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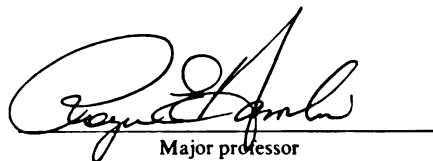
Housing Investment in Developing Countries:
The Case of Korea

presented by

JeHoon Lee

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Social Science



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ABSTRACT

**HOUSING INVESTMENT IN DEVELOPING COUNTRIES:
HOUSING INVESTMENT IN DEVELOPING COUNTRIES:
THE CASE OF KOREA**

By

Je-Hoon Lee

A DISSERTATION

Submitted to
Michigan State University
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1995

Korea's macroeconomic plans are linked to housing conditions, development, and operation of housing plans has **ABSTRACT** that has been organized through a series of five year plans. Central economic structures of development have a strong impact on private sector in **HOUSING INVESTMENT IN DEVELOPING COUNTRIES: THE CASE OF KOREA** strong linkages with the macroeconomy. Both of these circumstances have a significant impact on the general components of the Korean housing system.

By

New predictive have **Je-Hoon Lee**

determinants of residential investment in Korea are income, population, and effect on housing services. The main contribution by this dissertation is the addition of macroeconomic and

international, domestic, and political context to empirical analysis and interpretation of housing investment in policy was formulated.

An additional contribution is systematic analysis and description of housing policy in Korea as a case study. The example of Korea allows us to examine the results of forty years of housing investment in a country in its middle stage of development. An assessment of Korea's present housing situation reveals housing regression analysis are used to assess the impact of macroeconomic factors on investment to be inadequate and this has caused distortions in the housing market, data from Korea covering the period 1960-1990 are used to examine the relationship thereby lowering the consumption of housing services in a market faced with growing empirical relationships. Results show that housing investment in Korea is increasingly demand.

explained by levels of income, military spending, policy in housing, housing policy, foreign affairs, and global context of finance.

A general review of housing theory discloses that more and better housing is used as a solution to societal stress, and that state intervention is justified in the provision of housing. However, although existing models for housing investment are related to overall allocation of resources in a country, they failed to adequately consider macroeconomic factors.

Korea's macroeconomic plans are linked to housing conditions, development, and operation of housing plans based on policy, that has been organized through a series of five year plans. Central organizing structures of development have a strong impact on private sector housing investment, and also strong linkages with the macroeconomy. Both of these circumstances indicate a significant impact on the general components of the Korean housing market.

New predictive models developed in this dissertation, which define the determinants of residential construction investment, reveal a statistically significant effect on housing sector. These results are made more meaningful by adding international, domestic, and institutional variables to the context in which housing policy was formulated.

Analysis shows a statistically significant relationship between historical patterns of investment in housing sector and the structure of Korea's total investment. Based on theoretical framework, factor analysis, Pearson Correlation Analysis, and stepwise regression analysis are used to select variables. Regression models using time-series data from Korea covering the period of 1953-1993 are estimated to establish the empirical relationships. Results show that housing investment in Korea is statistically explained by levels of income, military spending, political stability, housing policy, foreign affairs, and global context of finance.

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CHAPTER ONE: INTRODUCTION

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LIST OF ABBREVIATIONS

BOK	Bank of Korea
CPI	Consumer price index
EPB	Economic Planning Board
GNP	gross national product
KDB	Korea Development Bank
KHB	Korea Housing Bank
KLDC	Korea Land Development Corporation
KNHC	Korea National Housing Corporation
M ₁	narrow money supply (currency plus demand deposits of the deposit money banks)
M ₂	broad money supply (M ₁ plus time and savings deposits at the deposit money banks)
MHA	Ministry of Home Affairs
MOC	Ministry of Construction
MTI	Ministry of Trade and Industry
NHF	National Housing Fund
NICs	the Newly Industrializing Countries

CHAPTER ONE

INTRODUCTION

1. Overview of the Study

Urban housing problems are among the most severe issues confronting nations world wide. Both developed and developing countries presently lack sufficient and affordable housing. In market based societies, the profit motive directs builders toward high end products, while low profits derived from low cost housing discourage investment. Government subsidy to housing faces problems of sustainability and social stratification. While such issues are gaining global attention, there has been little systematic analysis and development of models to achieve answers. Those that have, emerged tend to limit their perspective to selected criteria without considering broader contextual issues affecting government from within and without.

This dissertation empirically examines housing investment using Korea as a case study. Housing investment is one of the fundamental housing activity measurements at the macro level. It represents the magnitude of aggregate housing fluctuations and "reflects housing policies in the public and private sector" (Chang, 1986:4). It can be measured in terms of the total output of capital investment¹ or dwelling unit production,

¹ Housing investment includes "not only new construction but also capital spending on the alteration and modernization of existing dwellings." (Burns and Grebler, 1986: 138)

or that total as a percentage of gross domestic product² (GDP) or gross national product³ (GNP). This measure represents the overall performance⁴ of a housing industry⁵ and housing production and is a useful tool of comparison between different periods and between countries.

The research investigates a theoretical foundation by reviewing existing theories and literature concerned with housing investment with respect to overall allocation of resources in a country. This approach includes broader contextual variables such as level of income, military spending, political stability, housing policy effect, foreign affairs, and global context of finance.

The example of Korea⁶ allows us to examine the results of housing investment in a country in its middle stage of development, a condition of many developing countries. An assessment of Korea's present housing situation reveals housing investment to be inadequate and this has caused distortions in the housing market, thereby lowering the consumption of housing services in a market faced with growing demand.

To identify problems of overall housing investment, the question of policy and related decision-making processes must be addressed. It is essential to take a

² The gross domestic product is a "measure of total output in national income and product accounting". It includes exports but excludes imports. The gross national product takes account of the excess of imports over exports or the excess of exports over imports (Burns and Grebler, 1977: 45)

³ The gross national product is the aggregated value of all goods and services produced annually in the nation.

⁴ The yardstick for measuring the performance of the housing sector is shifted from the number of newly built units, the conventional standard, to residential investment. Because investment in monetary calculation reflects quality changes and assessment the future of housing markets.

⁵ Housing industry includes "all firms which share in the receipts of expenditures for housing." (Shih, K. 1990:1)

⁶ This dissertation deals exclusively with South Korea; I will use the term Korea in stead of South Korea. So, all references to Korea in the thesis are to South Korea

methodological approach that takes into account multidisciplinary and comprehensive relation to national policy and economic development. This approach needs to recognize a model for describing and predicting the cause-and-effect relations between economic growth and housing investment. We consider the interdependency of various components and aspects of the housing sector in the national economy as another determining factor associated with the functioning of complex housing policy backgrounds.

Analysis of the role of the housing sector in economic development has been a controversial issue, because most housing studies in Korea to date are descriptions of general housing policies, analyzing housing supply and demand or, case studies of specific geographical areas. Few empirical analyses use rigorous analytical frameworks. In the area of housing investment, there is only one systematic empirical study⁷ which has the historical pattern of housing investment at the national context been observed in Korea. However, this study has limited its analytical tool. This fact led to the fact that current empirical knowledge far too inadequate to understand the nature of housing investment.

To achieve the goal of understanding economic factors shaping the nature of housing investment and problems in Korea, this study incorporates into the investigation the determinants of housing investment at a large scale that previously attempted. It is at the national policy level. Housing policy was considered not as a separate issue but as one of many policies in national politics, and bureaucratic

⁷ Renaud's study (1980), for more detail see Chapter Three

structure. The scale of this approach takes in the international pressures and context applied by Korea's economic integration in to a global market. By making explicit comparisons among different sectoral policies, the effect of competition among sectors and resulting impact on the housing sector is discernible.

To comprehend the historical development of housing policies, this study follows the evolution of policies over time, identifying influences by political and economic transformations and resulting investment shifts for military, social welfare and environment. The effects of such influences are expected to emerge as interruptions, in continuities or fluctuations in housing policies.

An interdisciplinary approach permits the combination of a broad range of qualitative and quantitative analyses associated with politics, economics, and planning. A broad survey of literature reveals qualitative inquiries are based sociohistorical interpretations, and documentation. For quantitative analysis, a new model based on historical data of housing investments was developed. It includes international comparisons where appropriate. The results gained by different disciplinary and analytical approaches are compared for consistency of observation. The relative significance of housing situations is determined by comparing the results of the Korea study with that of other countries to assess the reliability and usefulness of results.

Finally, the observations yielded by this analysis have been brought together for policy recommendations. Through a comprehensive study the results are reinterpreted policy implications are suggested and some generalizations made.

2. Statement of the Problem

2.1. Objectives of the Study

Korea has shown substantial economic growth during the last three decades. In this regard, much scholarly attention (Brown, 1973; Cole and Park, 1983; Mason, 1980; Lim: 1991; Kuznets, 1988:11-45; Balassa, 1988:273-290; Chan, 1991:79-103) has been directed toward Korea as one of the Newly Industrializing Countries (NICs) to explore the nature and extent of this rapid growth. A careful survey of the current literature reveals that the development experience of Korea has been the foundation of theory building for economic growth.⁸ Yet Korea's housing market conditions have remained unsatisfactory⁹ (Renaud, 1992). In contrast to the continued emphasis on economic development in the current literature, the role of the government housing sector is rarely discussed. This study is an effort to fill this gap of at least partially.

In sum, this dissertation focuses on Korea's housing investment policy based on the following issues and research questions:

- What are the current housing investment policies and problems?
- How can we explain the determinants of housing investment?
- How have urbanization and political and economic policies influenced housing conditions and policies?
- What are the patterns of housing investment?
- What housing policies should Korea consider in the future and what role should the government play?
- What lessons can we learn from Korean housing investment experiences?

2.2. Effects on Economic Development in Korea

⁸ Most studies have focused on the "strong" and "developmental" state. However, recently a few studies try to find how the state changed as a result of development. For more detail see Kim, Eun Mee, 1992.

⁹ Renaud criticized restriction of housing finance by the government is the main reason for inefficiency of the Korean housing market. For more details see Kim. K. Y. 1988 and Lee. K. and Sohn. 1989.

3. Objectives of the Study

The main objective of this study is to provide a comprehensive analytical framework for determining the causes of housing investment, fluctuations of housing investments and housing policy in Korea. This study is important not only because it clarifies trends and determinants of housing investment but also because it provides some insights into the housing development in developing countries.

Political and economic factors are more difficult to define. Yet, in developing housing investment framework, they are the main features of housing in Korea over several distinctive periods since 1953. They have molded the greater investment policies, which have then affected housing. Therefore, it is essential to investigate the larger context and its effect on housing investment and policy development in Korea to if one is to create an effective analytical tool or predictive model.

For the purposes of theoretical discussion, this study primarily reviews the theories on housing investment and their relationship to macroeconomy policy and investments with levels of economic growth and government intervention in the housing sector. Moreover, housing investment models which represent empirical explanations can be derived from analysis of housing market and the linkage between housing spending and macroeconomics policies. More specifically, this study seeks to evaluate empirically the actual housing investment effects on economic development in Korea.

This empirical housing investment analysis and its interpretation also describe and evaluate other experiences of NICs and China in order to understand housing policy and development in those countries. Few studies explain the housing problems in a developing countries by looking at the government's policies on a macro level. In addition, this study attempts to investigate to inspect housing policies in a social-historical context, and to provide empirical evidence for the conceptual model by using economic and statistical analyses of Korean housing problem. The conceptual and empirical models could be used for other developing countries to test for generalization.

4. Methodology

The key method of analysis is based on multiple regression analysis and time series analysis. The Pearson correlation analysis and factor analysis are used in conjunction with the Burns and Glebler model (BG), which is taken as starting point, and hereafter is referred to as BG Model. The BG model associates levels of housing investments with levels of economic development, levels of urbanization, and natural population growth.

BG analysis has the advantage of simplicity but lacks of a comprehensive scope that takes into account political and socioeconomical factors. Although its shortcomings were acknowledged, it is still worthwhile as a regression model to acquire a base analysis for this empirical work. From this point of departure, theories of government intervention in housing markets and correlation to macroeconomic policies are used to

develop an improved model of housing investments. The new model considers the impacts of political-economic factors by examining the role of international, domestic, and institutional arrangements in housing policy formulation. The improved model takes into account current conditions of the Korean housing market and Korean housing policies and relates them to historical context. With this model we may address the question, How do macroeconomic policies and urbanization affect housing investment and to what extent may the pattern of housing investment undergo change?

By developing theoretical and empirical models, the impacts of political-economic factors on housing investment in Korea have been tested. In addition, economic, political, and social variables affecting the level of total housing investment are investigated with respect to internal social structures and governmental formations that have influenced levels of housing investments by relying on the utility maximization model approach as a theoretical guideline.

6. Research Context

5. Scope of the Study

This study examines the housing policies, political, and economic development of Korea as well as the decision process supporting its housing policy for a relatively short but significant period from 1953 to 1993. During this period Korea has engaged in an aggressive program of national and international economic integration as an independent state.

Korea is unique in many ways, not only in its historical background and in the impact of external influences on recent development, but also because, in spite of such peculiarities, Korea is a typical replication of Western-style economic and social development, seemingly fitting into the capitalistic development path of traditional developmental ideals. Most of all, Korea's intensive economic growth within such a short period provides a rare opportunity to study a full range of aspects of housing investment and housing policy development.

Some scholars of past housing investment studies in developing countries (M. H. Lee, 1990, Renaud, 1990) have been concerned about the lack of valid and constant data for research. In the case of Korea, there are some difficulties finding data that relate to the proportion of informal housing, such as squatters and illegal constructions, which are not recorded in the housing investment accounts (Renaud, 1980). Such omissions can bias a time series study and this should be considered carefully.

6. Research Context

This dissertation is divided into seven chapters. The Research Design Flow Chart in Figure 1 shows general research directions.

Chapter Two: General Theoretical Framework and Literature Review of Housing Theories

Chapter Two is devoted to a general literature review of housing theories and discussion of urban housing studies in Korea with a view to housing intervention in

relation to economic development theories. Current housing investments theories are explained with a critique in terms of resource allocation and with notes concerning the main role of governmental in the housing market. The key of this review is to classify housing theories in relation to national economic development.

Chapter Three: Existing Housing Investment Models

This chapter describes and verifies the reliability of existing housing investment models, including BG model and hypotheses. It focuses on the usefulness of these models for evaluating political development, economic policy, and urbanization, as they have influenced the historical development of housing policies in relation to economic development in developing countries.

Chapter Four: Background of Housing Market: Dimension and Pattern of Housing Development

This chapter addresses three questions: What are the current housing investment policies and problems?, What housing policies should Korea consider in the future? and What lessons can we learn from the Korean experience?

This chapter also investigates how Korea's macroeconomic plans have been linked to housing conditions and to development and operation of housing plans. Korean housing policy issues are explained in the context of social and economic transformation, which provide a link between the macroeconomy and that of the general components of housing markets. Major housing problems are identified in relation to housing investment.

Chapter Five: Models of Housing Investment in Korea *(Testing Korean housing policies)*

This chapter critically examines the reliability of the hypotheses.

Chapter Five answers three questions: How can we explain the determinants of housing investment? How have urbanization and political and economic policies influenced housing conditions and policies? and What are the patterns of housing investment?

This chapter presents a quantitative analysis of housing investment. Economic models are constructed to explain the historical pattern of the housing sector's behavior in investment. The empirical results are used as a basis for commenting on major housing policies, including housing construction plans, and the pattern and determinants of housing investment in Korea. Relationships between housing investments and key economic and demographic variables are described along with elasticities regarding housing investments. Comparisons are made between results of the Korean data and that of previous studies from other countries, including comparison of income elasticities for housing investment.

Chapter Six: Testing Models of Housing Investment in Korea.

Chapter Six provides hypotheses and its interpretation by testing regression analysis concerning housing investment models characteristic of Korean housing policies during the period of investigation. This chapter identifies how Korea's macroeconomics policies in turn have influenced housing policies. Special attention is given to the impact on housing policies of certain economic policies with respect to stabilization policy and anti-speculation measures. In this framework, problems of dominance and consistency among various policies are reviewed, and tested with

variables for urbanization and population as factors affecting Korean housing policies.

This chapter critically examines the reliability of the hypotheses.

Chapter Seven: Conclusion and Future Directions

This chapter provides a summary of the study's major findings. The limitations of explanatory models are addressed and offer a conclusion of this study. Policy recommendations for Korea and some general observations are suggested with the future goals.



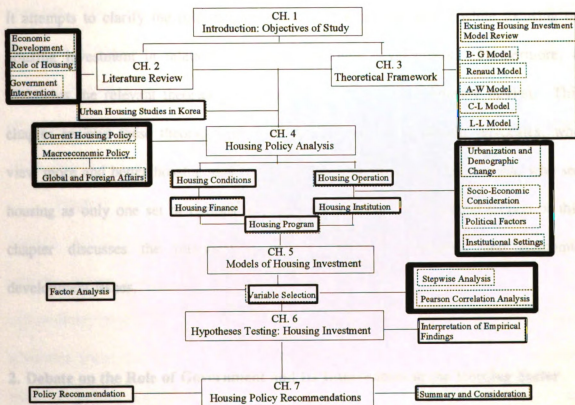
CHAPTER TWO

13

GENERAL THEORETICAL FRAMEWORK AND LITERATURE REVIEW OF HOUSING THEORIES

1. Introduction

Figure 1 Research Design



aggravated already serious dwelling shortages in developing countries since the 1930's.

Persistent dwelling shortages have resulted in deteriorating living conditions for the

GENERAL THEORETICAL FRAMEWORK AND LITERATURE REVIEW OF HOUSING THEORIES

Justifying housing

1. Introduction

This chapter reviews and evaluates the existing framework for housing theory. It attempts to clarify the role of government in the housing sector while focusing on housing investment in relation to national economic development. Furthermore, it highlights the relevant theories concerning intervention in the housing market. This chapter reviews these theories both from the perspective of housing advocates, who view more and better housing as a solution to societal stress, and economists, who see housing as only one set of options to social development. The second section of this chapter discusses the relationships between housing investment and economic development issues.

extraordinary pace of urbanization in the 1950's and 1960's, the housing sector has become

advocates argue that as the housing situation worsens, the need for government intervention

2. Debate on the Role of Government and Its Intervention in the Housing Sector

more compelling. Levels of social stress, urbanization, and housing shortages are just the

poor, and the housing situation is the most serious threat to the well-being of the

In developing countries, the role of government and its intervention in the housing sector during various phases of economic growth is a subject plagued with controversy concerning the position of housing in resource allocation. Yet housing issues have acquired paramount importance. Massive rural-urban population shifts have

aggravated already serious dwelling shortages in developing countries since the 1950's. Persistent dwelling shortages have resulted in deteriorating living conditions for the poor and have contributed to general increases in social stress.

2-1-1. Housing Advocates

Housing advocates and urban planners have fully recognized these development problems. They have engaged in a lively debate with economists about the optimal allocation of scarce resources for residential construction to relieve rising problems. Housing advocates are convinced that better dwellings and neighborhoods are the most effective and direct means of improving the human condition (Burns and Grebler, 1977: 100-103). They assign a high priority to housing for its own sake.

Housing subsidies for the poor have been proposed as a means to "correct unequal income distribution" in developing countries (*ibid.*:101). Support for this strategy comes from the urgent realities of rapid population growth and the extraordinary pace of urbanization in most parts of the developing world. Housing advocates argue that as the housing shortage worsens, the need for shelter becomes more compelling. Levels of societal stress increase, affecting everyone, not just the poor. In addition to its high social utility, housing advocates claim that improved shelter will contribute to political stability by moderating frustration with the slow tempo of betterment in their general living conditions (Howenstine, 1957: 26).

To support their premise, housing advocates argue that residential construction absorbs large quantities of labor with minimal input of scarce capital. In addition to the favorable labor-capital ratio, construction offers rural migrants a port of entry to the urban labor market and provides opportunities for the acquisition of skills. It has been pointed out that housing construction may employ the vastly underutilized pools of human and national resources available in low-income countries, and at zero or near-zero opportunity cost (Burns and Grebler, 1977).

The problem with this approach is that long term planning objectives can be sacrificed to short term goals driven by numbers of households.¹⁰ This fact can lead to improper standards¹¹ and the imposition of consumption¹² patterns that intended beneficiaries might not choose if offered alternatives. Since households do not have a housing problem as much as an income problem, a better recourse is more options. Such an alternative depends on greater knowledge of the housing market structure and respect for profit related alternatives.

When approaching the problem of quickly increasing housing units, decisions based on the aggregate level can lead to overestimates of the total volume of resources which "should" be available to the housing sector. With rushing of large scale housing

¹⁰ A 'household' is defined as 'two or more persons living together with common housekeeping or a person living alone who is responsible for providing his or her own meals.' The definition of households varies from census to census in Korea. The basic definition is that a household is defined as a group of persons sharing living quarters and households expenditures. The censuses also distinguish between ordinary households and quasi-households.

¹¹ For example, in regard to squatter settlements, we have to consider Turner's (1967, 1970) notion that government policies aggravated housing problems and disregarded the economic and social needs of the poor. Turner proposes applying site and service programs instead of providing housing as an end product. In the Korean case, the majority of squatter settlers move to the city seeking jobs, not housing.

¹² Consumption is defined as final consumption expenditure of residential households for new durable and non-durable goods and services less the net sales of second-hand goods, scrap, and wastes.

projects there is a good chance that few "high quality" (i.e., "high standards") or more desirable forms of housing investment will be produced. The end result is often a misallocation of resources within a context of no overall increase in the total volume of investment.

3. Relevant Theories on Housing Investment in the Housing Market

2-1-2. General Economists

In contrast, economists traditionally view housing as but one of many alternative uses of scarce resources, and not necessarily one deserving high priority. From their perspective, residential building may have a favorable labor-capital ratio, but its capital-output ratio is unfavorable in comparison to many other investments. The basis of their argument is whether rent or rental value is considered an adequate measure of housing output. In this situation, residential construction shows an unusually high capital-output ratio and consequently a long capital-recapture period (ibid.: 101).

Among economists, benefit cost or capital-output ratio provide a basis for a theoretical justification of delaying government action on housing investment. In other words, housing is considered welfare spending with an excessively high capital-output ratio. It is seen as an option that less developed countries could not possibly afford until enough productive industrial capital had been secured (Strassman, 1993).

Economists who deal with thirty year perspectives come into conflict with planners whose views often extend to much longer periods. Developing nations are receiving apparently good but conflicting advice based on length of perspective. The

question is which will make great progress: 1) by concentrating on capital outlays yielding a more rapid flow toward other purposes as well as for housing; or 2) a greater social investment where true cost of residential improvements may be measured in terms of the benefits foregone in capital outlay alternatives.

3. Relevant Theories on Housing Intervention in the Housing Market

In the preceding section of this chapter we see that both planners and economists view housing intervention as a justifiable economic strategy, but with differing outcomes, depending on the long- or short- term of analysis. Another consideration is the impact of market imperfections which produce and distribute housing services. Such imperfections are found in the existence of a social demand curve reflecting internal unperceived benefits to housing consumers, which it perceived would remove reason for public programs. Government intervention would be substantially necessary if the market mechanism assured optimal allocation to housing¹³ (Burns and Grebler: 102-125).

The general conditions for optimality have long since been established in economic theory. On the demand side, consumers will allocate their budgets in a way that equalizes the marginal utility of expenditures for all goods and services. They will spend more on goods and services yielding greater satisfaction and less on those of smaller utility, until the satisfaction gained is equalized over the whole spectrum of

¹³ The theory of housing intervention assumes that housing fits the general criteria for justifiable intervention that have been established by modern economists. This theory analyzes the imperfections of the markets which produce and distribute housing services.

consumption possibilities. On the supply side, output will be allocated in a way that equalizes profit rates. Resources will be shifted from the production of goods and services yielding lower profits to those yielding higher profits, until rates of return are equalized. These simplified abstractions will hold in practice only if several conditions are met.

The conditions for transforming the theory of allocation into practice apply to housing as they do to all other goods and services. Housing markets must operate efficiently. Consumers must know the utility of housing services relative to alternative objects of spending, and investors must have accurate information on rates of return on housing relative to other investments. The benefits must fully accrue to the demanders and suppliers of housing services. These conditions are unlikely to be met in the real world because of the cost of information, which requires expenditure of time, energy, and/or material resources.

Furthermore, the characteristics of housing such as its obvious indispensability, immobility, durability, and externality deter optimal allocation of resources in competitive markets. The above facts points to a strong presumption that the market mechanism fails to assure optimal allocations to housing.

