY2*logY3	0.006296	0.002612	2.41	0.017
$1/2(\log Y3)^2$	0.006568	0.001506	4.363	0.0001
LogW1	0.29209	0.016709	17.481	0.0001
LogW2	0.217515	0.029605	7.347	0.0001
LogW3	0.259681	0.020861	12.448	0.0001
LogW4	0.230713	0.019818	11.642	0.0001
$1/2(\log W1)^2$	0.170457	0.002691	63.337	0.0001
LogW1*logW2	-0.010628	0.002528	-4.204	0.0001
LogW1*logW3	-0.066633	0.002583	-25.793	0.0001
LogW1*logW4	-0.093196	0.002289	-40.716	0.0001
$1/2(\log W2)^2$	0.009394	0.004614	2.036	0.0434
LogW2*logW3	0.003279	0.003318	0.988	0.3244
LogW2*logW4	-0.002045	0.003084	-0.663	0.5081
$1/2(\log W3)^2$	0.159393	0.004213	37.829	0.0001
LogW3*logW4	-0.096039	0.002795	-34.364	0.0001
$1/2(\log W4)^2$	0.19128	0.003495	54.728	0.0001
LogY1*logW1	-0.003602	0.001256	-2.868	0.0047
LogY1*logW2	0.000277	0.00211	0.131	0.8957
LogY1*logW3	-0.003536	0.001495	-2.364	0.0192
LogY1*logW4	0.006861	0.00144	4.766	0.0001
LogY2*logW1	0.007921	0.001468	5.395	0.0001
LogY2*logW2	-0.012835	0.002505	-5.123	0.0001
LogY2*logW3	0.00052	0.001761	0.295	0.7682
LogY2*logW4	0.004393	0.001689	2.601	0.0101
LogY3*logW1	-0.001423	0.000722	-1.972	0.0502
LogY3*logW2	-4.84E-05	0.001286	-0.038	0.97
LogY3*logW3	0.008015	0.000878	9.127	0.0001
LogY3*logW4	-0.006543	0.000851	-7.688	0.0001
Adjusted R^2		0.981		
Durbin-Watson		1.556		

-Material factor share equation estimation (SH1)

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	0.29209	0.016709	17.481	0.0001
LogW1	0.170457	0.002691	63.337	0.0001
LogW2	-0.010628	0.002528	-4.204	0.0001
LogW3	-0.066633	0.002583	-25.793	0.0001
LogW4	-0.093196	0.002289	-40.716	0.0001
LogY1	-0.003602	0.001256	-2.868	0.0046
LogY2	0.007921	0.001468	5.395	0.0001
LogY3	-0.001423	0.000722	-1.972	0.05
Durbin-Watson		0.966		

-Labour factor share equation estimation (SH2)

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	0.217515	0.029605	7.347	0.0001
LogW1	-0.010628	0.002528	-4.204	0.0001
LogW2	0.009394	0.004614	2.036	0.0431
LogW3	0.003279	0.003318	0.988	0.3242
LogW4	-0.002045	0.003084	-0.663	0.508
LogY1	0.000277	0.00211	0.131	0.8956
LogY2	-0.012835	0.002505	-5.123	0.0001
LogY3	-4.84E-05	0.001286	-0.038	0.97
Durbin-Watson		1.261		

-Fixed factor share equation estimation (SH3)

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	0.259681	0.020861	12.448	0.0001
LogW1	-0.066633	0.002583	-25.793	0.0001
LogW2	0.003279	0.003318	0.988	0.3242
LogW3	0.159393	0.004213	37.829	0.0001
LogW4	-0.096039	0.002795	-34.364	0.0001
LogY1	-0.003536	0.001495	-2.364	0.0191
LogY2	0.00052	0.001761	0.295	0.7681
LogY3	0.008015	0.000878	9.127	0.0001
Durbin-Watson		1.453		