3-1. State Intervention

Several standards are commonly imposed to judge whether state intervention is warranted in the provision of goods and services. The question is whether housing

qualifies under any of the standards specified below. Burns and Grebler identify four major characteristics of standards: (1) merit goods, or public goods (2) goods distributed unequally (3) large projects and economies of scale, and (4) market imperfection.

3-1-1. Public Goods

The economic theory of public goods supports the foundations of government intervention in the housing provision. By definition, public goods have two aspects that differ from those of private goods involving characteristics behind their production and consumption. First of all, public goods can be characterized by their nonrival consumption or use at a given level of production among the people, i.e., consumption by one person need not diminish the quantity consumed by anyone else. In other words, a number of people may simultaneously use the same goods without interfering with others' use even though it may still be possible for one person to use the goods while others do not. The second characteristic of public goods is nonexclusion. This means that it is impossible, or prohibitively costly, to confine the benefits of the goods (once purchased) to selected persons. A person will then benefit from production of the goods regardless of whether or not he pays for them. Consequently, public goods are not marketable (Browning and Browning, 1979: 23-25).

Without any provision for coercion, each individual will not participate in cost sharing for public goods because there is no incentive for him or her to do so. In other

words, each individual will be better off by choosing non-participation as his "dominant strategy" regardless of the others' choices. "The rational economic response to such a situation is to refuse to pay for public goods" (Hula, 1988:6).

Because of these characteristics of public goods, it is difficult to expect that public goods can be provided by the private market at an optimal level. If provided voluntarily by a few contributions, they will nonetheless remain rare and insufficient.

When we assume a society has utilized all its available resources, there will then exist a boundary of the possible maximum level of the production of goods (production possibility frontier). Accordingly, if we categorized all goods supplied in a society as public and private goods, then there will be numerous possible combinations of the two types of goods to achieve the *Pareto Equilibrium*. According to this above discussion, housing is a private good, but sometimes it is necessary to be provided by the public sector.

3-1-2. Distributional Justice

The market has little to do with equity. The problems of the market associated with public goods and externalities are essentially concerned with the question of efficiency - how to allocate resources in a productive way. There is a public consensus that "fairness in income distribution is a desirable social characteristic that can be consumed jointly by all members of the society." (Lim, 1988: 102) In attempting this goal, some policy objectives should be targeted for those who are unable to compete in the market. In this case, government intervention in the lower income housing markets

would be justified as an aim to assist individuals and groups suffering economic hardships and/or social inequalities because of the inequality of the housing stock distribution. In this way the government could stand in affordable housing by intervening in market processes (Merret, 1979).

3-1-3. Large Projects and Economies of Scale

Intervention at too small a scale does not alleviate the problem but still consumes state resources without the benefit. Therefore, public support may be justified for projects requiring substantial investment in order to generate any return, or for projects characterized by substantial internal scale of economies. State intervention under this criterion appears justified for two important activities related to housing. First, land assembly in quantities sufficient to permit large-scale, comprehensive redevelopment may be possible only by a government expanding its broad financial base and exercising its right of eminent domain. Public support of urban renewal has been justified on this criterion. Second, public subsidy may be required to mobilize adequate resources for experimentation in building technology or for demonstrations of new and risky types of housing projects that otherwise may not gain public acceptance.

3-1-4. Market Failure

Market mechanisms do not inevitably work well and indeed often fail in the absence of state support. The nonexclusive and nonrival characteristics of public goods

are responsible for market failure. Moore (1978: 391) defines market failure as the inability of a market economy to allocate goods efficiently or to distribute them in a manner society deems equitable. Head (1974) states, "The causes of market failures may be classified in three broad categories: nonappropriability, large numbers, and imperfect information." Nonappropriability means that it is impossible for producers or consumers to appropriate the full social costs or benefits of their production or consumption. To a large extent, the concept of nonappropriability is equivalent to the nonexclusive property of public goods already mentioned and what economic literature refers to as externalities, spillover, or neighborhood effects

The existence of externalities is another rationale for public intervention into the housing market. The problem of large numbers constitutes a second cause of market failure. The third cause of market inefficiencies is imperfect information. To make decisions about the future, individuals and firms need accurate information. To the extent that this information is uncertain, inaccurate, unavailable, or expensive, one should expect decisions to be less efficient. The nonexclusive and nonrivalrous nature of public goods is likely to cause goods information to be undersupplied.

The existence of market failure is a necessary condition for government intervention in housing markets. Therefore, by the transitive property, the existence of public goods is a necessary but not a determining condition for government intervention. The theory of public goods and their responsibility for market failure provides the basis for a theoretical justification of public intervention and planning in the housing sectors. Furthermore, it expands to the issues of housing provision with the notion of economic efficiency and social equity.

3-1-5. Prisoner's Dilemma

Without cost sharing, each rational individual stops purchasing additional amounts of goods to maximize benefits when the marginal cost is equal with his marginal utility, regardless of the benefits the group might receive from that purchase. The result is suboptimal. Incidentally, this result is the same as the "prisoner's dilemma" in game theory, where resources used to increase the production of goods in the public sector will be available only at the price of contracting other goods in the private sector.¹⁴

In other words, when we assume that society produces only two goods, public and private, in addition to the previous assumptions, i.e., nonexclusiveness as well as the efficiency of government, it is possible to have an exchange rate between public goods and private goods. This is the social rate of substitution between the public goods and private goods we assumed on the basis of the above.

Individuals will stop purchasing public goods when marginal costs equal marginal benefits, and they will enjoy extra benefits from the public goods supplied by others as "free riders". They know they cannot be prevented from benefiting even if they do not pay. Participation for individuals will require members to bear costs, even though it is surely more desirable for the increase of benefits to society as well as to each individual by supply of optimal public goods.

¹⁴ In this regard, Samuelson (1954:387-389) set a condition for the optimality of public goods' production. He showed that a different pricing rule would be optimal for goods subject to nonrivalry consumption.

One sure way to solve the under-optimal production problem is through coercion. Actually, government financing of public goods with taxes can be seen as an efficient instrument to overcome the free-rider problem (Browning and Browning, 33). To finance public goods, we have to compete by relying upon tax revenues as levied in a political process (Heilbrun, 1981: 426-431).

However, the real problem is that coercive pricing on public goods through taxes does not necessarily solve the under-optimal production problem stated above, even though this intervention will generally be beneficial to more individuals of society.¹⁵ In relation to the argument, policy makers can decide on the nature and extent of intervention in the housing sectors.

4. The General Theories on Housing Investment in Relation to National Development.

The stage of national development is one of major factors in housing investment. There are several major housing theorists who have proposed stages of output allocation for housing with respect to the general stages of economic development (Howenstine, 1957, Donnison, 1967, Kuznets, 1960, Rostow, 1971 and Strassman, 1970). Their findings point out that stage of housing investment is geared to levels of general development (Chang, 1986).

¹⁵ McKean states (1965:496-505) that a democratic voting procedure somewhat succeeds in registering citizen preferences for public goods in the same way the market does for private ones.

In relation to the stages of economic growth, Rostow (1971, 1990:420-21) defines five stages: (1) the traditional society, where the major source of employment is farming, (2) pre-conditions for takeoff, (3) economic takeoff, (4) stages of economic maturity, and (5) the stage of mass consumption. When a country is in the stage of economic takeoff, a primary city exists in a nationally defined urban system.

According to Rostow's stages of economic growth, Korea is in the stage of economic maturity. This stage is characterized by the fact that the economy successfully passes the takeoff stage and begins to allocate 20 to 30 percent of the total output to maintain the process of economic development, and allocates the rest for welfare programs such as housing and medical services.

Strassman (1970) suggests a theory of general development and housing investment. He proposes that levels of economic development define the resources allocated for housing investment. The rate of residential construction is slow in both poor and advanced economies due, in part, to the lack of capital in the former and the decrease in population growth in the latter. Middle-income economies have the highest rates of residential construction because building materials and technology are domestically produced; also, entrepreneurs and labor are free to enter the housing market through their tests of the share of housing construction cost compared to GDP. Strassman's findings also lead to the conclusion that housing investments potentially can increase continually along with a growing national income.

Howenstine (1957) describes the relationship between housing investment and housing consumption and begins with the proposition of three stages of economic development. The first stage is the traditional society, where the major source of employment is farming. The second stage is the pre-conditions for takeoff, where the economy begins to allocate resources to maintain the process of economic development. The third stage is the economic takeoff, where the economy begins to allocate 20 to 30 percent of the total output to maintain the process of economic development, and allocates the rest for welfare programs such as housing and medical services.

development (Burns and Grebler, 1976:100). They are priority of resource allocation, stewardship, and the necessity of housing. Generally resource allocation for construction resources is the major target objective, intended to build factories and other essential producers' goods. Housing investment could be allowed only to the extent necessary for the success of this objective. Then, in the following step, housing investment should be expanded to the meet the 'minimum standard of health and decency'- given the problems of existing unemployment and underemployment can be solved- and workers are provided with the necessary capital. In the final stage, it is necessary to invest in housing. The improvement of housing conditions should be a major policy goal.

Donnison (1967:75-78) also suggests a three-stage scheme similar to Howenstine's, but places greater emphasis on central planning. Donnison defines the stages of economic growth as (1) early stages of industrial growth and urbanization, (2) economic growth, and (3) economic stages of maturity.

In the first stage, the investment priority should be placed on education, industrial investment, health, and defense. In relation to planning, the first priority can enforce minimum standards for urban planning. In the second stage, there is a trend in which the rate of population growth has been decreased, and individual incomes are increasing. Social needs can be obtained through a properly organized building industry. In addition, the resources can allow builders to contribute to the housing sector. Governmental set-up of a subsidy system for better housing for workers could be implemented from the beginning of the second stage. In the last stage, the pressure to meet the needs of special groups, such as large families and the elderly, is applied to

government. Howenstine and Donnison have in common that their research has partly theoretical characteristics, and that they are internal to state allocation and address housing at a national scale. Donnison's stage scheme identifies that Korea is in the last stage, and the government should actively take responsibility for the solution of the housing problems. The government should start to focus on the needs of special groups such as large families, the elderly, and handicapped. Therefore, housing investment is to be a major policy goal.

Kuznets (1960), a traditional economist, states his empirical estimates of the correlation between housing investments and levels of economic growth. He also recognizes the role of political institutions in macroeconomic development plans. He argues that governments should have blueprints for economic growth to ensure economic development. From his analysis of cross-section post-war data covering 34 countries, Kuznets proposes a positive correlation between per capita income and the ratio of the total construction investment to gross domestic product. According to his estimation, "for the lowest income groups in the sample, total construction averaged 8.5 percent of gross domestic product. In the next two income ranges, construction increased to 11.0 and 11.9 percent"(Burns and Grebler, 1977:21).

For the share of housing in construction investment, he states that the lowest income countries are 30.3 percent and the middle income countries are 42.5 percent. Kuznets attributes the generally rising trend to supply considerations: dwelling costs have risen relative to other construction costs. He later modifies his argument by reporting on a longitudinal analysis of data for 11 developed countries. This finding

suggests that on the supply-side the cost of housing is relatively high compared to that of construction cost, and that on the demand-side the rates of population growth decreases explain the diminishing need for housing. The cross section covers a broad development spectrum, with the developed nations at the upper end of that distribution.

CHAPTER THREE

EXISTING HOUSING INVESTMENT MODELS

1. Introduction

This chapter reviews the conventional model, a macro-level analysis of housing, developed by Burns and Grebler as a base with which to explain housing investment in a country. Since publication of their work, several studies have appeared which examine determinants of housing investment and its political impact on macroeconomic policies. The models reviewed are: Renaud's Model (1980), Annez and Wheaton's Model (1984), Chang and Linneman's Model (1990), and Lim and Lee's Model (1992). These studies have assumed that on the whole national housing investment is strongly affected by the level of economic development and associated with population and urbanization. In addition several urban housing studies conducted in Korea are also evaluated with respect to the above models. Therefore, this chapter serves as the theoretical foundation for the empirical analyses presented in Chapter Five and Six.

2. Existing Models in Housing Investments and Points of Departure

2-1. *Burns and Grebler's Model: Theoretical Model*

Burns and Grebler (1976) conduct an empirical model applicable to national housing investment and housing markets in developing and developed countries.¹⁶

They initially select per capita GDP, population growth, and urbanization levels to predict the percentage of the GDP represented by housing investments. Then, they associate levels of housing investments to the level of economic development. To interpret the housing problem in a given country, they use three independent determinants: (1) level of urbanization, (2) the status of the national economy, and (3) the social structure by cross-section analysis. They assume government actions affect housing investments and consumption.

Findings of BG model show that the share of housing construction in the total output of an economy is associated with the different levels of economic growth. They introduce a nonlinear relationship between housing construction and the production of an economy. Figure 2 indicates that the functions are truly parabolic, first rising, then peaking, and declining thereafter.

¹⁶ The countries included in their studies are listed in Appendix III.

The BG model is a structurally stable, using economic and demographic variables. It addresses three major theories that describe housing investments on a macro level concerning the proper size of housing in total output.

First, theoretical structure tests whether good housing directly improves human conditions.

Second, theoretical structure used to explain levels of housing investment is called the productivity theory of housing. It proposes that better housing will improve health and labor productivity.

Third, theoretical structure tests whether housing investment is closely related to the opportunity cost of capital in the country and the expected return on housing projects.

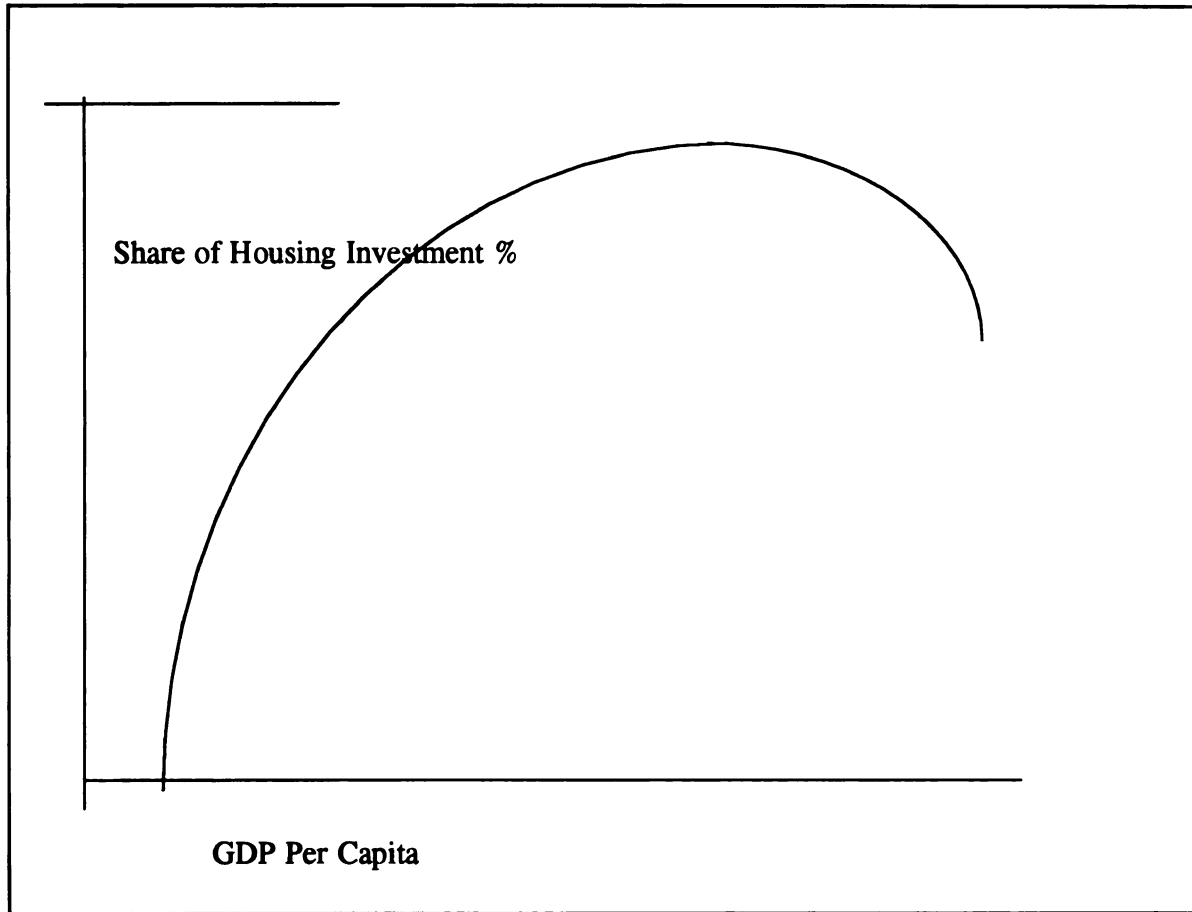
The first theoretical structure tends to insist on high housing standards that the poor do not afford and /or do not usually require. Such high standards as assumed by Burns and Grebler lead to problems of affordability and resource availability. Housing policies based on these theories produced fewer dwellings, thus exacerbating the housing problem.

The second argument relates to the fact that better housing improvements could be achieved with limited improvements in roads, water supply, drainage as well as public services. All of these will be accounted for social overhead in national accounts (Renaud 1980).

The third theoretical issue is the fact that the share of housing investment will increase when the scarcity of capita becomes less tense. This fact leads to the

conclusion that non-residential construction could yield higher returns to capital than housing.

Figure 2 The Nonlinear Relationship between Share of Housing Investment and GDP Per Capita



Source: Burns, L. and Grebler, L. "Resource Allocation to Housing Investment: A Comparative International Study." *Economic Development and Cultural Changes*, 25(1):95-121. 1976.

Table 1 Regression Analysis of Burns and Grebler's Model

$$H = \alpha + \beta_1 \text{ GDP} + \beta_2 \text{ GDP}^2 + \beta_3 \text{ DPOP} + \beta_4 \text{ DPOP}^2 + \beta_5 \text{ URB}^2$$

Dependent Variable

H: H is the share of housing in total output measured as average residential construction as a percentage of average annual gross domestic product.

Independent Variable

Y: GDP is development level measured as the average annual gross domestic product per capita

g: DPOP is the population growth measured as average annual rate of increase in national population

u: URB is urbanization measured as average annual rate of population increase in cities of 100,000 persons and over, divided by the average annual rate of increase in national population.

The abstract market analyses of BG model presented above (Table 1) are based on neo-classical economics whose model provides a very useful analysis for getting an idea of the determinants of housing investment. Therefore this model provides a valid a point of departure for a new approach, and establishes an overall picture of the role of government and its relation between economic development and population growth.

However, Burns and Grebler do not consider the specific way in which the government is related to social agents and institutional arrangements in the housing supply and planning. Even though the BG model has its clarity, it lacks specific institutional arrangements of the housing market, an omission which may lead to misunderstanding of the real situation. Improvement of the BG model should include the institutional arrangement for housing provisions.

2-2. Renaud's Model: A Model for A Single Country

Greater attention to economic variables has been found in studies published after the BG model. Renaud (1980) tested the housing investment model in Korea by focusing on variables of economic and financial conditions. These add a new dimension, which includes a contextual component addressing financial conditions and economic status.

Working with neoclassical economic assumptions, Renaud tried but failed to examine the changes in share of housing investment over the total output in Korea. He used a reduced form of the model and selected the per capita GNP as the economic indicator, finding a nonlinear relationship between the share of housing in the total output and GNP. Renaud tried to induce a more sophisticated model of housing finance to obtain a more effective explanation of the behavior of the housing share in the total output (Renaud, 1980: 397). Table 2 illustrates the overall summary of variables and the results of model specification.

In addition, Renaud's time-series study of Korea investigated the effect of the domestic savings ratio to the GNP and interest rates in an unregulated money market. His findings show that the existence of a non-linear increase of share of housing investments as the economy expands is supported.

However, there are apparent limits to the Renaud model. The variables used do not explain the behavior of the variation of housing investment, which is a significant

contextual factor. For example, domestic savings to GNP variable has related to the effects of multicollinearity because the variable is a ratio of GNP.

Renaud also failed to consider the specific institutional context of the housing financial situation in Korea. Even he has agreed that restriction of housing finance by the government is one of the main reasons for inefficiency in the housing market (*ibid.*: 397). His model simply explains the relation between two additional variables, such as the domestic savings rate and interest rates. We, therefore need a different framework of analysis to reach a better understanding of Korean housing.

Table 2 Regression Analysis of Renaud's Model

$$H = \alpha + \beta_1 \text{GNP} + \beta_2 \text{GNP}^2 + \beta_3 \text{DPOP} + \beta_4 \text{DPOP}^2 + \beta_5 \text{URB} + \beta_6 \text{URB}^2 + \beta_7 1/\text{GNP} + \beta_8 \text{DOMSAV} + \beta_9 1/\text{DOMSAV} + \beta_{10} \text{UMM}$$

Dependent Variable

H: H is the share of housing in total output measured as average residential construction as a percentage of average annual gross national product.

Independent Variable

Y: GNP is development level measured as the average annual gross national product per capita

g: DPOP is the population growth measured as average annual rate of increase in national population

u: URB is urbanization measured as average annual rate of population increase in cities of 100,000 persons and over, divided by the average annual rate of increase in national population.

domsav: ratio of domestic savings to GNP

umm: unregulated money markets¹⁷

¹⁷ Unregulated means that revolving around the private money market outside government control. For more details on the unregulated money market (UMM) in Korea see Yong-Chul Park.

Renaud analyzed four common nonlinear models for Korea. The four equations were as follows; quadratic form, reciprocal transformation, logarithm-inverse transformation, and a double log regression. After evaluating Korea's situation, he compared the results to BG's, as demonstrated in Table 3. Among four equations, Renaud showed that the reciprocal transformation and the logarithm-inverse transfer produced results consistent with the behavior of housing investment in Korea and also with the thirty-nine countries studied in BG's analysis (shown Table 4).

Table 3 Share of Housing in Total Output (SHTO): Korea Compared to Burns-Grebler Sample

Period	Population Growth Rate ¹⁾	Urbanization Indicator	Per Capita GDP ²⁾	SHTO actual	SHTO projected ³⁾	SHTO projected ⁴⁾ Korea Eq.5	SHTO projected ⁵⁾ Korea Eq.3
Post-War (1957-61)	2.98	1.88	144	1.51	2.85	1.46	1.4
1st Plan (1962-66)	2.59	2.17	165	1.73	2.95	1.79	1.89
2nd Plan (1967-71)	1.85	3.74	241	3.1	3.75	2.82	3
3rd Plan (1972-76)	1.98	2.64	357	3.77	5.75	3.89	3.79
4th Plan (1977-81)	1.59	2.2	865	3.6	4.55	6.15	4.9
B-G Sample	1.79	2.26	8.84	4.558	5.78	5.79	4.78

- Note: 1) 5 year average
 2) Constant 1970 US dollars
 3) Burns-Grebler Model
 4) Korea Equation 5: $Y = a - b/x$
 5) Korea Equation 3: $\ln Y = a - bx$
 6) Sample means for Group of 39 countries

Source: Renaud, Bertland. "Resource Allocation To Housing Investment: Comments and Further Results." *Economic Development and Cultural Change*, 28(2): 393 January 1980.
 Economic Planning Board, Korea Statistical Yearbook, 1982.

Table 4 Renaud's Estimated Regression Equations (Effects of Demographic Variables)

	constant	URB	URB ²	DROP	DROP ²	1/GNP	R ²	SEE ¹⁾	F-Value
(1)SHTO	-7.96 (3.28)	6.95 ²⁾ (2.49)	-1.06 ²⁾ (.45)	--	--	--	0.59	0.726	11.5
(2)SHTO	22.36 (5.56)	--	--	-15.36 ²⁾ (4.79)	2.81 ²⁾ (.99)	--	0.80	0.51	16.2
(3)SHTO	22.14 ²⁾ (9.87)	2.40 (6.90)	-0.45 (1.08)	-17.87 ²⁾ (3.34)	3.35 (1.46)	--	0.82	0.51	16.2
(4)SHTO	-2.70 (8.71)	2.27 (4.62)	-0.28 (3.44)	3.45 (6.83)	-0.21 (1.27)	34.04 ³⁾ (7.80)	0.93	0.34	33.1

Note: Numbers in parentheses are t-statistics.

1) SEE: standard error of estimate

2) Significance at 95 % level

Source: Renaud, Bertland. *ibid.* p.396

2-3. *Annez and Wheaton's Model: A Cross-National Context*

Annez and Wheaton (1984) propose a set of structural cross-sectional analyses models for housing investment in a cross-national context. First, they estimate the total growth in the housing stock and that portion of the growth that is recorded in GNP accounts. Second, they predict the average level of housing services among the newly constructed units and the price or cost of construction. They then assume that the share of housing investment equals the product of change in stock, average size, and cost, divided by GNP.

As endogenous variables, Annez and Wheaton estimate the growth of housing stock, the cost of new construction, and total volume of construction. In the case of

exogenous variables, they select demographic variables (population growth and household formation), policy variables (the cost and availability of credit, public housing production) and the level of income or economic development (GDP per capita or per household).

Annez and Wheaton's model¹⁸ is more comprehensive than the BG model; it is, however, more difficult to obtain some of the variables used in AW model, especially since they draw upon over 30 cross-country comparison studies.¹⁹

The results of their research are probably more important for their methodological implications than for their substantive interest. Aside from the problem of data collection, various countries differ in the importance of the variables. For example, the significance of interest rates and savings rates in housing investment can be interpreted differently in developed countries than in developing countries. In addition, Annez and Wheaton use abstract models to explain the relation between certain variables, whose applicability to the various countries' contexts, however, is not proven. Even though there are high correlation between housing supply ratio and per capita GNP, housing stock variable is not included in this conventional cross sectional housing investment studies. Nonetheless, they conclude that government intervention in the housing market has caused many problems that have contributed to a worsening housing situation.

¹⁸ Hereafter referred to as AW Model.

¹⁹ See Appendix III for the list of countries which are included in the Annez and Wheaton's model

2-4. *Chang and Linneman's Model: A Cross-National Context*

Chang and Linneman (1990) estimate alternative models of the growth rate of real housing investment. They analyze the different patterns of housing investment in Taiwan, Korea, Japan, and the United States. They introduce homeownership, dwelling size, and interest rates as independent variables. Using time series methods, they investigate reliable forecasting models for housing investment trends in each country. Their findings support the assumption by Buckley and Madhusudhan (1984) concerning financial deepening and inflation. In this respect, they demonstrate a clear relationship between official interest rates and change in housing investment in the United States, where a formal housing / financial market exists. While in Korea and Taiwan, because of the lack of a formal housing / financial market, official interest rates are not sensitive to the change of housing investment. Regardless of this difference, Chang and Linneman cannot explain causation for instability and distortion in housing market demonstrated in their findings, since they cannot analyze the specific institutional elements for housing investment.

2-5. Lim and Lee's Model: A Model for A Socialist Country

Lim and Lee (1993) conducted an empirical analysis of the historical trends of housing investment in a socialist country. They postulate economic and political variables to find out whether politics play any role in behavior of housing investment. In addition, they investigate the effect of social, political, and economic factors on consumption of housing in China. They present income elasticities using time-series and cross-section analysis. In order to overcome the problem of reliability of data, they supplement the total product of society and national income data. However, their model does not estimate the impacts of international and institutional elements in one country. International and institutional elements exercise major impacts on decision-making. It then affects housing investment and the provision of housing.

3. Previous Studies of Urban Housing in Korea

There are two major trends of urban housing studies in Korea. We can classify housing policy studies and housing market studies by making the following generalizations.

3-1. *Housing Policy Studies in Korea*

These policy-oriented housing studies were actively involved in the national debate on housing problems and policy formations in the 1960s and 1970s. At that time, research formats inclined toward a verbal description of housing policies or case studies focused on a specific topic or area.

According to Lim's classification (Lim 1987, 1988), housing policies can be divided into two major categories: explicit and implicit policies. Explicit housing policies have focused on solving housing problems directly. Low-income public housing²⁰ projects and housing finance plans are examples of such a policy application.

Implicit housing policy refers to the indirect impact on housing issues and policy by economic factors, including: taxes, military policy, and other investments, which since the 1960s have become increasingly complicated by housing stock shortages and affordability, two major issues needing to be incorporated into analysis of investment behavior.

Related to this, is the question of scale where one of the main policy concerns has been how many numbers of housing units should be built over a given period to reduce the housing shortage. Attempts to answer this question address have paid the most attention to changes in the housing supply ratio, while housing affordability has also been a policy concern. Since the 1960s, as implicit policy concerns, housing stock

²⁰ Public housing is defined as the housing initiated by public agency and included publicly funded private rental housing. (Ministry of Construction, 1989)

shortages and affordability could be identified as two major issues. Related to this, one of the main policy concerns has been how many numbers of housing units that should be built over a given period to reduce the housing shortage. Changes in the housing supply rate have been paid the most attention. Housing affordability has also been a policy concern.

3-2. Housing Market Studies in Korea

There are two major study topics on the housing market from the macro-level of analysis: 1) the working of the housing market; and, 2) the efficiency of government intervention in the market. The issues of housing market consist of demand, supply, and housing prices; while capital gains taxes and price control of newly built apartments are major discussions related to government intervention in the housing market in Korea.

Since the late 1970s, some scholars have begun to pay attention to housing markets as a topic (Follain et al. 1980, and Malpezzi et al, 1985). These contributions, like that of Chang and Linneman (1990) and Buckley and Madhusudhans (1984) successfully or not defined formal and informal housing market as factors against which to compare government intervention. After that, the number of housing market studies has increased, indicating a shift of concern from housing policies to the housing market influences. This transition seems to coincide with the introduction to the housing research of the neo-classical economics approach to analysis, a factor of

importance to the housing debate in Korea. Most neo-classical housing economists have insisted that government intervention is one of the causes of housing problems rather than a solution (Annesz and Wheaton, 1984).

In reviewing the urban housing studies in Korea (Table 5), we find that most studies have focused on the micro level of analysis. Though there are certain limitations concerning these studies, which attempt to analyze urban housing market studies, they provide depth and color to the more abstract macro-analyses.²¹ Most studies have focused on the equilibrium of supply and demand and estimation of housing demands by *ex ante* evaluation. Estimation of housing demand²² is the major study topic, followed by estimates for price and income elasticities of housing demand among the urban households in Korea.

Table 5 gives a selection of estimated income elasticities for housing demand and consumption. Variations among these values are wide. Using Korean data for 1972, Lluch et al. reported a fairly high value (2.48). In contrast, Mills and Song (1976), using Korean time-series data for the years 1962 to 1975, present the lowest value (0.027). Song and Struyk (1976), with Korean time-series data for the years 1960 to 1965 and 1966 to 1970 studying over 50,000 numbers of the urban area population using census data through 18 measurements presents 0.91 income elasticities and -2.42 price elasticities.

²¹ As macroeconomics studies, time series studies relating income and housing expenditure were conducted in the early 1960s.

²² The demand for housing reflects the willingness to pay for a set of attributes or services which are provided by the physical components of lot and housing structure. The most important of these attributes are access, space, tenure, on-site services, and shelter.

Sources of the variations are many. First of all, people living in different places at different times may not have an identical demand function. Second, the estimates may vary due to measurement errors. Third, specification biases could widen the gap between estimated elasticities among different studies. The third point is extremely important in interpreting the result of demand studies and searching for reliable estimates.

Follain, Lim, and Renaud (1980) analyze the Korean census data and obtain a price elasticity and an income elasticity respectively. They also define four determinants of home ownership in Korea. First, permanent income proves more influential than current determinants in home ownership decisions. The researchers find a close association between mobility and tenure status. A family living in a rental dwelling might be tempted to move. They compare Korean and U.S. data. They find that both income and price elasticities of housing demand are comparable in both countries. Income elasticity (0.57) is less than one, and price elasticity (-0.2) is negative or smaller than one in absolute value.

In addition, J. H. Kim (1983) analyzed a survey data and presents 0.09 ~ 0.24 income elasticities and -0.06 ~ -0.16 in price elasticities. This result shows abnormal inelasticity. Most of the housing market and demand studies strongly suggest that overall, the consumer demand for housing is not elastic with respect to both price and income. This implies that housing prices will depend upon not the quantities of excessive demand through market mechanism but control of the government and its

effect. It seems to me, without national estimates, the order of magnitude could be used for another country.

Table 6 lists estimated income elasticities for housing demand and consumption in selected countries. The table shows that most income elasticities fall between 0.5 and 1.00, suggesting that demand is inelastic. Compared to other countries, Follain et al.'s study (1976) estimated that demand is inelastic in Korea.

Table 5 Summary of Previous Housing Market Studies in Korea

Author	Income Elasticity	Price Elasticity	Data	Remark: independent variables
Song-Stryuk (1977)	0.91	-2.42	Time-Series and Cross-sectional analysis: 1960 ~ 1970	increasing rate of households
Mills- Song (1979)	0.027	-0.134	Time-Series: 1962-1975	total households
Follain et al. (1980)	0.57	-0.20 ~ -0.30	EPB special survey data in 1976	rate of housing shortage, number of households, the distance to the CBD
Jeong Ho Kim (1983)	0.09 ~ 0.24	-0.06 ~ -0.16	housing market and need analysis: 1982	size of household
Joon Soo Kim (1984)	1.14 ~ 1.18			
Kwan-Young Kim (1988)	1.726	Income Elasticity for Housing Demand: 1.536		

Source: Joon Soo Kim. "Time Series-Analysis of Determinants of Housing Supply-Demand in Korea." *The Study of Korea Development*, 5(4) 116, Korea Development Institute, 1983.

Table 6 Summary of Previous Housing Studies

Author	Place	Survey Year	Income Elasticity
Pooled owners and renters			
Howe and Musgrove	Guyaquil, Ecuador	1968	1.10
Howe and Musgrove	Lima, Peru	1969	1.31
Howe and Musgrove	Caracas, Venezuela	1966	1.09
Lluch et al.	Mexico	1968	0.93
Betancourt	Central Chile	1964	0.79
Lluch et al.	Korea	1972	2.48
Lluch et al.	Urban Korea	1971	0.86
Follain et al.	Korea	1971	0.54
Howe and Musgrove	Bogota, Colombia	1968	0.98
Renters:			
Follain et al.	Korea	1976	0.42
Mayo et al.	Cairo, Egypt	1980	0.25
Mayo et al.	Beni Suef, Egypt	1980	0.50
Ingram	Bogota, Colombia	1978	0.80
Ingram	Bogota, Colombia	1978	0.72
Ingram	Cali, Colombia	1978	0.16
Ingram	Cali, Colombia	1978	0.47
Strassmann	Cartagena, Colombia	1978	0.78
Jimenez and Keare	Santa Ana, El Salvador	1980	0.27
Owners:			
Follain et al.	Korea	1976	0.62
Ingram	Bogota, Colombia	1978	0.78
Ingram	Cali, Colombia	1978	1.19
Strassmann	Cartagena, Colombia	1978	1.05

Source: Malpezzi, S. and Mayo, S. "The Demand for Housing in Developing Countries: Empirical Estimates from Household Data." *Economic Development and Cultural Change* 35 (4): 687-721. 1987.

CHAPTER FOUR

BACKGROUND OF HOUSING MARKET: DIMENSIONS AND PATTERNS OF HOUSING DEVELOPMENT

1. Introduction

In this chapter, linkages are made between macroeconomic plan, housing policy and housing conditions, operations, and markets. Korean housing policy issues are explained in the context of the social and economic transformation Korea has experienced in the course of its rapid economic development and urbanization since 1960s. Accordingly, the legacy of past policies are evaluated with respect to their effectiveness and efficiency. The housing operation system, which includes housing institutions, housing finance, and housing programs is then described. Finally, an overview of housing problems and issues is presented.

2. Overview of National Context of Korean Housing

In order to further discuss housing in Korea, it is necessary to summarize its national context.

2-1. *Historical Background*

From the 1300s to the twentieth century, Korea was a protectorate of China. It was respected and valued for its scholars, and scientists and isolated because of its geography which is mountainous with the Yalu River as a natural barrier in the North. After 1854 Japan began modernizing and reaching for Korea as a doorway to the continent and took Korea by force. Between 1905 and 1945 Korea was a colony of Japan, which developed railroads and infrastructure, but focused development mainly in the North, which was lost following World War Two. At that time the country was divided at the 38th parallel, leaving the South with predominantly an agricultural based economy at the end of the war.

In response to communist presence in North Korea an American military government was set-up in Korea. In 1951 a democratic government was instituted but shifted to a military government in 1961. Though elections were held, they inevitably supported the military government. In addition, in 1987 for the first time in Korea's history, a president was elected by the direct vote of the people without serious illegitimate activities. Since then, Korea has experienced sound political development and spawned a new hope for democratization (Lim, 1990, Kihl. Young W. 1990). The shift of power and influence during the years from 1948 to 1995, have been dramatic and yet persistently supportive of industrialization and development which extends from the national to the local level. Furthermore, this trend accelerates local government decentralization and local government reform as high visibility issues.

In terms of political stability, throughout the decades of the 60s, 70s, and 80s, South Korea has had ongoing conflict with North Korea. It has expended about 5 percent of its GNP (or 30-40 percent of the total government budget) on military defense. This means Korea's burden of military expenditure has been onerous. Yet in spite of that commitment of resources Korea has managed to invest heavily in housing and urbanization.

2-2. *Land*

Land taken by the Japanese during the first half of the century was returned to the land lord class in 1949 as part of a land reform and industrialization strategy. After 1961, large corporations (*Chaebol*)²³ have accumulated over seventy-five percent of the land and industrial resources, while a wage labor class developed in textiles. Since the 1970s heavy industry in shipbuilding and automotive industries and information technologies have joined textile as economic factors.

In terms of land and population Korea is relatively a small country with an area of 99,000 km². Furthermore, approximately two thirds of the country is inhabitable mountainous land. It has only a very small amount of arable land -- 30 percent -- with a very high population density, 439 persons per square kilometer. Consequently, land price is extremely high and the assembly of residential land is very difficult.²⁴

²³ For more details see Appendix IV. Glossary

²⁴ For detailed accounts as to the way the residential land are linked together housing prices, see Hannah, K.H. Kim and Mills. 1993.

2-3. *Economy*

Korea's economy has grown rapidly since the 1960s, showing GNP rising from \$2.4 billion in 1962 to \$ 376.9 billion in 1994. Rapid economic growth has also been represented by the considerable hikes per capita GNP, which jumped from \$62 in 1962 to \$84,483 in 1993 (Bank of Korea, 1994). The average annual economic growth rate in 1953-93 was very high 7.56 percent. The growth of per capita GNP has been reflected in real wage increases in Korea. Figures 3 and 4 show the postwar real GNP per capita and its growth.

The growth of the Korean economy has been linked to the international economy. Korea's international trade has expanded significantly (Lim, 1990). Its exports expanded from \$1.09 billion in 1971 to \$57 billion in 1988, and its import from \$3.8 billion to \$52 billion. It is particularly important to observe that the expansion of exports finally created a trade surplus in 1986 for the first time in Korean history. In addition, Korea became a heavy debtor nation soon after it embarked on its economic development plans.

The absolute amount of debt and its share as percentage of the GNP has dwindled gradually since 1983. In 1989 the amount of total foreign debt was \$ 30.3 billion and the net foreign debt was reduced to \$1.6 billion (Table 7). In fact, Korea became a middle-income nation with a large amount of transactions in international markets.

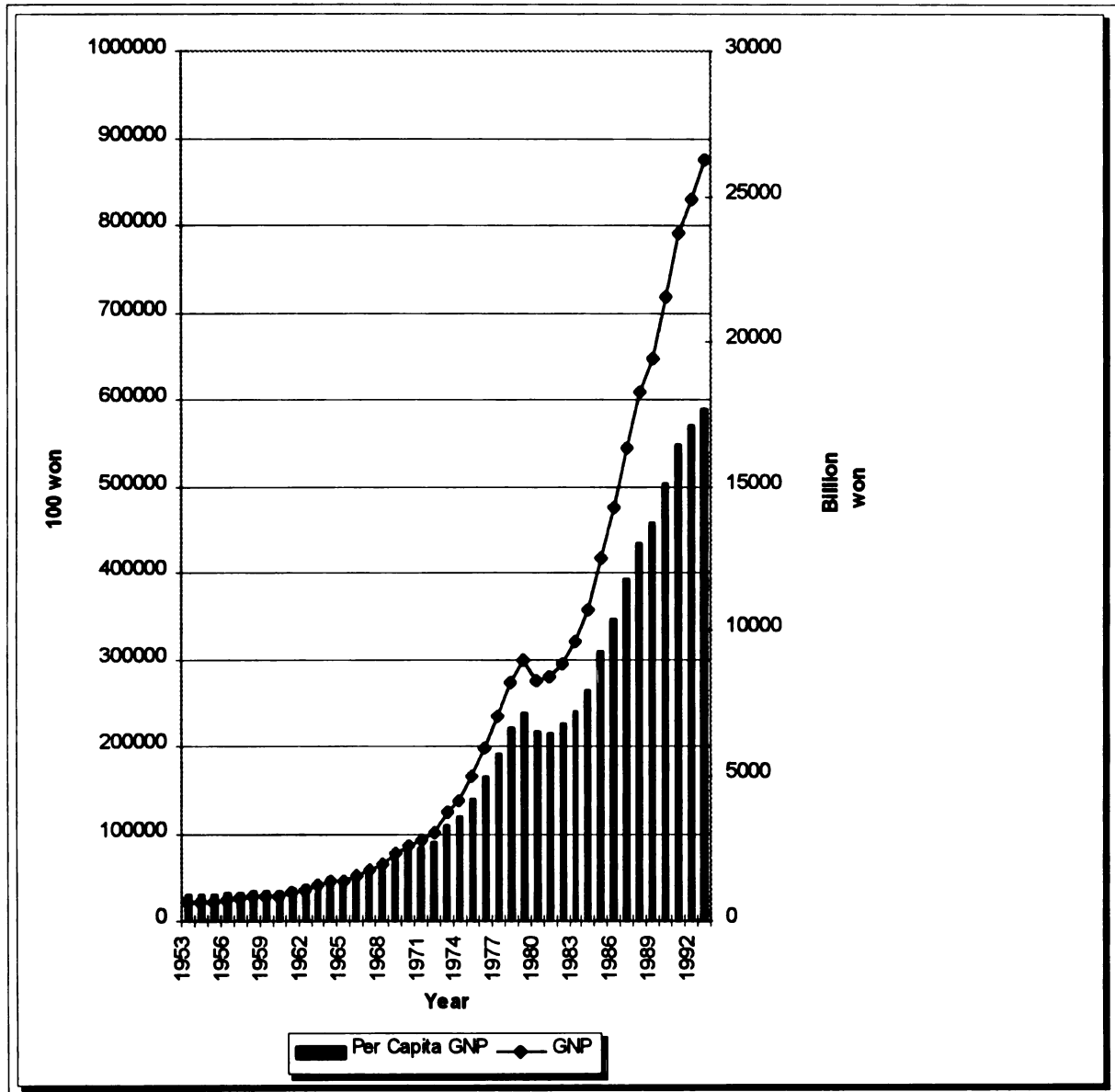
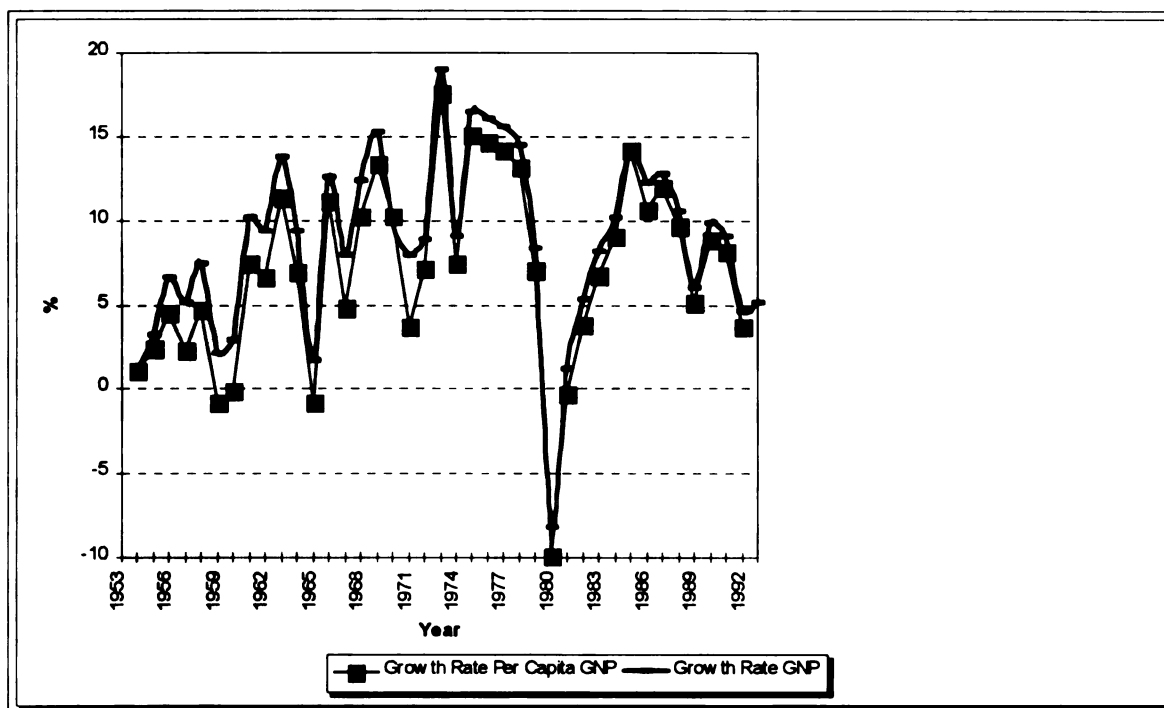
Figure 3 GNP Per Capita (1970 Constant Prices)

Figure 4 The Growth Rates of GNP Per Capita**Table 7 Indicators of Trade and Foreign Debt**

Year	Trade Account	Total Foreign Debt	Net Foreign Debt
1980	-4.4	27.2	19.6
1985	-0.02	46.8	35.6
1986	4.2	44.5	32.5
1987	7.7	35.6	22.4
1988	11.4	31.2	7.3
1989	4.6	30.3	1.6

Note: Unit: billion US\$

Source: Ministry of Trade and Industry, 1990

2-4. *Urbanization*

During the last three decades, Korea has undertaken the highest tempo of urbanization in the world. Consequently, the growth rate of the urban population in cities over 100,000 persons (a 4.461 percent per year average) was two and half times that of the total population (1.768 percent). Korea has transformed from a rural to an urban society. Table 8 demonstrates how Korea has become an urbanized nation. The share of urban population rose from 50.1 percent in 1970 to 70.5 percent in 1982, 75.2 percent in 1986, and 83.7 percent by 1992. The rate of urban growth in Korea has been quite high, although it has tended to decrease with the decline of rural-urban migration. Urbanization has followed industrialization with considerable public sector planning which has produced many new towns, resulting in a real estate boom. The predominantly agricultural country found at the end of World War II is rapidly disappearing or gone.

Table 8 Urbanization

Year	Total Population	Urban Population	Rural Population	Urban Population (in percentage)
1970	31,435	15,750	15,685	50.1
1978	36,628	23,238	13,390	63.4
1982	39,114	25,577	11,537	70.5
1984	40,430	25,599	10,831	73.2
1986	41,161	30,936	10,225	75.2
1988	41,975	32,963	9090	78.4
1990	42869	35558	7832	81.9
1992	43663	37319	7249	83.7

Note: Unit: 1000 persons

1. Nationwide population of 1982 -1988 is in accordance with residing population census.
2. Urban area population includes that of *Eup* with more than 20 thousand residents.

Source: Ministry of Home Affairs (MHA), *Municipal Yearbook of Korea*. 1987 , 1993

2-5. Income Distribution

Income redistribution as well as land reform has also been very successful and notable. A notable factor has been credit rationing. The long-term trend in income distribution has been fairly stable. The *Gini coefficient*²⁵ has changed slightly as follows: 0.3439 in 1965, 0.3322 in 1970, 0.3908 in 1976, 0.3574 in 1982, 0.3567 in 1984, and 0.34 in 1988 (Lee, 1990). This means that Korea is relatively equitable among the developing countries. Education and savings are particularly appreciated in this society.

²⁵ This index is a measure of the degree of inequality in the income distribution.