2 Cost function of small/ medium firms

-Seemingly unrelated regression estimation

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	-4.969102	2.790233	-1.781	0.0909
LogY1	1.256688	0.278909	4.506	0.0002
LogY2	0.929829	0.325561	2.856	0.0101
LogY3	0.034673	0.12563	0.276	0.7855
$1/2(\log Y1)^2$	0.127441	0.020195	6.31	0.0001
LogY1*logY2	-0.199093	0.016641	-11.964	0.0001
LogY1*logY3	-0.005677	0.007531	-0.754	0.4602
$1/2(\log Y2)^2$	0.160754	0.023684	6.788	0.0001
LogY2*logY3	0.001561	0.009305	0.168	0.8685
$1/2(\log Y3)^2$	0.003373	0.006556	0.514	0.6129
LogW1	0.330614	0.05372	6.154	0.0001
LogW2	0.531183	0.101381	5.239	0.0001
LogW3	0.090538	0.064561	1.402	0.1769
LogW4	0.047665	0.072354	0.659	0.5179
$1/2(\log W1)^2$	0.162302	0.005138	31.59	0.0001
LogW1*logW2	-0.013743	0.004909	-2.799	0.0114
LogW1*logW3	-0.067501	0.004539	-14.871	0.0001
LogW1*logW4	-0.081058	0.004311	-18.801	0.0001
$1/2(\log W2)^2$	-0.008599	0.009939	-0.865	0.3977
LogW2*logW3	0.008851	0.006333	1.398	0.1784
LogW2*logW4	0.013491	0.006813	1.98	0.0624
$1/2(\log W3)^2$	0.168322	0.0068	24.753	0.0001
LogW3*logW4	-0.109672	0.004723	-23.22	0.0001
$1/2(\log W4)^2$	0.17724	0.006575	26.955	0.0001
LogY1*logW1	-0.010129	0.00296	-3.422	0.0029
LogY1*logW2	-0.006301	0.005404	-1.166	0.258
LogY1*logW3	0.006819	0.003505	1.945	0.0667
LogY1*logW4	0.009612	0.00382	2.516	0.021
LogY2*logW1	0.009122	0.004014	2.272	0.0349
LogY2*logW2	-0.027772	0.00741	-3.748	0.0014
LogY2*logW3	0.005705	0.004844	1.178	0.2534
LogY2*logW4	0.012945	0.005206	2.486	0.0224
LogY3*logW1	0.001392	0.001793	0.776	0.4472
LogY3*logW2	-0.006434	0.003333	-1.93	0.0686
LogY3*logW3	0.007901	0.002155	3.667	0.0016
LogY3*logW4	-0.002858	0.002368	-1.207	0.2423
Adjusted R^2	0.96			
Durbin-Watson	1.466			

-Material factor share equation estimation (SH1)

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	0.330614	0.05372	6.154	0.0001
LogW1	0.162302	0.005138	31.59	0.0001
LogW2	-0.013743	0.004909	-2.799	0.0074
LogW3	-0.067501	0.004539	-14.871	0.0001
LogW4	-0.081058	0.004311	-18.801	0.0001
LogY1	-0.010129	0.00296	-3.422	0.0013
LogY2	0.009122	0.004014	2.272	0.0277
LogY3	0.001392	0.001793	0.776	0.4415
Durbin-Watson		1.628		

-Labour factor share equation estimation (SH2)

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	0.531183	0.101381	5.239	0.0001
LogW1	-0.013743	0.004909	-2.799	0.0074
LogW2	-0.008599	0.009939	-0.865	0.3913
LogW3	0.008851	0.006333	1.398	0.1688
LogW4	0.013491	0.006813	1.98	0.0536
LogY1	-0.006301	0.005404	-1.166	0.2495
LogY2	-0.027772	0.00741	-3.748	0.0005
LogY3	-0.006434	0.003333	-1.93	0.0596
Durbin-Watson		1.685		

-Fixed factor share equation estimation (SH3)

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	0.090538	0.064561	1.402	0.1674
LogW1	-0.067501	0.004539	-14.871	0.0001
LogW2	0.008851	0.006333	1.398	0.1688
LogW3	0.168322	0.0068	24.753	0.0001
LogW4	-0.109672	0.004723	-23.22	0.0001
LogY1	0.006819	0.003505	1.945	0.0577
LogY2	0.005705	0.004844	1.178	0.2448
LogY3	0.007901	0.002155	3.667	0.0006
Durbin-Watson		1.536		