3. Overall Housing Conditions

This section presents an analysis of overall housing conditions along four dimensions: housing supply, physical housing conditions, housing occupancy, and housing prices. In general, current housing conditions in Korea are not good, since serious problems of housing stock shortage, squatter settlements, small dwelling size, lack of facilities, and overcrowding exist because of high population density and rapid urbanization. Korea has witnessed some relatively poor conditions in housing stock (72.4 percent of dwellings-to-households ratio), in physical housing conditions (small dwelling size and lack of some dwelling facilities), and in housing prices and consumption (housing speculation, high housing prices and expenditures).

3-1. *Housing Supply*

Housing quality has improved considerably with the sustained growth of Korea's economy since the Korean war, yet major stock shortages remain a problem. Although housing investment has increased, the housing supply rate declined from 0.83 in 1960 to 0.791 in 1993 as shown in Tables 9 and 10. Table 9 shows the total number of households (10.2 million in 1990) and the total housing stock (7.3 million in 1990) in Korea. The imbalance between them is often referred to the great housing shortage crisis in Korea.²⁶

²⁶ Some housing analysts in Korea take a skeptical view of the accuracy of the total housing stock (Kim, J. H. 1988, Yoo, J. H. 1988). They argue that housing stock data does not represent the actual number of housing units. In fact, in the multi-household-housing, they are considered as one household in census data.

The problem of housing shortage has been more severe in large cities. In Seoul, the capital, the housing shortage rate was 44.7 percent in 1985 (Ministry of Construction (MOC), 1989 and Chung, 1990).

The reasons for the decline of the housing supply rate²⁷ are the high growth of household formation and urbanization, as well as the demolition of old housing stock. In any event, the Korean housing stock does not yet appear to be mature, and hence housing experts have suggested that housing investment will continue to grow along with the per capita GNP.

Table 9 A Summary of the Korean Housing Stock Conditions¹⁾

Year	Per Capita GNP ²⁾	Housing Investment ³⁾	Housing Investment (%)	Population Growth (%)	Dwelling Units ⁴⁾	Household ⁵⁾	Housing Supply Rate (%)
1955	30,916	11.97	1.78	2.96	---	---	79.5
1960	34,517	18.67	2.18	3.00	3,464	4,198	82.5
1965	48,074	32.16	1.69	2.28	3,867	5,133	75.3
1970	81,500	876	3.41	1.81	4,360	5,575	78.2
1975	140,701	1,808	4.40	1.89	4,734	6,367	74.4
1980	216,672	2,507	5.78	1.81	5,463	7,331	74.5
1985	308,897	4,864	4.33	1.95	6,104	8,751	69.8
1990	503,182	145,77.3	8.22	0.92	7,357	10,167	72.5

Note: 1) 1970 constant prices
 2) Unit: won
 3) Unit: Billion won
 4) Unit: 1000 dwelling units
 5) Unit: 1000 households

Source: Korea National Housing Corporation, *Housing Handbook*, 1983, 1989, 1994.
 Ministry of Construction, *Yearbook of Construction Statistics*, 1993.

²⁷ The rate of the housing stock shortage equals (1- housing supply rate)

Table 10 Housing Supply by Year

Year	Division	Total Households ¹⁾	Persons per each Household	Ordinary Households ²⁾	Number of Housing Units ³⁾	Housing Supply Rate (%)
1970	Whole Countr	5,857	5.2	5,576	4,360	78.2
	All Cities	2,525	5.0	2,404	1,398	58.2
1975	Whole Countr	6,754	5.1	6,367	4,734	74.4
	All Cities	3,412	4.9	3,216	1,809	56.3
1980	Whole Countr	7,968	4.6	7,470	5,319	71.2
	All Cities	4,668	4.5	4,294	2,542	59.2
1981	Whole Countr	8,147	4.7	7,712	5,435	70.5
	All Cities	5,053	4.7	4,697	2,823	60.1
1982	Whole Countr	8,418	4.6	7,962	5,584	70.1
	All Cities	5,309	4.5	4,973	2,951	59.3
1983	Whole Countr	8,762	5.5	8,220	5,759	70.1
	All Cities	5,636	4.4	5,262	3,227	61.3
1984	Whole Countr	9,143	4.4	8,486	5,931	69.9
	All Cities	6,003	4.3	5,583	3,320	59.5
1985	Whole Countr	9,575	4.2	8,751	6,104	69.8
	All Cities	6,334	4.2	5,797	3,351	57.8
1986	Whole Countr	9,859	4.2	9,037	6,303	69.7
	All Cities	6,337	4.2	6,137	3,593	58.5
1987	Whole Countr	10,175	4.2	9,320	6,449	69.2
	All Cities	6,532	4.2	6,328	3,747	59.2
1988	Whole Countr	10,513	4.0	9,612	6,670	69.4
	All Cities	6,749	4.2	6,536	3,935	60.2
1989	Whole Countr	10,419	3.7	9,920	7,438	71.4
1990	Whole Countr	11,354	3.71	10,168	7,357	72.5

Note: 1) Excluding nonblood relationship and one-person households

2) Unit: 1,000 households²⁸

3) Unit: 1,000 units

Source: Korea Housing Bank. *Housing Economics Statistical Yearbook*. 183-184. 1994.
Ministry of Construction. *Yearbook of Construction Statistics*. 1993.

²⁸ Ordinary households are based on family groups related by birth or marriage including some persons living with family group such as servants, housemaids, boarders or employee related the household business.

3-2. Physical Housing Conditions

In Table 11, one can observe some of the quality conditions. The average floor area in the 1970s, rose from 55.11 m² to 78.2 m² in 1990. The number of persons per room fell from 2.34 to 1.7. The level of sanitary facilities steadily rose. The share of new dwellings equipped with modern facilities such as flush toilets and running hot water has been rapidly augmented. Clearly the quality of Korean housing made some net gains.

Table 11 Housing Quality Trend and Status Quo

	1970	1975	1980	1985	1990
Floor/unit ¹⁾	55.11	57.7	66.26	73.4	78.2
room/unit	--	3.1	--	--	3.6
person/room	2.34	2.3	2.115	1.934	1.7
area/person ¹⁾	--	7.9	9.64	11.19	13.9
flush toilet (%)	--	15	18.4	33.1	40
without bathroom (%)	--	--	77.9	65.3	--
hotwater bathroom (%)	--	--	10.0	20.0	--

Note: 1) Unit: m²

Source: Economic Planning Board, *Housing Census*, 1970, 1975, 1980, 1990

3-3. *Housing Occupancy and Tenure*

Homeownership in Korea is not widespread because of the limited availability and terms of mortgage money²⁹ and absence of tax benefits. In Korea, there are four kinds of tenancy. First, is a substantial amount of deposit with monthly rent (Sak-Wol-Sei). Second, a tenant who pays only a monthly rent and no deposit. Monthly renters who do not have access to accumulated savings from relatives or from good incomes face severe problems. The pure rent, western style, is used only by the poorest households. In third form, called Chonsei, tenants occupy a whole house³⁰ and pay a lump sum without paying monthly rent but do not gain ownership. The Chonsei is based on this capacity scarcity.:

Fourth, partial Chonsei, households occupy a part of the house and pay a lump sum (Ministry of Construction, 1985, 80).

For a partial Chonsei the imputed rent is estimated as

$$R = \sum_{t=1}^n [(A - D, t)i + D] / t$$

where A = amount of original Chonsei

D = monthly deduction from Chonsei

B = period

i = curb market interest rate

For security deposits with monthly rent, R is equal to the monthly rent to which is added r the deposit multiplied by the monthly curb rate. With the real estate boom,

²⁹ Borrowing from the extremely active unregulated money markets is not possible because the rates are very high (between 3 and 5 percent monthly) and the terms of maturity very short (typically a maximum of twenty months.)

³⁰ The definition of a whole house include single family dwelling unit, multiple family dwelling units, duplex and apartments.

Chonse deposits have risen and therefore, implicitly, so have implicit rents. Table 12 reveals that the largest proportion of tenants do not have their own independent unit but have to share their unit with others. One of the factors of the *Chonse* system is that it makes access to rental units dependent on accumulated wealth.

Both *Chonse* system and credit rationing have distorted housing demand for the last three decades as have underinvestment in the housing sector and increasing concentration of real estate wealth in the hands of middle and upper income groups, and increasing prices, while over crowding also continues to be a problem.

Table 12 Distribution of Households by Tenure

	1970	1975	1980	1985	1990
Korea	5,857 (100.0)	6,754.3 (100.0)	7,969.2 (100.0)	9,571.4 (100.0)	11,354.5 (100.0)
Owner	3,719 (63.5)	4,259.9 (63.1)	4,671.8 (58.6)	5,127.2 (53.6)	5,667.3 (49.9)
<i>Chonse</i>	1,019 (17.4)	1,171.3 (17.3)	1,904.5 (15.3)	2,201.9 (23.0)	3,157.1 (27.8)
Rental ¹⁾	914 (15.6)	1,049.1 (15.5)	1,231.3 (15.5)	1,892.5 (19.8)	2,172.6 (19.1)
Others	205 (3.5)	273.9 (4.1)	161.6 (2.0)	349.8 (3.6)	357.6 (3.1)
Cities	N/A	3,412.6 (100.0)	4,670.0 (100.0)	6,330.8 (100.0)	8,462.4 (100.0)
Owner		1,509.9 (44.2)	2,007.3 (43.0)	2,617.2 (41.3)	3,429.9 (40.5)
<i>Chonse</i>		1,048.5 (30.7)	1,657.1 (35.5)	1,970.2 (31.1)	2,927.5 (34.6)
Rental ¹⁾		738.8 (21.6)	931.9(19.9)	1,554.5 (24.6)	1,900.1 (22.5)
Others		115.4 (3.4)	73.7 (1.6)	188.9 (3.0)	205.0 (2.4)

Note: Unit: thousand households, numbers in parentheses are percentage
1) includes monthly rentals with deposit

Source: Korea National Housing Corporation, *Housing Handbook*, 1983, p. 14, 1989, p. 12, 1994, p. 18.

National Statistical Office, *Population and Housing Census*, 1970, 1975, 1980, 1990.

3-4. *Housing Prices and Affordability*

High housing prices relative to household income have hurt the ability of urban families to afford adequate housing, whether rental or owner-occupied. Large capital gains from real estate may also have worsened the distribution of wealth and income. Table 13 and Figure 5 provide indices (1974=100) of the prices of housing, land, construction materials and all other goods as well as real GDP, urban household consumption expenditure, money supply (M_2), and the rates of return on savings deposits and on curb market loans during the last 18 years. Housing prices increased by 960%, registering an average annual rate of 17.1 percentage, over a period of 16 years. This pace of increase was much faster than the rate of growth of the consumer price index (CPI) at 10.8 percentage per rate of 5.7 percentage. After a dramatic increase during a period of high inflation in the late seventies, housing prices stabilized between 1984 and 1987 and then rose sharply in 1988 and 1989 (Kim, Kyung-Hwan, 1991:1-5).

Table 13 Trends in Housing-related Economic Variables: 1974-1991

Year	Real GDP	UC ¹⁾	M ₂ ²⁾	HP ³⁾	LPK ₄₎	LPS ⁵⁾	LP6 ₆₎	WPI ₇₎	PCM ₈₎	CPI ₉₎	RYD ₁₀₎	RCML ₁₁₎
1974	100	100	100	100	100	100	100	100	100	100	100	100
1975	107	134	128	139	127	132	122	126	123	125	115	141
1976	121	167	164	176	161	153	148	142	132	144	134	199
1977	133	193	239	220	215	201	216	154	151	159	153	280
1978	146	259	323	287	320	474	387	173	175	182	181	406
1979	157	343	402	396	373	505	472	205	216	215	215	589
1980	154	415	510	502	417	572	553	284	281	276	257	853
1981	164	498	638	609	448	593	592	342	311	336	299	1154
1982	176	578	810	623	472	644	625	358	325	360	322	1452
1983	197	631	934	764	559	1016	824	359	338	372	348	1826
1984	215	688	1006	787	633	1253	1002	361	334	380	383	2264
1985	230	741	1163	787	678	1354	1080	365	327	390	421	2808
1986	259	813	1377	766	727	1404	1149	359	325	400	421	3456
1987	289	935	1640	820	834	1493	1309	361	328	413	510	4255
1988	322	1095	1992	929	1063	1912	1694	371	355	442	560	5106
1989	342	1239	2387	1064	1402	2570	2235	375	379	465	--	--
1990	477	--	--	--	1691	3348	2838	--	--	508	--	--
1991	525	--	--	--	1907	3722	3220	--	--	556	--	--

Note: 1) UC: Urban Consumption

2) M₂: Money Supply

3) HP: Housing Price

4) LPK: Average Land Prices in Korea

5) LPS: Average Land Prices in Seoul

6) LP6: Average Land Prices in 6 Major Cities

7) WPI: Whole Sale Price Index

8) PCM: Price of Construction Material

9) CPI: Consumer Price Index

10)RYD: Return on 1 Year Deposit

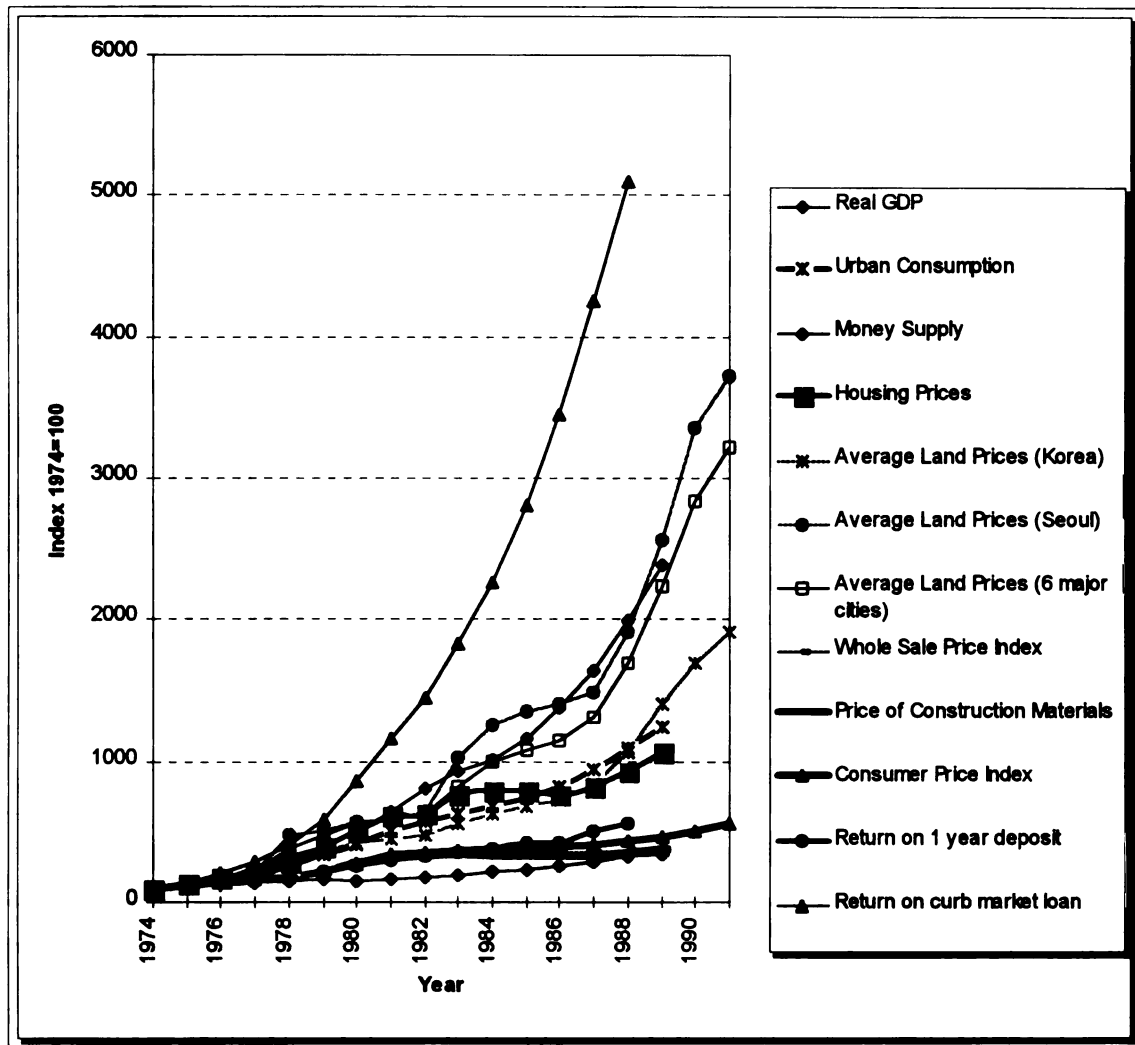
11) RCML: Return on Curb Market Loan

Source: Son. J. Y., *An Economic Analysis of the Land Problem and Land Policy, Korea Development Institute*, p. 34, 1990.

Korea Housing Bank. *A Demand for Housing Loan Model*. 64-66. 1989.

Bank of Korea, *Economic Statistics Yearbook*, 1988, 1989.

Figure 5 Trends in Housing-related Economic Variables: 1974-1991



4. Housing Institutions

In the 1960s and 70s, Korea reorganized its housing institutions. There are three types of organizations: public, semi-public (non-profit or publicly supported), and private sectors. The public sector is represented by the local Construction Bureau/Ministry of Construction and the semi-public sector by the Korea National Housing Corporation (KNHC).

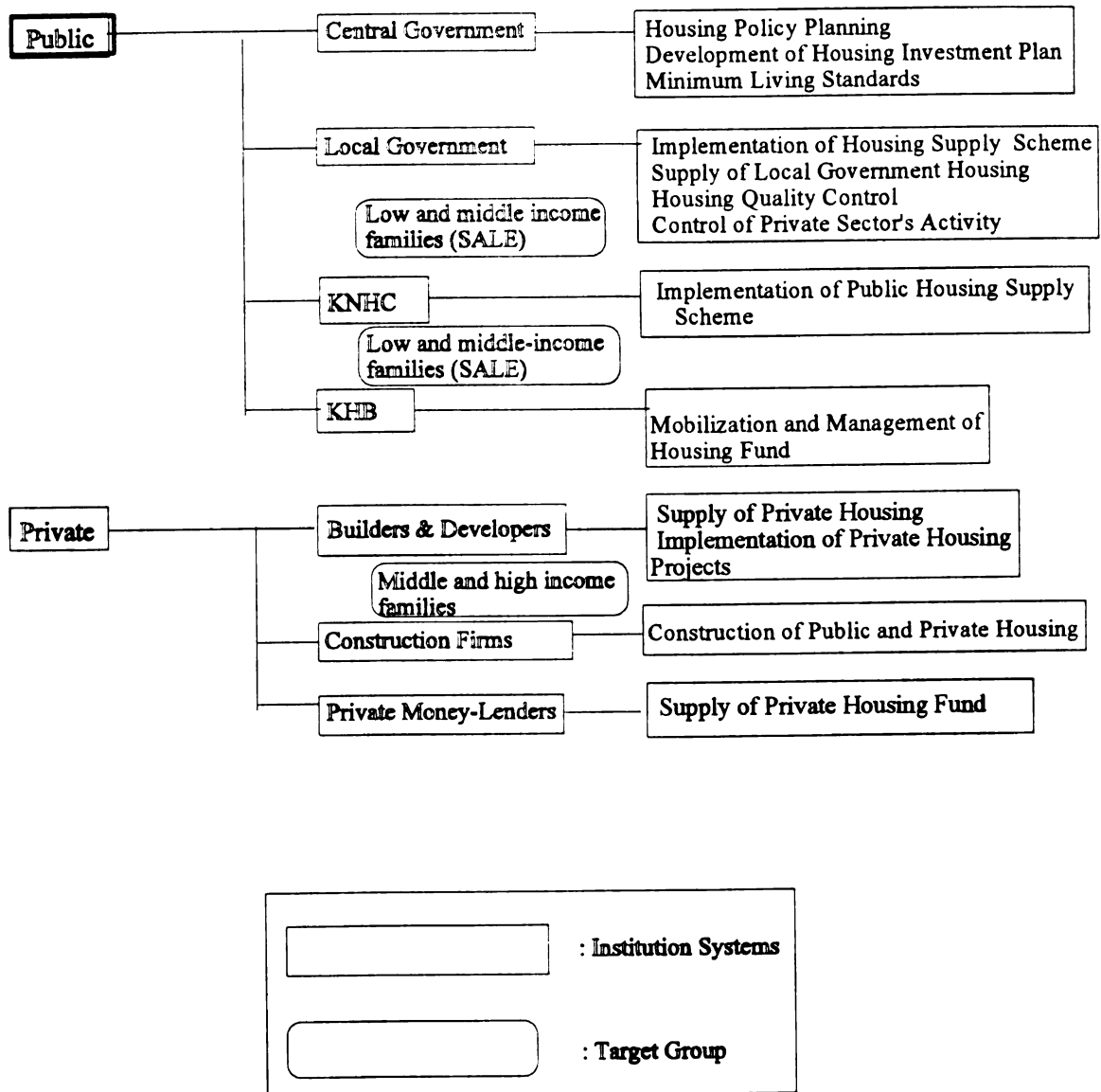
Although the implicit importance of these institutions is extended into the private sector, which is not easily quantifiable, we can still see how important is each institution by the proportion of completed housing units during the last three decades. Table 14 shows that the private sector plays the major role in housing supply in Korea. Figure 6 shows the relationship of housing institutions and residents' income levels. There is also a public housing program for low-income families.

Table 14 Housing Supply of Public / Semi-Public / Private Sectors

	Housing Supply	Period (1962-81)
	Units	Percentage
Public Sector		
Local Government	534,049	20
Semi-Public Sector		
KNHC	222,451	9
Private Sector	2,608,620	71

Source: Korea Housing Bank, *Housing Economic Statistical Yearbook*, 1994.
Korea National Housing Corporation, *Housing Handbook*, 1994

Figure 6 Public/Private Classification by Participation, Fund, and Target Groups in Housing Supply



Source: revised from KNHC, Housing Policy Development Research. pp. 307. 1983.

5. Housing Finance

Housing is not only a valuable and durable good but also expensive. The lack of access to mortgage financing by middle or lower income group causes a concentration of housing demand in that economic class. Finance plays a major role in the housing operation system and can be utilized to facilitate effective demand for housing. Effective financial strategies selected by government can promote the housing construction industry by the efficient allocation of funds in the housing market. In addition, housing finance is an effective policy instrument, providing an anticyclical measure through promotion of housing activities when the national economy is in a sluggish phase.

However, Korea's housing finance system has several problems. Lack of funds to be mobilized into housing is a chief concern. Renaud criticizes such major problems of a system as attributable to *financial repression* (1987, 1988), which refers to a set of regulations that forcing "domestic savings into pre-determined sectors of the economy and which set deposit interest rates below the market rate"(Renaud, 1989:4).

In terms of mobilization and supply of housing finance, almost all of the housing finance in Korea is covered by the Korea Housing Bank (KHB) and the National Housing Fund (NHF), two of the major housing finance institutions.

KHB is the main organization responsible for raising and disbursing funds for housing. Initially, it provides housing finance loans and raises its funds through collecting deposits, sale of housing debentures, and borrowing from the government.

Among two different kinds of housing finance, KHB has taken care of both permanent financing and construction financing. Permanent financing gives a loan to the household in lien of the house to be purchased. This will increase the household's housing affordability and facilitates transactions in the housing market. Construction financing provides a short-term loan to the house builders. This financing promotes housing construction activities (Lee, K and Sohn, K., 1989).

It is important to understand the source and use of funds by KHB in terms of Korean housing finance. Deposits received show wide fluctuation, which affects mobilization of availability of loans. On the other hand, Worker's Property Formation Savings Deposits and housing installment savings deposits show a steady increase, as expected. These two long-term deposits are the major sources of stability in KHB's fund mobilization, since the deposits are utilized solely for loans.

The share of loan collections by KHB shows a very low level compared with other financial institutions. In 1987, the ratio of loan collections to the total fund was 7.4 percent. This was mainly due to the high ratio of permanent financing in asset management. Therefore, the KHB is under a heavy pressure to mobilize sustained banking activities.

NHF has, however, maintained a strong position in main housing loans. The NHF system was established in 1981 in order to implement the Comprehensive Housing Construction Plan. The fund is used to provide loans for site development and national housing construction. The sizes of housing units are limited to below sixty m²

for housing construction loans. The amount of the loan³¹ per unit is between five million won and six million won, depending on the size of housing units and the area where the site is located.

A total loan amount of 731,202 million won was provided from the NHF to build 118,953 dwelling³² units between 1982 and 1987. Among the total amount of loans, about fifty-eight percent was provided to the public rental housing projects of local governments and KNHC.

Meanwhile, domestic saving rates and *the propensity to save* have an important relationship to housing finance. *The propensity to save* is an important factor for housing finance in terms of sources for homebuyers or housing loan lenders. Domestic savings rates are high, for example 38 percent in 1988. In comparison, the savings rates of many other developing countries are around 5-10 percent (Chang, 1986). One of the important reasons for the high savings rate in Korea is the need to accumulate funds to purchase a house. This unusual *propensity to save* partially accounts for Korea's active housing development. Table 15 exhibits mortgage loan conditions, expressed in terms of amount, period, and interest rates.

³¹ The maturity term is twenty years with a one-year grace period. The interest rate is 5 percent per annum for rental housing and 10 percent per annum for owner housing.

³² A 'dwelling' is a 'building or part of a building which provides structually separate living accommodation'.

Table 15 The Conditions of Mortgage Loan

Sector	Amount (% of Value)	Period (years)	Interest Rate (%)
Public	50	20	11 - 13
Private	70 or less	3 - 20	14

Source: Korean Housing Bank, 1982

There has been a continuous increase in the supply of housing loans by KHB and in residential investment (Table 16). However, a comparison between 1986 and 1987 shows an unusual relationship where a larger number of houses were constructed with a smaller supply of housing finance. This implies that the housing finance system in Korea covers a small portion of the housing construction activities.

6. Housing Program

A housing program is a plan for implementing a housing policy. In general, after a housing policy and priorities have been established, the housing authority designs a housing program which consists of specific targets, such as the number of housing units to be constructed within a given time. The targets are justified on the basis of expected housing needs and demands among target groups and spatial allocations by the public and private sectors. However, there is usually a gap between targets and performance, which should be examined.

Table 16 Aggregate Index of the Housing Activities¹⁾

	GNP Constant	Residential Housing Investment	No. of Housing Units Constructed	Annual Supply of Housing Loans	Ratio of Loans over Housing Investment (%)
1970	17,013.0	855.8	115,000	5.95	0.695
1975	26,113.5	1490.8	179,951	35.94	2.41
1980	36,672.3	2179.1	211,537	281.32	12.9
1985	52,705.4	2742.3	227,362	889.82	32.44
1986	59187.8	3395.4	288,252	864.63	25.46
1987	66,319.6	3658.1	244,301	1096.86	29.98

Note: 1) Unit: Billion won

Sources: Bank of Korea, *National Accounts*, 1987.

Korean Housing Bank, *The Statistical Yearbook of Banking Services*, 1987.

Korea has adopted a comprehensive approach toward the basic types of housing programs. This approach considers the public and private as a whole housing sector rather than as specific targeted groups (Table 17). Targets, finance, and land are the three main components of housing programs. Since housing is not only used as a service for social welfare but also as a tool for an economic development plan in Korea, housing programs have been designed as five-year short-run plans.

Table 17 Dwelling Construction: Planned and Realized by Initiation¹⁾

Period	Planned		Realized	
	Public	Private	Public	Private
Units				
1962-66	8.4	91.6	12.2	87.8
1967-71	6.0	94.0	12.8	87.2
1972-76	30.0	70.0	30.0	70.0
1977-81	38.4	61.6	44.5	55.5
1982-86	43.2	56.8	47.6	52.4
1988-92 ²⁾	45.0	55.0	33.3	66.7
Funds				
1962-66	15.0	85.0	8.0	92.0
1967-71	5.2	94.8	13.8	86.2
1972-76	19.5	80.5	18.9	81.1
1977-81	22.7	79.3	31.9	68.1
1982-86	26.8	73.2	30.5	69.5
1988-92 ²⁾	20.4	79.6	-	-

Note: 1) Unit: %

2) *Two-Million Houses Program*

Source: Korea National Housing Corporation, *Housing Statistical Yearbook*, 1990

Korea Housing Bank, *Housing Economic Statistical Yearbook*, 1994

Ministry of Construction, *Yearbook of Construction Statistics*. 1993.

Table 18 shows the results of housing programs which have a good record in terms of the percentages of housing programs completed. From the viewpoint of progress made in public housing programs, Korea has a high growth rate from a 12 percent total completed housing units in the first housing program (1962-66) to 41 percent of total completed units in the fourth housing program (1977-81).

Table 18 Housing Construction Plan: Planned and Realized: 1962-1992

5 Year Plan Period	Housing Units		R/P (%)	Funds		
	Planned ¹⁾	Realized ¹⁾		Planned ²⁾	Realized ²⁾	R/P (%)
1962-66						
Public	40,266	39,915	99.1	5,864	4,602	78.5
Private	435,074	286,020	65.7	33,093	47,619	143.9
Total	475,340	325,935	68.6	38,957	52,221	134.0
1967-71						
Public	30,000	69,613	232.0	4,793	38,344	800.0
Private	470,000	470,725	100.2	86,584	238,837	275.8
Total	500,000	540,338	108.1	91,377	277,181	303.3
1972-76						
Public	250,400	228,766	91.4	254,000	369,473	145.5
Private	582,600	531,825	91.3	1,045,000	1,125,805	107.7
Total	833,000	760,591	91.3	1,299,000	1,495,278	115.1
1977-81						
Public	512,000	497,792	97.2	600,000	2,973,317	495.6
Private	818,000	618,234	75.6	2,040,000	6,310,900	310.8
Total	1330,000	1,116,026	83.9	2,640,000	9,314,217	352.8
1982-86						
Public	618,000	549,344	88.9	5,957,000	5,272,600	88.5
Private	813,000	605,727	74.5	16,531,000	12,039,800	72.8
Total	1,431,000	1,155,071	80.7	22,188,000	17,312,400	78.0
1988-92 ³⁾						
Public	900,000	905,000	101	13,136,000	-	-
Private	1,100,000	1,812,000	136	51,147,000	-	-
Total	2,000,000	2,717,000	165	64,283,000	-	-

Note: 1) Unit: dwelling unit

2) Unit: Million won

3) *Two Million Houses Program*Source: Korea National Housing Corporation, *Housing Statistical Yearbook*, 1990Korea Housing Bank, *Housing Economic Statistical Yearbook*, 1994Ministry of Construction, *A Study on Housing Problems and Policy Development in Korea*, 129, 1985.Korea National Housing Corporation, *Housing Handbook*, 52-53, 1987.

7. General Housing Policy Issues and Evolution of Housing Policies

Housing policy refers to the range of activities that public and private sectors jointly undertake to provide housing services for a society. It may be used as an instrument to influence the settlement patterns of a nation or a city. Korea recognizes the overlap and importance of both sectors and integrates their involvement in its housing policy. However, in such an inclusive approach, government always plays the dominant role and the private sector lacks details of policy and documentations to enhance its position.

Housing policy receives low priority in national development policies in many developing countries because housing is an expensive investment involving large capital outlays. However, this is not true in recent situations in Korea, where housing has been regarded not only as a means to achieve social welfare and income redistribution, but also as a tool for economic development. Thus, housing programs are connected to economic development programs, which are examined below as aspects of housing supply and demand policy.

Housing supply focuses on expanding housing units, and housing demand relates to enhancing housing purchasing power. Over time both of these aspects of housing policy have been greatly influenced by a general land policy, which has evolved through historical land reform movements, referenced above, and has more recently evolved as a new town policy where a decentralized urban population is

particularly encouraged.³³ Such a diffusion strategy has introduced the question of housing distribution into the supply question. However, supply, rather than distribution, is more emphasized.

As a consequence of both supply and distribution issues, public housing remains too expensive for low-income families, even though less stringent requirements for eligibility to public housing have been established. Therefore, distribution as a component of supply (spatial, scale, target groups, equity, etc.) should receive heightened attention in Korea. Such factors become evident by their absence in the five year plans made by Korea during the last half century.

7-1. *Summary of Korean Housing Policy*

The evolution of housing policy can be examined by dividing the postwar period into 1945-61 and subsequent five-year planning periods (Chung, 1985). The following segments review the evolution of Korean housing policy. Each economic development plan includes goals and objectives of general policy, accomplishments and results.

7-1-1. Postwar Transition (1945-61)

There are two subtle divisions of housing policy and program in the *Postwar Transition Period*, 1945-61. The first part of the period from 1945 to 1954, was marked by a huge immigration of about four million Koreans returning to their

³³ See the site of new town near Seoul at the Appendix II.

homeland after the country's liberation from Japan in 1945. This sudden increase in population resulted in acute housing shortages which were worsened even further by the Korean War of 1950-53. Matters were made more difficult as new economic structure was being introduced, as for example, institution of a capital gains tax in 1950, which reduced private sector incentive to invest in housing.

During the initial postwar period housing issues were addressed by the Ministry of Construction. Government gave itself a target of building one million houses for the period of 1950-56. To assist this goal, the Korea Development Bank (KDB) was created in 1953, and in 1954 was given the job of providing housing funds. In 1958, the Construction Industry Act was passed in order to promote a sound development industry and two years later the capital gains tax was abolished. The effect of these actions was felt immediately an increase in number of houses built between 1960 and 1961 over that of the previous years.

In summary, during the period of 1951-61, housing was considered as part of a plan to address social needs. A total of 916,486 housing units were constructed, including 260,000 fabricated housing units which were provided in the form of governmental relief under the guidance of office of Veterans Administration. Data are shown in Table 19. It was, however, not enough. Although the national housing supply rate was increased, the housing shortage remained at 17.3 percent, while the shortage in Seoul was significantly higher at 36 percent.

During the latter postwar period housing policy had evolved as new options for housing finance strengthened demand and regulation of private and public sector

housing alone with relief in supply-related taxes expanded housing supply. In this process, housing policy became useful as an overall price stabilization mechanism.

Table 19 Residential Construction Accomplishments: 1951-1961

Year	Public Construction	Private Construction	Total
'51 - '56	197,330	323,457	520,787
'57 - ' 61	59,150	336,549	395,699
Total	256,480	660,006	916,486
Ratio (%)	28.0	72.0	100.0

Note: Unit: Dwelling Unit

Source: Special Task Force of Planning and Coordination Dept. of the Prime Minister Office, *The Evaluation Study of 1st 5 yr. Economic Development*, 708. 1967.

7-1-2. First Five-Year Economic Development Plan (1962-66)

A systematic approach to housing policy began with the first five-year economic development plan in 1962. At that time housing policy shifted from being an element of social planning to an element in general economic policy (Rho and Ha, 1987). This transition was based on the principal objective to establish a self-reliant economy. In this case, housing policy was regarded as one of the additional components of a major economic plan, and as result, priority status suffered.

The housing stock shortage and deterioration of investment rates were perceived as major housing supply problems. They were addressed during this period to alleviate the rate of housing shortage. In 1962, builders were given access to construction loans for land and housing development. Manufacturers of construction materials were also given assistance, with the result that about 326,000 new dwelling units were built. Such

numbers were considered as progress, though they were thirty-two percent short of the target goal of 475,000. Attempts to address the demand side included a self-housing program, which targeted the homeless. It was adopted in 1962, with the objective enabling a household to borrow from the KDB an amount of fifteen to forty percent of that household's own funds.

However, the most important development was the creation of the KNHC in 1962. This institution maintained broad responsibilities including land acquisition and development, housing construction, management of public housing, and installation of infrastructure for large scale housing development. The initial capital investment was 500 million won.

With such a national initiative, local administration structures were needed to articulate policy effectively. This was accomplished with the 1963 amendment to the Public Housing Act, which led to a distinction between the first category (KNHC) and a second category (local government) of public housing initiatives.

During the period of 1962-66, more than 52 billion won was actually invested, thirty four percent more than planned. According to the plan, the private sector was to build as many as 435,000 units but ended up with only 286,000, or sixty-six percent of the target. The public sector was to produce 40,000 units and are this target (Ministry of Construction, 1985: 22-26). The overall performance however, was quite disappointing.

While the number of dwellings built fell far short of the target, money invested rose above what was planned because the government had to keep up with rapid

increase in dwelling prices. The result was public sector share of housing supply at 85 percent and of finance funds at 15.1 percent, which were only 12.2 and 8.8 percentage of what was to be realized. The private sector thus played a major role of housing policy. However, it was still less than that of developed countries where level of housing investment over the GDP averages 5.5 percent. In Korea during the five year plan, the level of housing investment over the GDP was only 1.7 percent.

The ratio of housing supply also declined from 84.2 percent in 1960 to 74.6 percent in 1966. These facts suggest that at that time, the government's direct investment into the housing sector was limited because of greater demand for investments in industry, production equipment and infrastructure facilities. Housing investment had low priority. To sum up, the major development in this period was the access of the homeless to long-term housing loans and the founding of the KNHC.

7-1-3. Second Five-Year Plan (1967-71)

The housing stock shortage was still a major housing problem during this plan period. In order to alleviate the shortage, expansion of the housing supply became a main objective of housing policy. In terms of achieving the goal of expansion, new construction in this period was a phenomenal success (Chung, 1985). The initial target of 500,000 units was exceeded by 8.1 percent. Sustained price hikes led to an investment of 277 billion won, which was expanded by 800 percent. This surpassed the planned amount of 91 billion because of hikes in the cost of housing construction components.

Both public and private sectors did well. The public sector exceeded the target by 132 percent while the private sector exactly met the plan's goal. Such a success can be explained by a series of measures. In 1967, Korea Housing Funds (KHF) was created as a financial institution with an initial capital investment of one billion won. The fund was allowed to issue housing bonds. In the same year (May 19th), the Korea Housing Funds Act was amended so that 15-25 year loans could be made for small dwellings of 66 m² floor area or less. On January 4th, 1969, the Korea Housing Funds was renamed by KHB. These changes certainly strengthened the demand for housing. However, faced with rapid urbanization, creeping inflation, and land speculation, the government adopted, in 1967, anti-speculation measures including a heavy capital gains tax and other price stabilization measures in 1971.

On the supply side, pre-fab techniques for high-rise apartments were introduced. A series of amendments of the Building Industry Act during the 1967-71 period led to an upgrading of the industry's technical and financial capabilities. In the meantime, the capital of KNHC was raised to 10 billion won, and initiators of public sector housing (KNHC and local government) were given tax allowances. Further tax allowances were made in the income tax and a 50 percent capital gains tax was limited to cases where the lot size was less than ten times the building area. A few other minor tax law changes were made.

The most important development of the period was the creation of KHB. This period was marked by a huge expansion in the housing finance system and its funds and relatively mild restrictive measures, with the result that the construction target was

exceeded. However, at the same time, the public and private sectors had to invest much more money. The actual investment amount was 203 percent more than planned, and a general decline began after 1969.

The expansion of housing investment came following moderate economic growth. The share of housing investment had increased from 1.7 to 3.4 percent. Nonetheless, the level of housing investment was still almost half that of developed countries.

7-1-4. Third Five-Year Plan (1972-76)

With the new KHB and KHNC in place, a systematic approach to housing policy was easier, though it led to an overall housing policy emphasizing the role of public housing. Evidence of this is found in an 18.2 percent increase of the share of public sectors compared to the previous planning period. This period's target was to build 833,000 dwellings units, but ended up with 760,591 units, or 91 percent of the target. About 1.3 trillion won was planned for investment, but the actual investment was 1.5 trillion won. The creation of 760 thousand housing units may be attributed to the 30.1 percent showing of the public sector. The overspending of housing investment was mainly caused by hikes in land prices. For example, in Seoul, the share of land cost amounted to 52.5 percent of total housing prices at that time (Planning and The Coordination, Office of the Prime Minister, 1977: 529), while in earlier periods the percentage was low. The increase represented an inflation rate. Thus, the construction target was almost met with relatively moderate price inflation.

Both public and private sectors met 91 percent of the target, in spite of a global economic shock in 1972 in response to the oil shock induced by an aggressive OPEC position. In response, Korea relaxed some anti-speculation measures, which deepened the real estate market suddenly. In addition, to strengthen the economy, slackening since 1969, the money supply was increased and interest rates were reduced.

In 1972, the government set up for the first time a ten year housing construction plan, which symbolized an intention for serious involvement in housing issues. The MOC initiated the main activities of this plan and its independent control of implementation. Furthermore, the government was now actively involved in maintaining several newly enacted comprehensive housing laws. This plan included, among other things, the use of foreign loans.

In 1973 the public sector, which includes KHNC, the central government, and local governments, set a maximum housing size at 85 m². The 1973 amendment of the Housing Construction Promotion Act led to a precise definition of public sector dwelling sizes: 60 m² - 85 m² (single-detached) dwellings, 40 m² - 85 m² (row-houses), and 40 m² - 85 m² (apartment). The capital of the KHB was raised to 20 billion won (Ministry of Construction, 1986). However, as the economy became overheated by the real estate boom in 1974, a series of restrictive measures were taken once again.

This period was marked by several changes in housing laws (Table 20) and related-taxes, a greater distinction between public and private sectors, and international factors, which were significant, though without direct involvement as that in the initial postwar period. The share of housing investment over the GNP increased a little from 3.0 to 3.6 percent; however, this portion was absolutely short compared to that of

developed countries (6.8 percent) during this period. Furthermore, the housing supply ration also decreased from 71.2 percent in 1970 to 74.4 percent in 1975.

Table 20 Housing Policy Goal in Housing Related Law

Laws	Content
Public Housing Law (enacted in 1963, abolished in 1972)	To improve housing situation and public welfare by constructing public housing for low-income households.
Housing Construction Promotion Law (enacted in 1972)	To improve overall housing service and public welfare by planned supply of housing. For this, the law deals with housing finance, production and supply of housing materials.
Housing Construction Promotion Law (amended in 1977)	To promote living security of tenant households and to provide better housing service for all
The law to promote living security of the working class and to support saving (enacted in 1987)	prescription to promote living security of the working class and to support saving

Source: Lee, K., and Sohn, K. *A Study on the Optimum Allocation of the Housing Finance*, Korea Research Institute for Human Settlement, February, 1989. p. 9.

7-1-5. Fourth Five-Year Plan (1977-81)

This period was characterized by housing stock shortage, an imbalance of housing supply and demand, and an economic recession beginning in 1978. There was also a sudden rise of housing prices and poor quality of housing construction. To cope with these difficulties, price stabilization became an important housing policy measure (Table 21). Several major laws were enacted to stabilize dwelling prices. In addition the government worked out a system of housing sales and strengthened a transaction tax.

The target for new housing during this five-year period was 1,330,000 units with 2.6 trillion won. However, no more than 1,116,000 units were built (83.9 percent of the target) and about 9.3 trillion won was spent, or 253 percent more than planned. This result reflected an unprecedented price increase since 1976, attributable to real-estate land speculation. The speculation was partly due to the large inflow of funds from the Middle-East as a result of construction exports (Chung, 1985). The reaction of the government was immediate. To combat speculation, in 1978 the government not only sharply increased capital gains taxes but also imposed a system of land sales permits, making speculative land transactions traceable and more difficult.

Measures intended to curb rising housing costs were in conflict with the overall goals of expanding housing supply. As a result, housing production, which attained in 1978 a record high of 300,107 units, fell sharply to 251,000 units in 1979 and 211,537 in 1980. The doubling of the price of oil in 1980, international economic recession, and domestic recession, a drop of 5 percent in the GNP, were also major causes of weakening housing construction at that time. The government therefore relaxed the 1978 measures by cutting the capital gains tax.³⁴

In June 1981, broad measures were taken to recover from the economic recession following 1978. In addition, there was the separation of the National Housing Funds (NHF) from KHB Funds. The idea was to allow the MOC to control the NHF better.

³⁴ The action was applied differently. For real estate held less than two years, capital gains taxes were cut from 80 to 75 percent. For real-estate held for more than two years, capital gains taxes were cut from 70 to 50 percent.

On the supply side, on December 31, 1977, the Housing Construction Promotion Act was substantially amended, and builders were classified into “designated” and “registered” categories according to their qualifications. There were also changes in regulations concerning building codes, infrastructure installment, and house sales. However, the most important development was the creation in 1979 of the Korea Land Development Corporation (KLDC), with the mission of providing low-cost residential land. The KLDC’s capital was 200 billion won, raised to 500 billion won in 1980. The capital of KNHC was also raised to 50 billion won in 1978 (Ministry of Construction, 1985).

7-1-6. Fifth Five-Year Plan (1982-86)

This period was characterized by controlling the excess demand for housing and sale prices of housing. The target for the entire period was 1,431,000 units, and the target for the sub-period 1982-84 was 660,000 units, of which 579,000 (87.7 percentage of the target) were built. The swing of dwelling construction which started in 1979 continued until 1981 when annual production was no more than 150,000 units. In the meantime, the housing shortage rate which was 22 percent in 1970 reached 30 percent in 1980. This was enough to alarm the concerned authorities.

The government reacted by providing a series of incentive measures. All new dwellings built within a prescribed period were given reductions in capital gains taxes. Lands sold for new dwellings was exempted from a capital gains tax. Acquisition and registration taxes on public sector dwellings (85 m² or less) were cut by 30 percent.

All these measures were taken in 1982. In fact, dwelling construction increased from 150,000 in 1981 to 191,920 in 1982, 226,000 in 1983, and 222,000 in 1984. Thus, there was a recovery, but it was slow.

Table 21 Housing Policy Measures

Objectives	1970's	1980's
To Promote Construction	• Privately Operated Housing Funds • Land Development Corporation • Designated Firms • Advanced Sale	• National Housing Fund • Worker's Saving • Public Development
Equity	• Transfer Income Tax • Control of Housing Prices • Housing installment Deposit • National Housing Funds • Funds Subscriber's Deposit	• Housing Bond Bidding System • Tenant Protection Law • Rental Housing Supply

Source: Lee, K., and Sohn, K. *A Study on the Optimum Allocation of the Housing Finance*, Korea Research Institute for Human Settlement, February, 1989. p. 12

7-1-7. The Sixth Five-Year Economic Social Development Plan³⁵ (1987 -1991)

This period was characterized by an increased scale of planning in which both economic and social policies were combined. Improving housing supplies for low-income groups was a specific agenda which emphasized the expansion of public land development for housing sites. In addition, the plan aimed restrain and speculation by raising property taxes for owners of multiple residences, and by stabilizing housing rental rates with institutional support for the housing rental industry.

The sixth five-year plan was interrupted by the *Two-Million Houses Program*, which led to creation of a new and more ambitious program. This shift of emphasis coincided with an important political transformation. In 1987 the first presidential election took place without illegitimate activities. This introduced a new era of democracy and social initiative.

7-1-8. The Two-Million Houses Program (1988-1992)

The Korean government initiated the five-year *Two-Million Houses Program* of 1988-1992 in order to meet ever-increasing housing stock demand. The plan was developed in 1987, and has been implemented since 1988. It made a significant contribution to easing the housing stock shortage problem. It also stabilized housing

³⁵ From this plan, the government changed name of five year plan into the economic social development plan. This fact represents that they intend to focus on balancing economic and social development.

prices, provided new housing units of various sizes, and established higher quality housing on a massive scale.

The plan called for dramatic expansion in the current housing supply capacity by constructing a total of two million housing units. In addition, the rate of housing investment over the GNP was to increase from 4.6 percent (1980-1987) to an average of 6.5 percent. The level of construction capacity extended to 400 thousand housing units per year from a level of 200 thousand in previous years, reflecting improved housing productivity capacities, including human resources and materials (Yu, 1992). As shown in Table 22, the housing program was successful in promoting new housing construction on a massive scale. The first year saw 317,000 new building permits. The number of residential building permits issued accelerated to a maximum level of 750,000 units in 1990. In 1992, the four-year aggregate amounted to over 2.17 million. That year saw 575,000 building permits issued, implying that over 2.77 million units were supplied for the entire planning period, approximately 35 percent more than the initially-targeted two million units.

Table 22 The Two-Million Houses Program

	'88-'92 Plan	'88-'92 results	'88-'92 Ratio	'88 result s	'89 result s	'90 result s	'91 result s	'92 results	'93 results
Total	2,000	2,717	136	317	462	750	613	575	695
Public Sector	900	905	101	115	161	270	172	195	227
permanent rental	190	190	100	-	43	60	50	37	-
public housing	50	21	42	-	-	-	-	21	189
- rental	20	15	75					15	31
- sale	30	6	20					6	158
long term rental	150	171	114	52	39	65	15	-	-
worker	150	144	96	-	-	61	36	47	38
- rental	50	43	86			20	12	11	10
- sale	100	101	101			41	24	36	28
Small-size Sale	360	379	105	63	79	84	63	90	-
Private Sector	1,100	1,812	165	202	301	480	449	380	468

Note: Unit: 1000 dwelling units and %

Source: Ministry of Construction, '94 *Comprehensive Housing Construction Plan*, 1994.2.