3 Cost function of large firms

-Seemingly unrelated regression estimation

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	-10.70179	3.848098	-2.781	0.0087
LogY1	1.477095	0.342532	4.312	0.0001
LogY2	1.854868	0.344934	5.377	0.0001
LogY3	0.129067	0.093598	1.379	0.1767
$1/2(\log Y1)^2$	0.095649	0.013243	7.222	0.0001
LogY1*logY2	-0.195173	0.020639	-9.456	0.0001
LogY1*logY3	-0.003033	0.004338	-0.699	0.489
$1/2(\log Y2)^2$	0.072526	0.014078	5.152	0.0001
LogY2*logY3	-0.011335	0.004634	-2.446	0.0196
$1/2(\log Y3)^2$	0.006713	0.001956	3.431	0.0016
LogW1	0.461426	0.041755	11.051	0.0001
LogW2	-0.013247	0.083454	-0.159	0.8748
LogW3	0.392932	0.047611	8.253	0.0001
LogW4	0.158889	0.05468	2.906	0.0063
$1/2(\log W1)^2$	0.170796	0.003962	43.109	0.0001
LogW1*logW2	0.002569	0.004215	0.609	0.5462
LogW1*logW3	-0.059897	0.00419	-14.295	0.0001
LogW1*logW4	-0.113467	0.00369	-30.75	0.0001
$1/2(\log W2)^2$	-0.008997	0.009186	-0.979	0.3341
LogW2*logW3	0.007892	0.005632	1.401	0.1699
LogW2*logW4	-0.001463	0.005598	-0.261	0.7953
$1/2(\log W3)^2$	0.153677	0.007804	19.692	0.0001
LogW3*logW4	-0.101671	0.00462	-22.005	0.0001
$1/2(\log W4)^2$	0.216601	0.005461	39.663	0.0001
LogY1*logW1	-0.014878	0.002978	-4.996	0.0001
LogY1*logW2	0.020573	0.005853	3.515	0.0012
LogY1*logW3	-0.012908	0.003124	-4.132	0.0002
LogY1*logW4	0.007214	0.003743	1.927	0.0621
LogY2*logW1	0.001731	0.002007	0.862	0.3943
LogY2*logW2	-0.008161	0.00403	-2.025	0.0505
LogY2*logW3	-0.000671	0.002204	-0.305	0.7624
LogY2*logW4	0.007101	0.002669	2.661	0.0117
LogY3*logW1	-0.002321	0.000776	-2.99	0.0051
LogY3*logW2	0.001294	0.001612	0.803	0.4275
LogY3*logW3	0.00467	0.000857	5.447	0.0001
LogY3*logW4	-0.003643	0.001029	-3.542	0.0011
Adjusted R^2		0.9571		
Durbin-Watson		1.409		

-Material factor share equation estimation (SH1)

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	0.461426	0.041755	11.051	0.0001
LogW1	0.170796	0.003962	43.109	0.0001
LogW2	0.002569	0.004215	0.609	0.5444
LogW3	-0.059897	0.00419	-14.295	0.0001
LogW4	-0.113467	0.00369	-30.75	0.0001
LogY1	-0.014878	0.002978	-4.996	0.0001
LogY2	0.001731	0.002007	0.862	0.3917
LogY3	-0.002321	0.000776	-2.99	0.004
Durbin-Watson		1.179		

-Labour factor share equation estimation (SH2)

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	-0.013247	0.083454	-0.159	0.8744
LogW1	0.002569	0.004215	0.609	0.5444
LogW2	-0.008997	0.009186	-0.979	0.3311
LogW3	0.007892	0.005632	1.401	0.166
LogW4	-0.001463	0.005598	-0.261	0.7947
LogY1	0.020573	0.005853	3.515	0.0008
LogY2	-0.008161	0.00403	-2.025	0.0471
LogY3	0.001294	0.001612	0.803	0.4251
Durbin-Watson		1.39		

-Fixed factor share equation estimation (SH3)

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	0.392932	0.047611	8.253	0.0001
LogW1	-0.059897	0.00419	-14.295	0.0001
LogW2	0.007892	0.005632	1.401	0.166
LogW3	0.153677	0.007804	19.692	0.0001
LogW4	-0.101671	0.00462	-22.005	0.0001
LogY1	-0.012908	0.003124	-4.132	0.0001
LogY2	-0.000671	0.002204	-0.305	0.7616
LogY3	0.00467	0.000857	5.447	0.0001
Durbin-Watson		1.611		