The plan was driven by the creation of a system of five new towns near Seoul. These were Bundang, Ilsan, Pyongchon, Sanbon, and Jungdong. Table 23 provides the scale and target population of new towns.

Table 23 New Town Development Plan

Classification	Total	Bundang ⁴⁾	Ilsan	Pyongchon	Sanbon	Jungdong
Area ¹⁾	15,153	5,985	4,757	1,496	1,267	1,648
Construction housing units ²⁾	294	97.5	69	42.5	42.5	42.5
Total Population ³⁾	1,176	390	276	170	170	170

Note: 1) Unit: 1000 pyung, 1 pyung equals 3.3 m²

2) Unit: 1000 dwelling units

3) Unit: 1000 persons

4) for the map of new town location, see appendix IV

Source: Ministry of Construction, *Housing Construction Plan in the 6th five-year Economic Social Development Plan*, 1988.8.

It is clear that the *Two Million Houses Program* improved the short-term supply of housing considerably. In addition to other factors, it must certainly have contributed to the fall in housing prices in Seoul (Renaud, 1992). These achievements notwithstanding, the plan has recently drawn much criticism. The primary one is that the rising housing construction boom, which started in 1989, touched off excessive investment in construction, resulting in a shortage of construction material and a stampede of manpower into the construction industry, virtually jeopardizing other segments of the national economy. The sale price of these housing units may not reflect fully the cost of the resources involved. It also had a negative impact on inflation and wages. Furthermore, this program achieved some of its results by overriding the institutional problem of the housing sector in general. These measures did not resolve the apparent problems. Nor did they provide a program of institutional, regulatory, financial, and fiscal reform.

7-1-9. The Seventh Five-Year Economic Social Development Plan (1992-1996)

The Seventh Five-Year Economic Social Development Plan set the average economic growth target at 7.5 percent per year during the period. This downward readjustment of the GNP could be pursued by reducing consumption and investment. The average annual rate of growth in construction investment was lowered from 17.2 percent in the sixth plan period to 7.5 percent.

Where the housing sector is concerned, the plan implies reduction in housing investment, because construction investment is considered to be less productive and more inflationary. A large volume of housing investment is required to meet them, suggesting that housing investment decisions must be somehow integrated with those for the national economy. With respect to housing markets, demand will accelerate with rapid increases in household and in per capita income, and the demand for better quality housing will rise as middle-class households expand (Kim, J. 1993).

7-1-10. Summary of Evolution of Housing Policies

The evolution of the postwar Korean housing policy can be summarized in the following terms. First, the primary objective of the housing policy so far appears to have been the production of new dwellings. Second, housing policy in Korea has evolved in the three following areas: (1) the expansion of housing finance through the

KHB, designed to increase demand, (2) the production of low income housing through KNHC, and (3) local government and the promotion of private sector housing.

As far as housing finance and public sector housing production are concerned, the policy has achieved what it set out to achieve. However, the most apparent failure of the policy has been the difficulty of promoting private sector dwelling construction. This could be explained by overregulation of the building industry on the one hand and, to some extent, the industry's lack of access to interim financing. The third shortcoming of housing policy in Korea is that it has been too often subject to an overall economic stabilization policy. In each of the five-year plan periods examined, an expansionary housing policy was accompanied either by anti-speculation or an overall economic stabilization policy in such a way that expansion in dwelling construction was short-lived (Table 24). This has perhaps been necessary for stable economic growth (Table 25). However, the result is a mounting housing shortage.

The final comment which can be made about the postwar evolution of Korean housing policy is that taxes have not been used to effect a cyclical stability of dwelling construction, with the exception of using capital gains taxes for fighting speculation. There is no reason why housing-related taxes should not be used for recovering the slack in, or extending the expansion of dwelling construction. One conclusion that emerges from a review of the evolution of housing policy in Korea is that housing policy should somehow be a little more separated from the overall economic stabilization policy without, of course, provoking real-estate speculation. In addition, it

appears imperative that the private sector play a more active role in housing finance and construction.

A. Policy Priority

The first housing policy issue is the priority ordering of housing investment. There is no doubt that the highest priority is the housing shortage. It must be pointed out that the solution to the shortage problem will also attenuate the problems of affordability and the equity in housing welfare distribution. In order to develop a comprehensive set of alternatives for a ten year housing investment plan, the top priorities are:

(1) New housing investment plans should be designed with attention to the segmented housing markets. Given the distinct needs, affordability, and consumption behavior of families, each sub market characteristic should be accounted for in designing appropriate policies. (Lim, 1987: 183).

(2) To be effective, a housing program should define the target group and formulate targeted minimum standards, taking into account the physical character of the dwelling, dwelling control, environmental locus, and relative locus.

(3) The role of the public sector should be emphasized in housing production of low-income housing. State-developed rental housing for the low-income groups should be expanded.

(4) The government's contribution to public mortgage funds should be increased and the long-term mortgage financing system of the KHB should be further developed.

(5) Government intervention in the housing market should be based on social need, and should limit private monopolies.

Table 24 Housing Policies in Economic Plans

Plans	Objectives	Planned Housing Supply Rate
The 1st ('62-'66)	To promote self-help housing construction	77.7%
The 2nd ('67-'71)	To promote housing construction by the private sector	76.8%
The 3rd ('72-'76)	To promote housing construction both by the private and the public sector	78.9%
The 4th ('77-'81)	To promote the supply of housing sites and smaller housing units	80.0%
The 5th ('82-'86)	Stabilization of housing price	78.4% 3.24 pyung Person
The 6th ('87-'91)	To promote the supply of housing for the low income households	78.4% 208,000 Rental Units

Source: Lee, K., and Sohn, K. *A Study on the Optimum Allocation of the Housing Finance*, Korea Research Institute for Human Settlement, February, 1989. p. 10

Table 25 Major Characteristics of Economic Development Plans

	First EDP	Second EDP	Third EDP	Fourth EDP	Fifth EDP	Sixth EDP
P O	Correction of 'socio-economic vicious circle' Establishing the a self-reliant economy	Modernization of industrial structure Promotion of self-reliant economy	Coordination of growth, stabilization and equity Achievement of self-development Maximization of land cultivation and development	Achievement of self-generation growth Promotion of equity through social development Technical innovation and efficiency improvement	Stabilization of prices Raising of productivity Promotion of distortions in the economy and promotion of rational development	Enhancing growth control Strengthening Internationalization Improving the living environment
P	1962-66	1967-71	1972-76	1977-81	1982-86	1987-91
E G	7.1 (7.9)	7.0 (9.7)	8.6 (10.2)	9.2 (5.5)	7.6	7.0
M P	Securing energy Correction of structural imbalances in economy Expansion of key industrial and social overhead capital Effective use of idle resources Improvement of balance of payments position Technical development	Self-sufficiency of grains and development of forestry and fisheries Formation of foundation for industrialization Improvement of balance of payments position Raising farmers' incomes Improvement of technology and productivity	Self-sufficiency in food staples Improvement of living environment Industrial structure Development of technology and human resources Expansion of social overhead capital Improvement of welfare	Securing domestic investment resources Achievement of balance in B.O.P. Raising international competitiveness Expansion of employment opportunities and manpower development Expansion of Saemaul campaigns Improvement of living conditions Expansion of investment in science and technology Improvement of economic management and system	Curbing inflation Recovery of competitive power in heavy industry Consolidation of agricultural policy Improvement of financial system Overcoming energy constraints Adjusting government function and rationalization of fiscal management Shift to competitive system and promotion of open economy Development of education and manpower and promotion of science and technology Establishing new relationship between labor and management Expansion of social development	Fiscal reform Reform of monetary control and financial supervision Deregulation of administrative control Forming a new pattern of economic behavior Promotion of industrial structural adjustment Development of the informative industry Expansion of SOC and reform of the distribution system.

- Notes:
- 1) Economic Development Plan
 - 2) Figures in parentheses denote the actual growth rate
 - 3) PO represents Principal Objectives
 - 4) P means Period
 - 5) EG means Economic Growth Rate
 - 6) MP means Major Policies

Source: Economic Planning Board, *Korea's five-year Plan*, 1961, 1966, 1971, 1976, 1981, 1986
Economic Planning Board, *Korea's five-year Plan for the New Economy*, July, 1993

8. Housing Issues and Problems

In spite of sustained increases in resources allocated to housing, Korea has serious problems with housing shortages, worsening affordability problems, and the lack of an adequate mortgage financing system. Housing conditions in Korea have regressed in terms of rates of housing supply and homeownership during the last decade. The overall physical housing conditions, considering dwelling size and facilities or shared dwellings and density, are relatively poor. Public housing cannot meet the needs of low-income families in terms of quantity, quality, and price. The most serious problem is land speculation by middle and upper income groups, which causes high housing prices in the market. It will be a difficult task for the Korean government to solve these issues as it seeks to improve housing quality and increase housing quantity.

One of the crucial problems of housing is the absolute housing stock shortage. (Chung, 1990) Since the 1960s, there has been a growing shortage of housing, felt particularly in Seoul and other large cities. The ever-increasing number of people and industries has created a serious housing problem. The acute housing shortage can no longer be ignored, and the government has built new towns within the Seoul Capital Region.

Mayo, Malpezzi, Gross (1985) argue that in developing countries governments have worsened housing shortages by trying to solve the problem through government

housing. Governments attempt to improve housing quality through imposing high standards and building codes, which they argue have improved nothing.

In spite of a reasonable amount of resources allocated to housing, the low level of housing production can be partially attributable to a skewed distribution of housing demand and a low housing supply elasticity (Ha, 1989). The income elasticity of housing demand in Korea is positive and tends to increase with income level.

While efforts to provide sufficient housing has its own associated problems, they are often complicated by the question of affordability. Traditional approaches³⁶ to the problem of urban settlement have failed to provide affordable public housing for low-income urban households because government policies have been ineffective in providing adequate housing. The main reason is that these policies have been based on a poor understanding of the nature of the problem. What they are missing is insight into aspects of the reality of squatter settlements. The government had followed unrealistic assumptions which regard squatter settlements as “cancerous growth” (Ha, 1990:297) and focusing on the physical conditions only not on socioeconomic needs.

Clearly, a better understanding of target groups should make it possible to devise more effective housing policies. One approach by public institutions has to produce houses for both sale and rent to low-income groups. However, the housing authorities have concentrated on the policy of state-developed housing for sale to encourage urban households' home ownership, which excludes the low income groups,

³⁶ Traditional approaches refer to the several urban redevelopment strategies such as urban renewal project, Hapdong redevelopment project, clearance program for squatter settlements, etc. For a detailed discussion of urban redevelopment policy, see Ha 1990.

to which are attached elderly and handicap individuals. This reference should cover builders are reluctant to provide smaller units, because they are less marketable, less profitable, and therefore more risky. Under such circumstances, low-income and tenant households find themselves in a situation where suitable housing is more difficult to acquire.

CHAPTER FIVE

MODELS OF HOUSING INVESTMENT IN KOREA

1. Introduction

As noted in the previous literature review and existing models of housing investment, new housing investment models are now examined. A theoretical rationale and a conceptual model structure are presented by this study. Then, hypotheses and variables are constructed. Finally, models are developed to define the determinants of housing investment. The potential factors of housing investment in general are investigated first. Then, the relationship between the behavior of housing investment and the conditions of housing stock is analyzed. This relationship provides insights regarding housing investment patterns.

2. Research Design

2-1. Theoretical Rationale

The basic theoretical rationale for the study of housing investment determinants lies in the assumption of traditional consumer utility maximization. Under the free market economy, an individual decides how much to spend on housing following the maximization of his/her utility subject to budgetary constraints. The aggregation of all

individual demands for housing results in demands for housing for the entire nation. In other words, this assumption raises the question of how one country actually reveals preferences for housing provisions in a context of changing circumstances. Most housing investment determinant studies focus on the level of housing investments, which are used as dependent variables. These studies use various independent variables. Within the context of the consumer utility maximization assumption, housing analysts have attempted to explain statistical variations in housing investment, which are dependent variables, by using a regression equation. The independent variables used in the equation have been socio-economic. An example of a conventional housing investment model is

$$Y = f_i(x_1, x_2, x_3) \text{ ----- Equation (1)}$$

$$Y = a + b_1x_1 + b_2x_2 + b_3x_3 \text{ ---- Equation (1) }^1$$

where,

Y represents the share of housing in total output measured as average residential construction as a percentage of the average annual gross domestic product;

x_1 represents the explanatory variable of development level measured by per capita income;

x_2 represents explanatory variables of population growth, measured by the average annual rate of increase in national population; and

x_3 represents the explanatory variable of urbanization, measured by the average annual rate of population increase in cities of 100,000 persons or more divided by the average annual rate of increase in the national population.

We have to pay attention to the fact that x_1 can be considered as a variable measuring demand and x_2 and x_3 as variables measuring need. Not only for economists, but for policy analysts as well, this conventional housing investment determination model has become a standard; with only slight modifications along the basic line, they have employed similar models.

The general housing investment determination model they have used is

$$Y = f_2 (x_1, x_2, x_3, \dots, x_i) \text{ ----- Equation (2)}$$

$$Y = a + b_1x_1 + b_2x_2 + b_3x_3, \dots, + b_nx_n \text{ ----Equation (2)}^1$$

where,

x_i represents each dependent variable which is mostly related to socio-economic variables.

The current study also utilizes this general housing investment model, which is the traditional model in the theory of housing investment determinants. In addition, the linkage among the independent variables is measured in terms of the correlation coefficient in the study.

The proposed model is based on equation 2 above. We assume that potential factors influencing housing investment, in general, can be categorized into six dimensions. The model selects various independent variables: socio-economic status, urbanization and demographic change, policy effects, housing conditions, institutional setting, and global and foreign affairs effects. Specifically, the proposed model is

$$\ln SH = a + b_1 \ln SEO + b_2 \ln DEM + b_3 \ln POL + b_4 \ln HOC + b_5 \ln INS + \\ b_6 \ln FOA + u \text{ -----Equation (3)}$$

where,

SH represents the dependent variable of housing investment;

ln stands for the natural logarithm of the variable, *a* denotes the regression constant, *b_i* depicts the coefficients of each independent variable, *SEO* represents the independent variables of socio-economic status, *DEM* represents the independent variables of urbanization and demographic change, *POL* represents the independent variables of policy effect, *HOC* represents the independent variables of housing conditions, *INS* represents the independent variables of institutional setting, *FOA* represents the independent variables of global and foreign affairs effect, and *u* is residual, error term.

Equation (3) estimates housing investment using different measurements and combinations of variables. The variables for socio-economic status characteristics are per capita GNP, total national revenue, total national expenditures, money supply, deflator index, savings rates, the consumer price index, and producer price index. Urbanization and demographic change variables include the growth rate of national population, rate of urbanization, and growth rate of the urban population. Policy effect variables are *two million house program* dummy variable,³⁷ political stability³⁸ dummy variable, and election dummy variable.³⁹ Housing condition variables are the housing supply rate and the total number of households. Institutional setting characteristic

³⁷ The two million houses program is a dummy variable that identifies the actual housing plan period. For more detail, see CH. Six

³⁸ The political stability is one of a measurement that identifies the status of the political system. We assume that less political stability is a country, the less housing investment will occur. For more details, see CH. Six.

³⁹ Election variable is a dummy variable that identifies the actual election and previous year. We assume that as one of political factor, election conditions relate to housing investment.

variables are composed of defense expenditures and social welfare expenditures.

Finally, the global and foreign affairs variable is the trade balance.

Consequently, the new proposed model in detail becomes as follows:

$$\ln SH = a + b_1 \ln PERGNPO + b_2 \ln PERGNPO2 + b_3 \ln TRO + b_4 \ln TEO + b_5 \ln MSO + b_6 \ln DOMSAV + b_7 \ln AEXPEN + b_8 \ln CPI + b_9 \ln PPI + c_1 \ln DPOP + c_2 \ln DPOP2 + c_3 \ln URB RTE + d_1 \ln TWOMIL + d_2 \ln DPLSTABL + d_3 \ln ELECTION + d_4 \ln REALPLY1 + d_5 \ln EALPLY2 + d_6 \ln REALPLY3 + e_1 \ln NHO + e_2 \ln NSIZE + e_3 \ln NTHH + f_1 \ln RATDEF + f_2 \ln SWPG + g_1 \ln TRABALO + g_2 \ln INTR + g_3 \ln EXCHANG + u \text{ ----Equation (4)}$$

where,

SH represents the dependent variable of the level of housing investment at constant prices; *ln* stands for the natural logarithm of the variable, *a* denotes the regression constant. For independent variables,

SEO:

- *PERGNPO* and *PERGNPO2* (square term of per capita GNP) represent the independent variables of per capita income
- *TRO* represents the independent variables of total revenue
- *TEO* represents the total expenditure variables
- *MSO* represents the money supply variables
- *DOMSAV* represents the ratio of domestic savings to the GNP (we can also use *SAVR*- saving rate, the rate of private savings to disposable income)
- *AEXPEN* represents the average expenditure per person in the national budget
- *CPI* represents the consumer price index
- *PPI* represents the producer price index

DEM:

- *DPOP* and *DPOP2* (square term of national population growth) represent the independent variables of the growth rate of the national population,
- *URBRTE* represents the independent variable of growth rate of urbanization.

POL:

- *TWOMIL* represents the *two million house program* plan dummy variable
- *DPLSTABL* represents the political stability dummy variable
- *ELECTION* represents the election dummy variable
- *REALPLY1, 2, and 3* represent dummy variable of real estate regulation

HOC:

- *NHO* represents the number of constructed housing units,
- *NSIZE* represents the number of persons per household,
- *NTHH* represents the total number of households,

INS:

- *RATDEF* represents share of national defense spending over total expenditure
- *SWPG* represents social welfare spending as a percentage of the GNP

FOA:

- *TRBALO* represents the trade balance
- *INTR* represents the interest rates-the proxy of long-term mortgage rate
- *EXCHANG* represents the exchange rate of won to the U.S. Dollar

and u is the residual, error term.

2-2. *Conceptual Model Structure*

We may make the following inferences for the modification of the conventional housing investment theory. Unlike conventional housing investment models, the new proposed models address several issues. With this in mind, we set up sub-models.

2-2-1. Global Open Model (Domestic Housing Investment and Foreign Affairs Approach)

Housing investment is affected not only by domestic affairs, but also by global and foreign affairs. We assume that the global context of finance and foreign affair are related to the determinants of housing investment. Government policies are responsive to economic changes. For example, a modification in the exchange rate affects the total output of the Korean economy and influences the availability of the money supply, which in turn affects rates of inflation and balance of payments.

We speculate that there is a global and foreign affairs effect on housing investment. We designed this model as a *global open model*, in contrast to conventional housing investment models which are *closed domestic models*. Korea's major economic strategy, which is distinguished by dependence on exports and foreign finance, has affected the production and distribution of housing services. Foreign trade and exports make up a portion of aggregate spending on the government just as do domestic consumption, investment, and general government spending.

Foreign affairs and domestic policies are two essential factors that determine the allocation of investment in developing nations. In this dissertation, foreign affairs and global effects are measured by the exchange rate, foreign aid, and trade balance. The exchange rate, EXCHANGE, is an indicator of foreign affairs because it is a measurement of economic strength and competitiveness in the global economy. The exchange rate is a key element influencing housing investments. We assume that the trade balance variable, TRABALO, is also a major variable that affects housing investments.

2-2-2. National Allocation Model

Military expenditures affect Korea's housing investment. This cannot be understood by cross-national comparative studies. In the mid-1980s, military spending exceeded spending on health and education combined. For the analysis of housing investment, we can no longer neglect the components of fiscal problems especially military spending. It is important to put military spending decisions on the same footing as other fiscal decisions, to examine possible trade-offs systematically, and to explore ways to bring military spending into a better balance with development priorities such as housing investment. We call this the *national allocation model* by focusing on this interaction between housing investment, military spending, and social welfare spending subject to budget constraints. Furthermore, this model accounts for an environment of decision-making for allocating resources under special circumstances. Korea spends a considerable amount of its national income on defense. This has a negative impact on the developmental

process and divert money from the housing market. RATDEF is an indicator of military expenditures.

2-2-3. Policy and Institutional Impact Model

There is a policy and institutional effect. This model uses dummy variables to account for the different phases of government intervention and operation. By examining the role of international, domestic, and institutional arrangements in policy formulation, the variation in housing investments in Korea can be understood. The relationship between political determination and institutional settings can establish a political understanding of housing problems in developing countries.

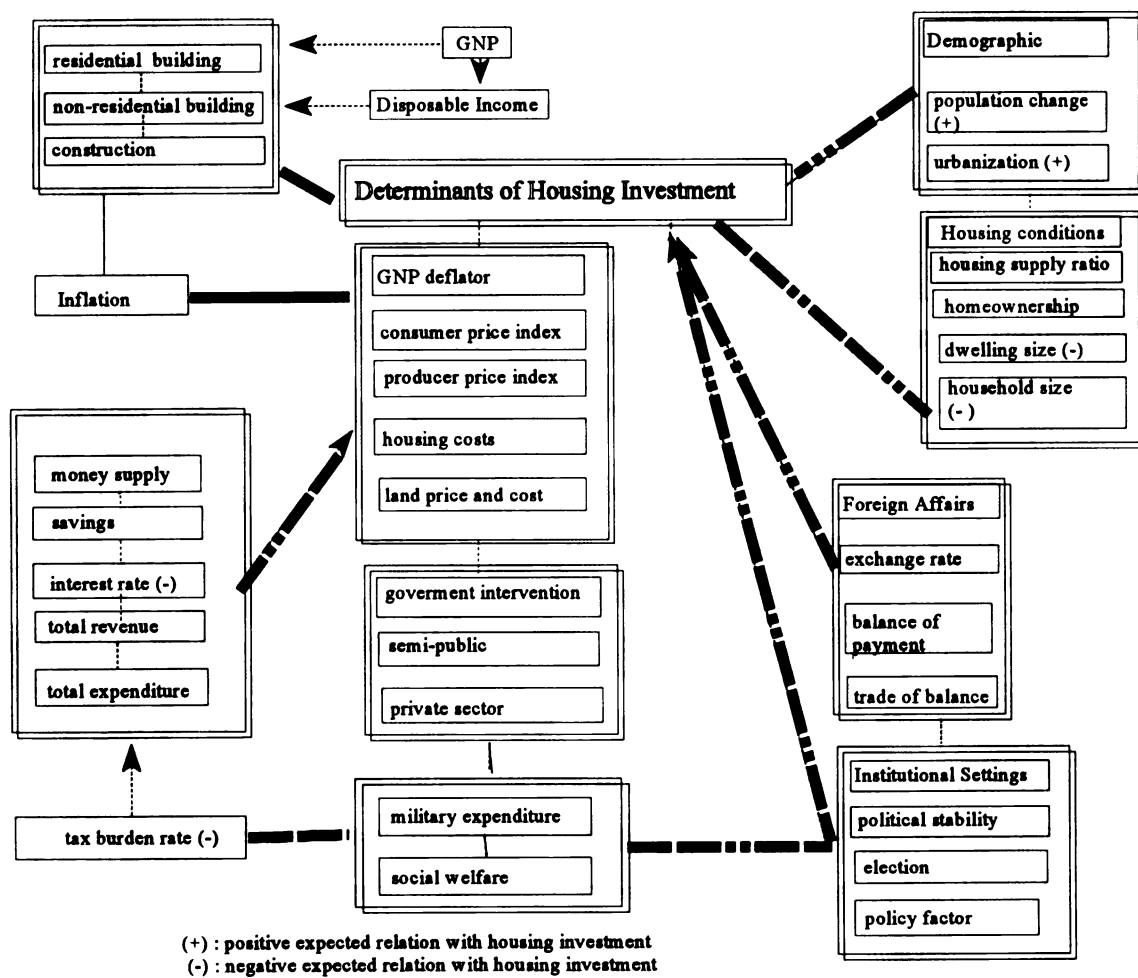
Furthermore, political factors are important to the behavior of housing investment, particularly in developing countries. For example, the housing investment decreased dramatically between 1979-81 in Korea when coups broke out after President Park Chung-Hee was assassinated in 1979. We can thus recognize the importance of political factors in housing investment. It is, however, difficult to measure and predict the influence of these factors.

2-2-4. Financial Model

Because the level and growth rate of savings are relatively high in Korea, we assume that high savings rates will contribute to housing investment. Because of the high levels and growth rates of homeownership and dwelling size, we believe that these two variables are important in Korean's housing investment. Some financial variables, mortgage interest rates and inflation are also expected to significantly impact housing investment.

Figure 7 is a graphical representation of the model structure. It shows the relationship among the main independent variables. The figure also demonstrates the variables computed by each factor category.

Figure 7 Graphical Representation of Model Structure



2-3. *Formulation of Hypotheses, Variables and Models of Analysis*

2-3-1. Hypotheses

What factors account for differences in the share of resources invested in residential construction? One important factor is likely to be the stage of development, an index of a nation's ability to mobilize resources for new housing. Is the size of the share systematically related to the economic development stage? There has been some theorizing about such a relationship and its nature, supported by a modicum of statistical verification. How important are demographic variables such as urbanization? The share of housing in total output is related to the economic development level, population growth, political settings, institutional arrangements, foreign affairs and urbanization.

Based on the purpose of this study and theoretical discussion, the study postulates the main hypotheses developed for statistical investigation as follows:

First H_a ,⁴⁰ ***one of the most important determinants of the level of housing investment is socio-economic factors in Korea.***

The growth of the economy, population, and urbanization is positively associated with housing investment. If we compare cases in other developed countries, we can assume that when housing stock is not "mature," the factor of per capita GNP is highly important to housing investment, and the linear or the quadratic form of per capita GNP is not much different. Furthermore, other variables, particularly interest rates

⁴⁰ Alternative Hypothesis

and inflation, become insensitive in housing investment unless the housing stock reaches a mature level.

Second H_a , housing investment as a share of total output are explained by the demographic and urbanization factors in Korea.

Third H_a , the level of housing investment is mostly determined by the policy effects in Korea.

We assume that political factors play as critical a role in government resource allocation.

Fourth H_a , the level of housing investment is mostly determined by housing conditions in Korea.

If the postulate holds, then what is the magnitude of these forces?

Fifth H_a , among the most important determinants of the level of housing investment are government and institutional factors in Korea. The budget constraint factors have affected the level of housing investment in Korea.

Housing is part of a country's politics and economy. Domestic politics with its varying political stability and institutional settings affect housing in total output in Korea. The excessive military expenditures leave little in the national treasury for the other sectors of the economy. This means that Korea spends large portions of its gross national product for defense. If the postulate holds, then what is the magnitude of these forces?

Sixth H_a , housing investment as a share of total output is previously determined by global and foreign affairs affect in Korea.

Seventh H_a , some combination of main effect variables from six different domains will generate a predictive model of housing investment that is a better predictor than the main effect variables selected from any one domain, based upon predictor variables containing a p -values ≤ 0.05 and an overall regression p -value ≤ 0.05 .

2-3-2. Definitions of Variables

Models are formulated to test the hypotheses and to evaluate the economic development impact on housing investment. We investigate which factors affect housing investment and to what extent the Korean economy can allocate its resources to construct more housing. For dependent variables, we use three different measurements: housing investment as a share of total output, residential housing construction area per person, and housing investment per household.

The appropriate method for investigating and explaining resource allocation in shares committed to housing is multiple regression analysis. This analysis allows each potential determinant to be examined individually while holding others constant, and permits the derivation of the appropriate weight of each with respect to the other. Variables are defined and estimated for (1) testing the relative power of economic and demographic factors in contributing to an explanation of the level of housing investment and (2) identifying the relationship between the level of housing investment and economic development.

2-3-3. Dependent and Independent Variables for Time-Series Analysis⁴¹

Dependent variables representing housing investment are divided into three different measurement categories: national housing construction investment as a percentage of the GNP, housing construction area per person, and housing construction investment per household.

Independent variables are classified into six categories: socio-economic status, institutional setting, urbanization and demographic change, housing conditions, policy effect, and global and foreign affairs effect.

Table 26 Variables for Time-Series Analysis

A. Dependent Variable

- (a) CONNP: national housing construction investment as a percentage of the GNP
 - (b) PHAREA: housing construction area per person
 - (c) HIHSH: housing construction investment per person
-

B. Independent Variables

Socio-Economic Status Variables⁴²

- (a) PERGNPO: per capita constant gross national product
- (b) TRO: constant total revenue
- (c) TEO: constant total expenditure
- (d) MSO: constant money supply
- (e) Deflator: deflator index based on 1970
- (f) CPI: consumer price index based on 1970
- (g) DOMSAV: ratio of domestic savings to GNP
- (h) UMM: unregulated interest on money markets
- (i) DCPI: growth rate at consumer price index
- (j) SAVR: ratio of private savings to disposable income

⁴¹ For more information - source, units, formular see Appendix V.

⁴² In order to investigate the relationship between housing investments and key variables in the national economy, we focus on estimating the elasticity of housing investments with respect to income. In addition to income and price variables, we can include several other independent variables which may affect housing investment.

- (k) AEXPEN: average income per person in the national budget
- (l) HSGEXPIN: average expenditure per household in the national budget
- (m) PPI: producer price index based on 1970

Demographic and Urbanization Variables⁴³

- (a) DPOP: annual rate of increase in the total population
- (b) IRUPOP: rate of increase in the urban population
- (c) URB RTE: rate of urbanization
- (d) RURPOP: rural area population
- (e) URBPOP: urban area population includes that of *Eup*⁴⁴ with more than 20 thousand
- (f) POPU: nation-wide population
- (g) URB R: annual rate of growth of cities over 100,000 divided by the average rate of growth in the national population
- (h) URB: rate of growth in cities over 100,000

Policy Effect Variables

- (a) TWOMIL: the *two million house program* dummy variable
- (b) DPLSTABL: the political stability dummy variable
- (c) PARK: Park's Regime dummy variable
- (d) ELECTION: the election dummy Variable

Housing Condition Variables

- (a) NTHH: total number of households
- (b) NSIZE: number of persons per household

Institutional Setting Variables⁴⁵

- (a) RATDEF: defense spending over total expenditures
- (b) DEFR: defense spending rate of growth
- (c) DEFPG : defense spending as a percentage of GNP
- (d) DEF PB : defense spending as a percentage of budget
- (e) SWSP: social welfare spending in mil. won
- (f) SWR: social welfare spending rate of growth
- (g) SWPG: social welfare spending as percentage of GNP
- (h) SWPB: social welfare spending as percentage of the budget
- (i) ECRTE: economic growth rate
- (j) PDEN: population density

Foreign Affairs Effect

- (a) TRBALO: trade balance in million US dollars
 - (b) EXCHANG: exchange rate of won to the U.S. dollar
 - (c) INTR: interest rate
-

⁴³ These variables include the growth rate of the total population and the ratio between the rural and urban population.

⁴⁴ *Eup* refers to township

⁴⁵ These variables are related to the role of government action in constructing more housing.

3. Patterns of Housing Investment and Fluctuations

3-1. *The Level of Housing Investment and Fluctuations*

The level of housing investment which is represented in 1970 constant prices appears in Table 27 and Figure 8. Korea became highly unstable regarding housing investment after 1975. Housing investment in the later stage is high compare to other Asian countries. In order to diagnose the level of housing investment, the housing investment per capita is presented in Table 28 and Figure 9. We can see that the housing investment per capita has increased continuously. The pattern of housing investment per capita income is quite similar to the level of housing investment patterns. Table 27 presents housing fluctuations in terms of the percentage of change in the level of housing investment from the previous year. Figure 8 shows rather stationary patterns all through 1953 to 1993. The growth rates of housing investment are very high, 10.1 % on average. The 19.07 percent of standard deviation of growth rates represents the relatively high volatile growth rate. The periods of the Second Economic Plan and Sixth Plan have a much higher growth rate (18.3 percent and 18.5 percent) than those of other plan periods.

Table 27 The Level of Housing Investment

Real Level of Housing Investment						Growth Rate of Real Housing Investment				
Period	Mean	S.D. ¹⁾	Max.	Min.	C. D. ²⁾	Mean	S.D. ¹⁾	Max.	Min.	C. D. ²⁾
Postwar transition (1953-61)	13.5	2.98	18.7	9.9	0.22	2.8	25.49	39.87	-37.13	9.03
First Plan (1962-66)	22.1	6.10	32.16	17.41	0.28	12.6	10.43	27.63	-1.46	0.83
Second Plan (1967-1971)	70.1	21.37	93.9	42.7	0.30	18.3	14.35	30.9	1.3	0.78
Third Plan (1972-76)	166.9	54.95	218.9	87.1	0.33	11.1	22.55	34.8	-13.3	2.04
Fourth Plan (1977-81)	410.6	86.00	483.8	279.6	0.21	8.6	28.12	39.3	-31.9	3.26
Fifth Plan (1982-86)	542.1	62.94	609.9	440.0	0.12	9.08	11.49	22.8	-3.61	1.26
Sixth Plan (1987-91)	1225.7	539.05	1823.3	668.7	0.44	18.5	14.89	41.7	2.7	0.81
Research Target (1953-93)	380.49	517.160	1823.35	9.87	1.36	10.1	19.07	41.7	-37.1	1.88

Note: Units: Billion won, 1970 constant prices

1) S.D. means Standard Deviation

2) C.D. means Coefficient of Deviation

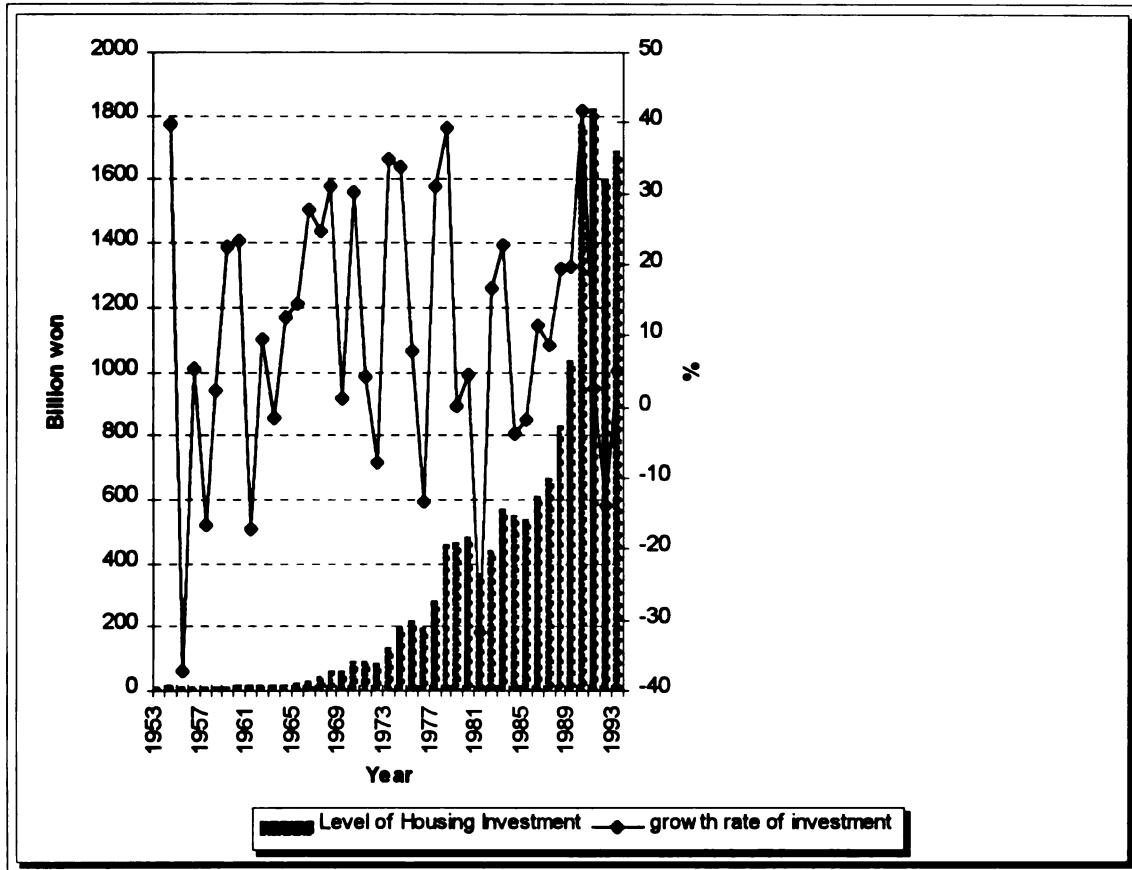
Figure 8 The Level of Real Housing Investment

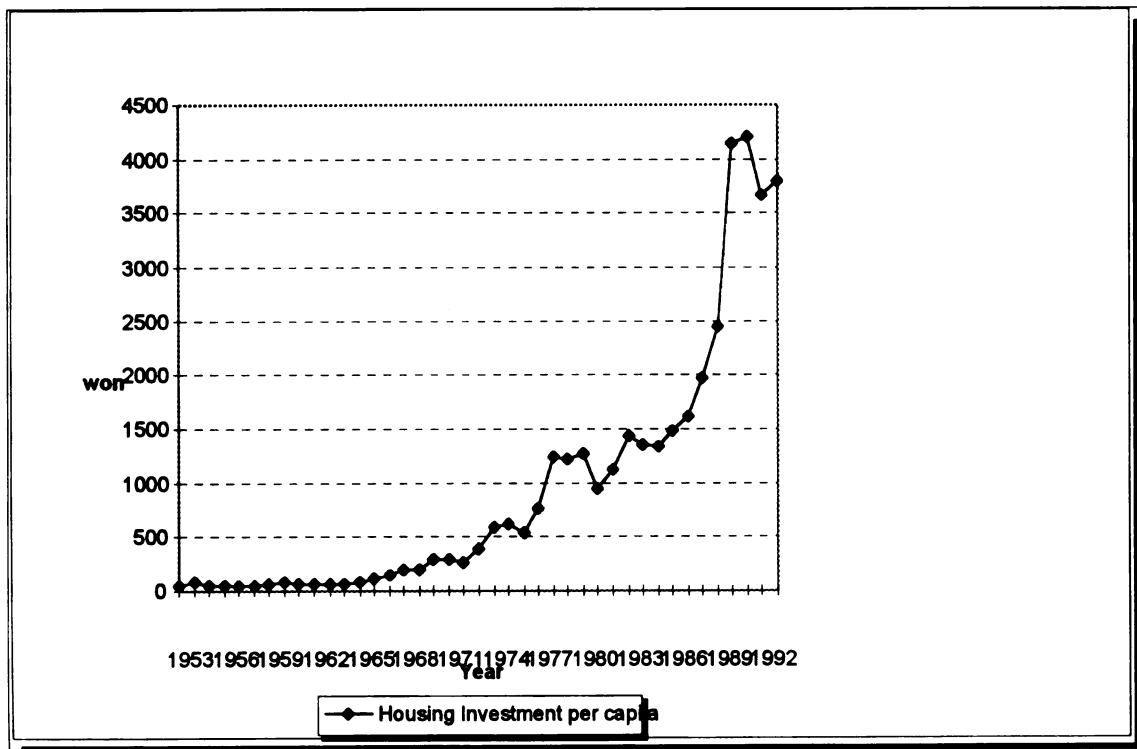
Table 28 Housing Investment Per Capita

Period	Mean	S.D. ¹⁾	Max.	Min.	C. D. ²⁾
Postwar transition (1953-61)	58.3	11.26	76.22	45.79	0.19
First Plan (1962-66)	78.6	18.88	110.27	63.84	0.24
Second Plan (1967-1971)	222.2	62.28	285.4	141.7	0.28
Third Plan (1972-76)	478.4	149.67	620.4	259.9	0.31
Fourth Plan (1977-81)	1092.3	223.79	1269.1	767.8	0.20
Fifth Plan (1982-86)	1345.0	138.53	1480.9	1118.9	0.10
Sixth Plan (1987-91)	2874.9	1224.04	4214.1	1608.4	0.43
Research Target (1953-93)	866.28	1104.94	4214.1	45.79	1.28

Note: Unit: won, 1970 constant prices

1) S.D. means Standard Deviation

2) C.D. means Coefficient of Deviation

Figure 9 Housing Investment Per Capita

3-2. *The Share of Housing Investment and Fluctuations*

The share of housing investment as a percentage of GNP appears in Table 29 and Figure 10. Examining the share of housing investment overall for the 1953 - 1993 period, Korea has an average of 3.61 percent. The Sixth Plan period (1987-1991) has recorded a 6.0 percent. The pattern of the share of housing investment increased from 1.7 percent in the First Plan to 4.9 percent in Fifth Plan, then peaked to 6.0 percent in Sixth Plan period (1987-91).

Housing fluctuations in terms of the percentage change in the share of housing investment from the previous year appear in Table 29 and Figure 10. The average growth rate of share of housing investment and its variance are high. It increases from -1.4 percent in the Fifth Plan to 9.7 percent in the Sixth Plan stage. Overall, there is a 1.5 percent growth rate overall from 1953-1992.

Table 29 The Share of Housing Investment as a Percentage of GNP

Period	Share of Housing Investment					Growth Rate of Share of Housing Investment				
	Mean	S.D. ¹⁾	Max.	Min.	C. D. ²⁾	Mean	S.D. ¹⁾	Max.	Min.	C. D. ²⁾
Postwar transition (1953-61)	1.8	0.37	2.53	1.36	0.21	-2.6	28.19	39.22	-41.68	-10.78
First Plan (1962-66)	1.7	0.24	2.04	1.42	0.15	3.3	13.56	17.24	-17.70	4.14
Second Plan (1967-1971)	3.0	0.43	3.5	2.5	0.14	8.3	17.54	22.6	-16.5	2.11
Third Plan (1972-76)	3.8	0.83	4.9	2.9	0.22	-3.4	26.08	27.1	-34.9	-7.76
Fourth Plan (1977-81)	5.0	0.80	5.9	4.0	0.16	3.3	24.81	29.0	-33.6	7.50
Fifth Plan (1982-86)	4.9	0.67	5.9	4.3	0.14	-1.4	15.58	16.0	-18.6	-10.75
Sixth Plan (1987-91)	6.0	1.87	8.2	4.1	0.31	9.7	17.05	35.3	-7.0	1.77
Research Target (1953-93)	3.61	1.82	8.2	1.36	0.50	1.50	20.63	39.2	-41.68	13.78

Note: Units: %

1) S.D. means Standard Deviation

2) C.D. means Coefficient of Deviation

Figure 9 The Share of Housing Investment as the Percentage of GNP

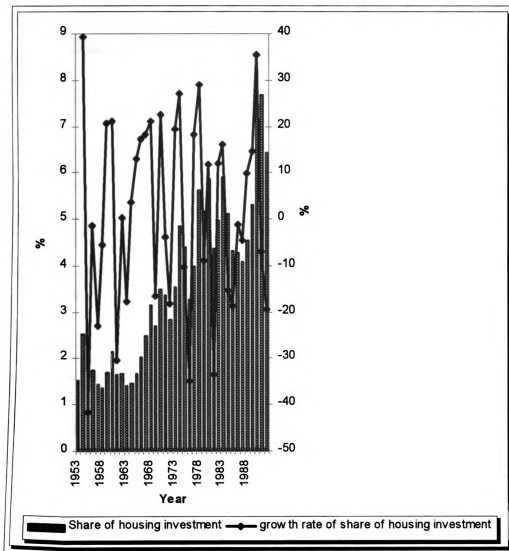


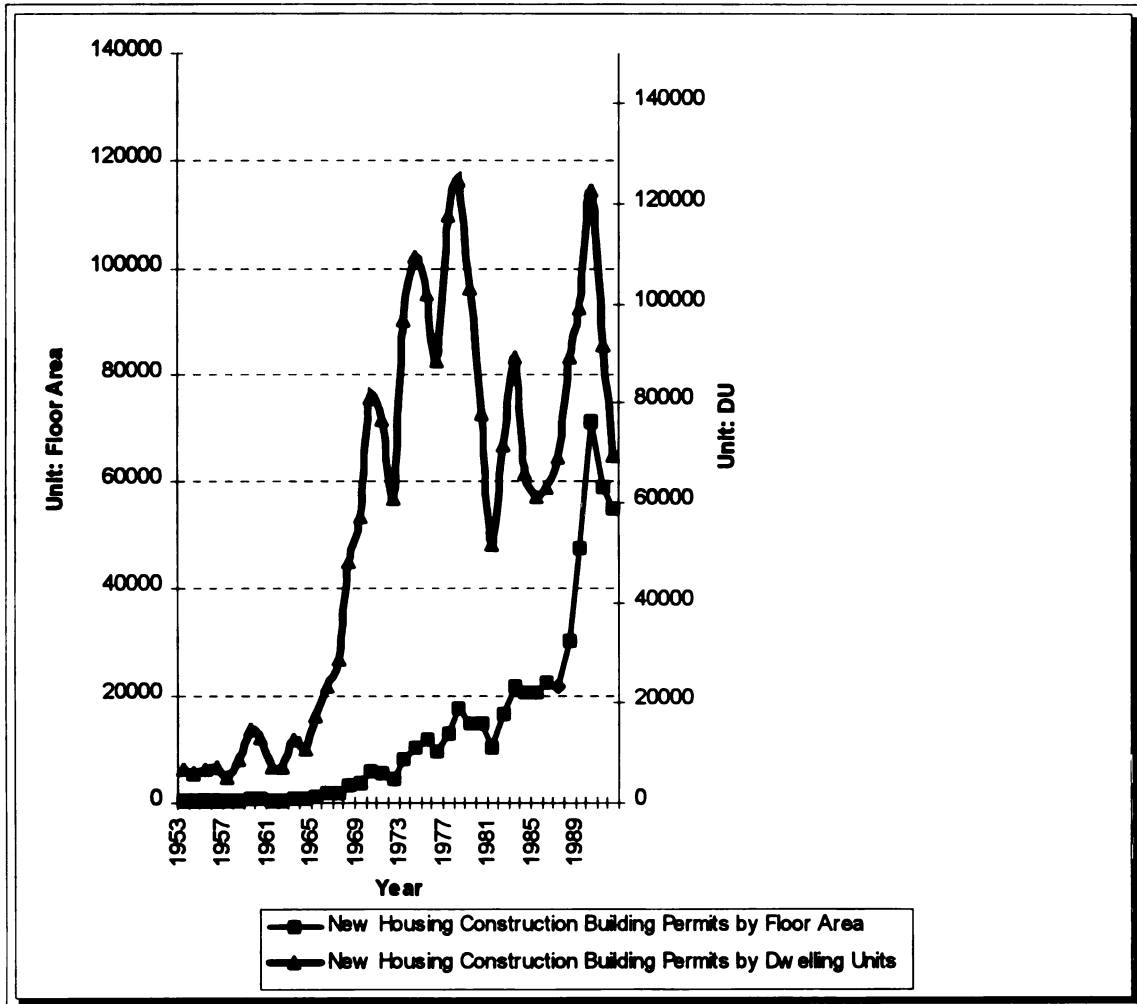
Table 30 New Housing Construction**Floor Area**

Period	Mean	Standard Deviation	Maximum	Minimum	Coefficient of Deviation
Postwar transition (1953-61)	402.5667	175.7513	734.8	262.5	0.436577
First Plan (1962-66)	945.16	496.025	1731	390.6	0.524805
Second Plan (1967-1971)	4098.6	1641.185	5885	1977	0.400426
Third Plan (1972-76)	8773	2727.126	11623	4524	0.310854
Fourth Plan (1977-81)	14036.2	2661.378	17516	10308	0.189608
Fifth Plan (1982-86)	20406.8	2253.452	22518	16651	0.110427
Sixth Plan (1987-91)	45859.6	31631.17	70927	21639	0.689739
Research Target (1953-92)	13223.32	17383.74	70927	262.5	1.314627

(Unit: FA 1000 m²)**Dwelling Unit**

Period	Mean	Standard Deviation	Maximum	Minimum	Coefficient of Deviation
Postwar transition (1953-61)	8372.333	3290.638	14727	5154	0.393037
First Plan (1962-66)	14205.2	6354.965	23353	6990	0.447369
Second Plan (1967-1971)	58371.2	21374.52	80956	28812	0.366183
Third Plan (1972-76)	91388	18724.81	109347	60832	0.204894
Fourth Plan (1977-81)	94984	30208.98	124789	51644	0.318043
Fifth Plan (1982-86)	70219.4	11312.66	89255	61252	0.161105
Sixth Plan (1987-91)	94304	19359.95	122679	69110	0.205293
Research Target (1953-92)	56553.68	39449.03	124789	5154	0.69755

(Unit: DU)

Figure 11 New Housing Construction Building Permit

New housing construction is usually measured by housing statistics of dwelling units and floor area. In the case of Korea we can replace new housing construction permit data for real new housing construction although there is a reliability problem involved in using building permits to trace the recent evolution of the housing stock. For a consistency check between the building permits data and actual construction data, we note that the slight difference of 3 percent exists. It may be due to a limited amount of illegal construction across all urban areas.