4 Cost function of very large firms

-Seemingly unrelated regression estimation

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	6.119841	2.657146	2.303	0.0267
LogY1	-0.370683	0.238061	-1.557	0.1275
LogY2	0.586277	0.24465	2.396	0.0215
LogY3	0.077909	0.088102	0.884	0.382
$1/2(\log Y1)^2$	0.218402	0.012359	17.672	0.0001
LogY1*logY2	-0.144644	0.013856	-10.439	0.0001
LogY1*logY3	-0.005419	0.005707	-0.95	0.3482
$1/2(\log Y2)^2$	0.134546	0.012385	10.864	0.0001
LogY2*logY3	0.000275	0.006057	0.045	0.964
$1/2(\log Y3)^2$	0.002207	0.004361	0.506	0.6156
LogW1	0.217684	0.04345	5.01	0.0001
LogW2	0.266277	0.058891	4.522	0.0001
LogW3	0.308747	0.041036	7.524	0.0001
LogW4	0.207291	0.039522	5.245	0.0001
$1/2(\log W1)^2$	0.178886	0.003484	51.347	0.0001
LogW1*logW2	-0.003256	0.00344	-0.947	0.3496
LogW1*logW3	-0.07143	0.003214	-22.224	0.0001
LogW1*logW4	-0.1042	0.002967	-35.121	0.0001
$1/2(\log W2)^2$	0.008764	0.004976	1.761	0.086
LogW2*logW3	0.005518	0.003339	1.653	0.1064
LogW2*logW4	-0.011026	0.003374	-3.268	0.0023
$1/2(\log W3)^2$	0.146572	0.005268	27.821	0.0001
LogW3*logW4	-0.08066	0.004152	-19.426	0.0001
$1/2(\log W4)^2$	0.195886	0.005216	37.552	0.0001
LogY1*logW1	0.00667	0.002534	2.632	0.0121
LogY1*logW2	-0.005571	0.003411	-1.633	0.1105
LogY1*logW3	-0.011969	0.002389	-5.01	0.0001
LogY1*logW4	0.01087	0.002324	4.678	0.0001
LogY2*logW1	0.005322	0.002493	2.135	0.0391
LogY2*logW2	-0.011831	0.003374	-3.506	0.0012
LogY2*logW3	-0.000782	0.0023	-0.34	0.7356
LogY2*logW4	0.007291	0.002273	3.208	0.0027
LogY3*logW1	-0.005909	0.001206	-4.9	0.0001
LogY3*logW2	0.002204	0.00163	1.352	0.1842
LogY3*logW3	0.013969	0.001103	12.661	0.0001
LogY3*logW4	-0.010264	0.001083	-9.481	0.0001
Adjusted R^2		0.9748		
Durbin-Watson		1.06		

-Material factor share equation estimation (SH1)

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	0.217684	0.04345	5.01	0.0001
LogW1	0.178886	0.003484	51.347	0.0001
LogW2	-0.003256	0.00344	-0.947	0.3472
LogW3	-0.07143	0.003214	-22.224	0.0001
LogW4	-0.1042	0.002967	-35.121	0.0001
LogY1	0.00667	0.002534	2.632	0.0105
LogY2	0.005322	0.002493	2.135	0.0364
LogY3	-0.005909	0.001206	-4.9	0.0001
Durbin-Watson		1.079		

-Labour factor share equation estimation (SH2)

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	0.266277	0.058891	4.522	0.0001
LogW1	-0.003256	0.00344	-0.947	0.3472
LogW2	0.008764	0.004976	1.761	0.0827
LogW3	0.005518	0.003339	1.653	0.1031
LogW4	-0.011026	0.003374	-3.268	0.0017
LogY1	-0.005571	0.003411	-1.633	0.1071
LogY2	-0.011831	0.003374	-3.506	0.0008
LogY3	0.002204	0.00163	1.352	0.181
Durbin-Watson		1.052		

-Fixed factor share equation estimation (SH3)

Variables	Parameter estimate	Standard error	T for H0: parameter=0	Prob > |T|
INTERCEPT	0.308747	0.041036	7.524	0.0001
LogW1	-0.07143	0.003214	-22.224	0.0001
LogW2	0.005518	0.003339	1.653	0.1031
LogW3	0.146572	0.005268	27.821	0.0001
LogW4	-0.08066	0.004152	-19.426	0.0001
LogY1	-0.011969	0.002389	-5.01	0.0001
LogY2	-0.000782	0.0023	-0.34	0.7348
LogY3	0.013969	0.001103	12.661	0.0001
Durbin-Watson		1.522		

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