We see that basically new housing construction patterns are consistent with the previous level and share of housing investment patterns (Table 30). Figure 11 demonstrates that housing quality in terms of floor area per new construction unit has improved in Korea.

A recent estimate of new housing stock demand runs as high as 5.9 million units by the year 2001. The estimation is based on the assumption that a close relationship exists between per capita income and housing investment. (Kim, 1993:336)

Housing fluctuations in terms of the percentage of change in new housing construction from the previous year appear in Table 31 and Figure 12 Korea had negative growth in the Postwar transition period and in the Fourth Plan period.

Table 31 The Growth Rate of New Housing Construction**Floor Area**

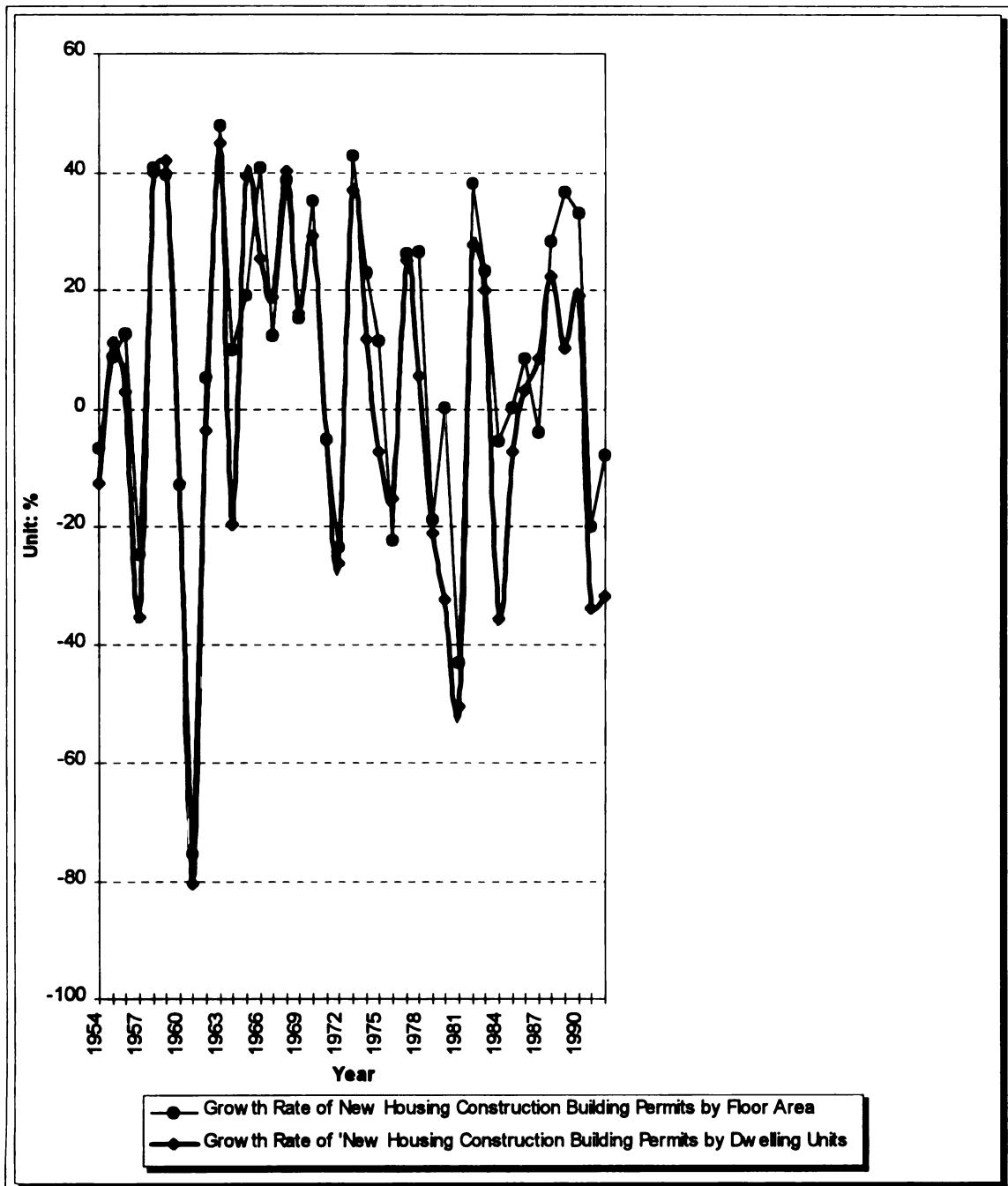
Period	Mean	Standard Deviation	Maximum	Minimum	Coefficient of Deviation
Postwar transition (1954-61)	-2.3	37.64	40.72	-75.47	-16.49
First Plan (1962-66)	24.5	18.83	47.75	5.15	0.77
Second Plan (1967-1971)	19.3	17.98	38.7	-5.2	0.93
Third Plan (1972-76)	6.3	29.02	42.9	-23.7	4.64
Fourth Plan (1977-81)	-1.8	29.91	26.5	-43.0	-16.48
Fifth Plan (1982-86)	12.9	17.78	38.1	-5.6	1.38
Sixth Plan (1987-91)	14.7	23.21	36.5	-20.1	1.58
Research Target (1954-92)	9.51	27.02	47.8	-75.47	2.84

(Unit: 1000 m²)**Dwelling Unit**

Period	Mean	Standard Deviation	Maximum	Minimum	Coefficient of Deviation
Postwar transition (1953-61)	-5.7	40.08	41.90	-80.36	-7.07
First Plan (1962-66)	17.2	27.86	44.81	-19.57	1.62
Second Plan (1967-1971)	19.8	17.00	40.1	-5.5	0.86
Third Plan (1972-76)	0.0	24.88	37.0	-26.1	-1334.82
Fourth Plan (1977-81)	-14.7	30.12	25.0	-50.4	-2.05
Fifth Plan (1982-86)	1.6	24.97	27.8	-35.7	15.94
Sixth Plan (1987-91)	5.2	22.73	22.4	-34.1	4.36
Research Target (1954-92)	2.63	28.87	44.8	-80.36	10.99

(Unit: DU unit)

Figure 1 The Growth Pate of New Housing Permits



CHAPTER SIX

TESTING MODELS OF HOUSING INVESTMENT IN KOREA

1. Introduction

This chapter is an empirical interpretation of explanatory analysis concerning several housing investment models. First, it presents the overall data description and correlation relationship for various housing investment models. Second, the chapter illuminates determinants of housing investment by using factor analysis. The chapter factor analyses verifies the implications of empirical findings of the various housing investment models. Third, it tests the specifications of the housing investment models.

Three analytical methods were used : (1) Pearson correlation analysis, (2) factor analysis and (3) multiple regression analysis. The analysis began with selection of dependent variables. Out of 75 variables, 11 important variables were selected for regression analysis. There were initially 36 independent variables which were grouped into 6 categories according to similar characteristics. Regression equations were then derived for the most important categories of housing investment. Qualitative variables were treated as dummy variables.

2. Data Description and Data Collection

The data of income variables are collected at 1970 constant prices. The results are quite different from the current prices. It is important to use constant prices because these are more appropriate in our analysis by representing dramatic changes of trends. Observations of population growth are based on census data, as are the estimates of mid-year population to calculate the growth rate from the previous year. The long-term mortgage rate is considered as the interest rate in our analysis.

Per capita GNP can be termed as the level of income, and ratio of housing investment over the total output can be termed as share of housing investment. As stated in the literature review, most of the studies used per capita GNP, and percent of housing investment over the total output as dependent variables. The data description in the housing investment models is presented in Table 32.

In order to identify important dependent variables to perform regression analysis, initially 10 dependent variables were introduced to show the different aspects and diversity of housing investment. But due to the limited scope of this research, a reduced number of categories were needed. This was done by using correlation analysis and factor analysis.

Table 32 Descriptive Statistics

Variables	PERGNPO	ECRTE	TRO	TEO	MSO	DEFLA	EXCHANGE
N	41	41	41	41	41	41	41
Min.	29.815	-3.7	66.533	53.6	40426.667	2.2	18
Max.	583.447	13.8	5282.15	6291.58	2887393.12	122.4	88890.2
Mean	182.463	7.563	1440.271	1535.173	735363.538	40.029	439.444
Var.	29178.249	15.551	2517860.61	2756335.39	582552E+12	1245.73	73888.975
S. D. ¹⁾	170.816	3.944	1586.777	1660.221	763251.183	35.295	271.825
Medi.	110.562	7.6	587.609	851.53	561769.231	27.2	398.9

Variables	CPI	TRBALO	PPI	DOMSAV	HSGEXPIN	INTR	DPOP
N	41	41	41	40	33	40	40
Min.	7.5	-4078.667	1.1	1.358	27.16	8	-0.347
Max.	1005.8	1590.081	108.6	35.877	486.031	19.5	4.403
Mean	307.354	-768.109	42.015	19.736	202.869	12.726	1.768
Var.	100608.413	871441.39	1625.545	148.977	15068.821	8.224	0.95
S. D. ¹⁾	317.188	933.51	40.318	12.206	122.755	2.868	0.974
Medi.	130	-781	17.91	20.345	168.772	13.87	1.574

Variables	URB	HIHSH	URBRTE	HGLOPC	PHF	PDEN	IRUPOP
N	40	33	40	27	19	41	39
Min.	-15.78	3.568	37.2	0.18	11.3	205.1	-0.467
Max.	22.131	155.93	83.7	301.366	2711.219	443.6	9.957
Mean	4.461	46.32	56.374	57.28	762.53	335.751	3.733
Var.	65.087	1872.505	248.968	6813.685	787120.71	5785.103	3.918
S. D. ¹⁾	8.068	43.272	15.779	82.545	8887.198	76.06	1.979
Medi.	4.919	35.497	52.8	2791.08	17.231	345.3	3.423

Variables	NTHH	NSIZE	HRTE	RATDEF	NHF	SWSP	SWPG
N	33	34	35	40	19	33	33
Min.	4358	3.7	62.9	6.247	24.6	104	2.2
Max.	11907	5.87	82.5	62.189	3414.266	108708	4.8
Mean	7127.818	4.948	75.423	27.334	950.068	23152.242	3.752
Var.	4885898.90	0.531	25.421	169.186	1369590.6	996388000	0.439
S. D. ¹⁾	2210.407	0.729	5.042	13.007	1170.295	31565.619	0.662
Medi.	6702	5.225	76.9	4.586	414.546	5806	3.9

Note: S. D means Standard Deviation

2-1. *Correlation Analysis*

Pearson correlation technique is applied to investigate the correlation patterns. Two types of correlation matrices are developed: (1) correlation among independent variables, and (2) correlation between selected dependent variables and independent variables.

2-1-1. The Correlation Relationship among Dependent Variables

Because of the different meanings of these measurements of housing investment, the relationships among these patterns are to be examined. Table 33 shows the correlation matrix of these measurements. We can see very high correlation coefficients (over 0.8) among these measurements. Since new housing construction is the major component in the level of housing investment, it is important to find that this variable is statistically significant. However, the coefficient of PBBCDW and other variables are quite low, so the PBBCDW variable is eliminated from dependent variables. Figures 13 and 14 show the relationship among these measurements which are transformed by normalized plots.⁴⁶

The original units of the series have no effect on the plot; each series has the same amount of variation. Normalized plots ($Z = \frac{(xi - \bar{x})}{S.D.x.}$) are helpful in studying the

⁴⁶ Normalized plots (so-called *Z Scores*) are normalized the series by dividing the differences of the series and its mean by its standard deviation.

joint movements of two or more series with different units of measurement. We can see quite a coincidence among these patterns of three measurement in general, although a slightly different pattern appears between the level and share of housing investment from 1953 to 1968.

Table 33 Correlation Matrix among Dependent Variables

	CONNP	HIHSH	PHAREA	RESO	PBBCDW
CONNP	1.00				
HIHSH	0.916	1.00			
PHAREA	0.861	0.980	1.00		
RESO	0.860	0.984	0.982	1.00	
PBBCDW	0.774	0.602	0.573	0.496	1.00

Note: RESO:Level of housing investment

CONNP:Share of housing investment

PHAREA: Per capita new housing construction area

HIHSH: Per household level of housing investment

PBBCDW:New housing construction by dwelling unit

Figure 13 The Relationships among Housing Investment Patterns by Normalized Plots

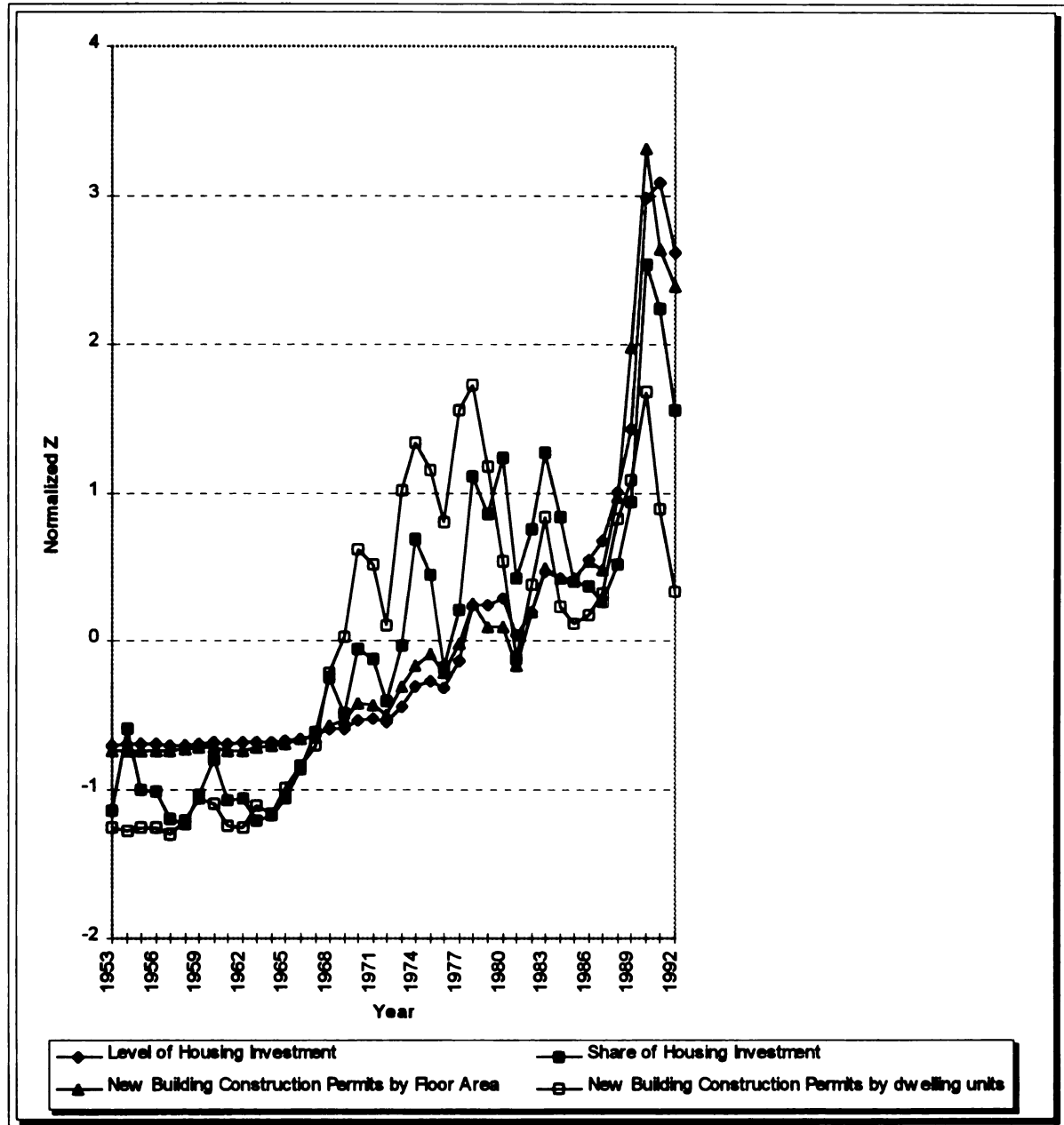


Table 34 and Figure 14 show the relationship among the housing growth/fluctuation patterns. We can see that highly coincident growth patterns exist. The growth pattern between the level and share of housing investment is still coincident with each other. The correlation coefficient among housing investment growth patterns has statistical meaning; however, it is much lower than that of the housing investment pattern itself (over 0.5). We may find that the floor area is more correlate than that of the dwelling unit approach. It can be said that the floor area approach is a more accurate representation.

Figure 14 The Relationships among Housing Investment Growth Patterns by Normalized Plots

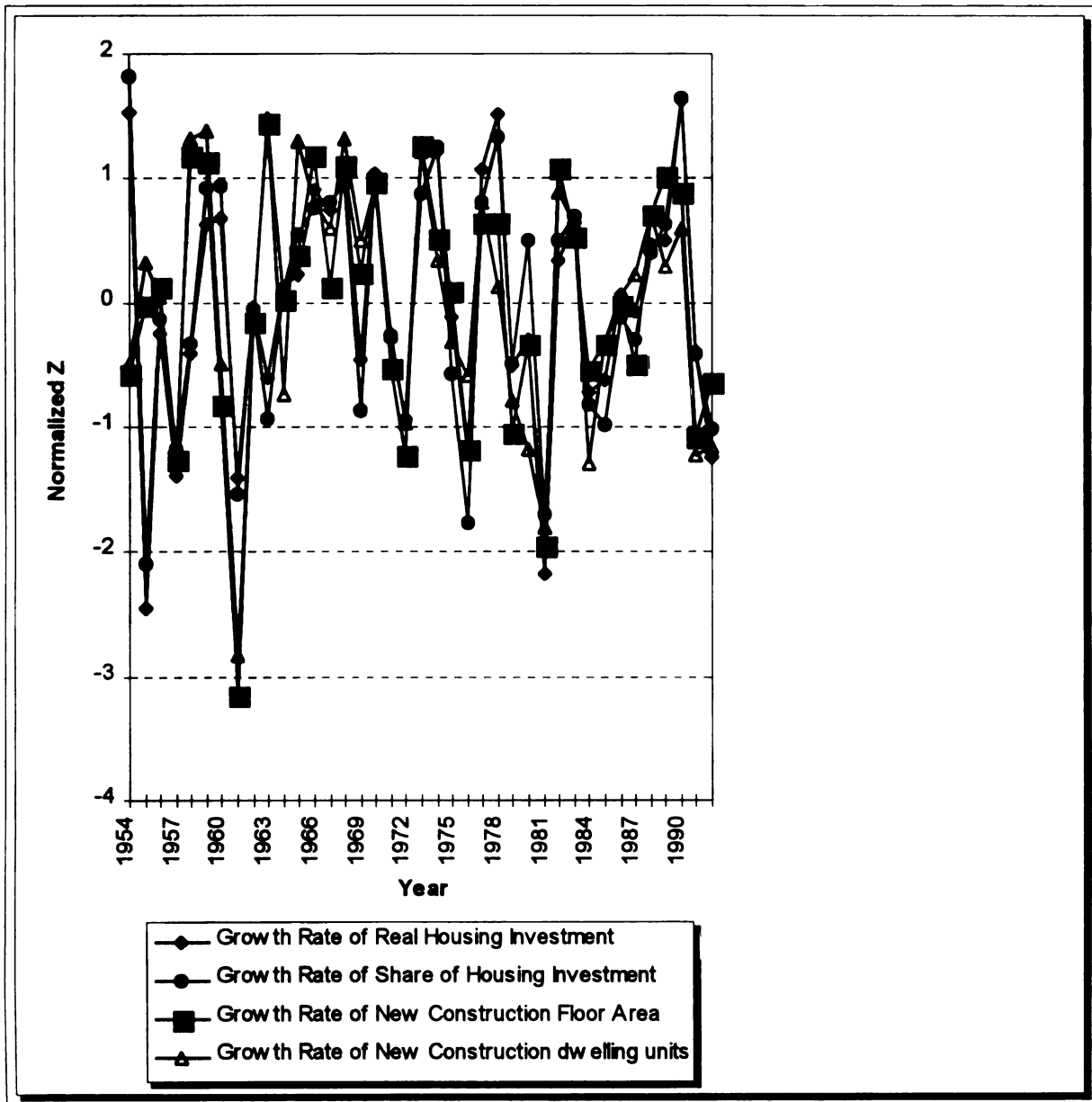


Table 34 Correlation Matrix among Housing Investment Growth Patterns

	IRHIV	IRCONNP	GRPABCFLO
IRCONNP	0.973		
GRPABCFLO	0.601	0.555	
GRPBBCDW	0.562	0.515	0.914

Note: IRHIV: Growth rate of the level of housing investment
 IRCONNP: Growth rate of the share of housing investment
 GRPABCFLO: Growth rate of the new housing construction by floor area
 GRPBBCDW: Growth rate of the new housing construction by dwelling unit

2-1-2. The Correlation Relationship among Independent Variables

The correlation matrix of independent variables in housing investment model is presented in Table 35. The level of housing investment is highly correlated with the per capita GNP(0.826). The coefficient of TRO, TEO, MSO, and SWSP to the Per Capita income shows very high (over 0.97). This may dominate the relations over other variables' relationship. Therefore, these variables are also eliminated for regression analysis. The results of correlation analysis are described below.

The three population variables show that they are moderately correlated. Population density is negatively correlated with population growth (DPOP). Several income measuring variables [per capita GNP, total revenue (TRO), total expenditure (TEO), and money supply (MSO)] are strongly correlated to each other. Among the four housing related variables, most of them are moderately correlated with each other. Considering the correlation with housing investment, three variables, such as, people in housing units (NSIZE), number of households (NTHH), number of housing units (NHO)

are highly correlated with each other variables. However, housing supply ratio (HRTE) are negatively correlated with all other housing variables.

Table 35 Correlation Coefficient Among Independent Variables

	PERGNO	PERGNP	PERGNP	ECRTE	TRO	TEQ	MSQ	DEFLAI	EXCHAN	CPI	TRBALO	DOMSAV	HSGEXP	INTR	DPOP	URB
PERGNO	1.000															
PERGNP02	0.989	1.000														
ECRTE	0.251	0.218	1.000													
TRO	0.972	0.943	0.237	1.000												
TEQ	0.980	0.983	0.147	0.961	1.000											
MSQ	0.985	0.988	0.275	0.950	0.984	1.000										
DEFLAI	0.983	0.907	0.103	0.967	0.959	0.925	1.000									
EXCHANGE	0.505	0.431	-0.050	0.621	0.566	0.487	0.744	1.000								
CPI	0.910	0.877	0.060	0.952	0.941	0.899	0.997	0.776	1.000							
TRBALO	0.406	0.324	0.439	0.518	0.311	0.337	0.396	0.392	0.386	1.000						
DOMSAV	0.722	0.686	0.624	0.675	0.627	0.694	0.591	0.259	0.540	0.420	1.000					
HSGEXPIN	0.974	0.959	0.165	0.979	0.987	0.971	0.974	0.607	0.961	0.388	0.630	1.000				
INTR	-0.682	-0.656	-0.525	-0.711	-0.657	-0.686	-0.622	-0.461	-0.597	-0.585	-0.730	-0.662	1.000			
DPOP	-0.546	-0.516	-0.352	-0.596	-0.558	-0.547	-0.601	-0.499	-0.598	-0.391	-0.563	-0.598	0.617	1.000		
URB	-0.266	-0.246	-0.285	-0.243	-0.249	-0.300	-0.264	-0.238	-0.248	-0.141	-0.315	-0.282	0.230	0.209	1.000	
URBRTE	0.931	0.889	0.132	0.973	0.938	0.906	0.993	0.745	0.990	0.440	0.617	0.961	-0.625	-0.598	-0.243	
PDEN	0.928	0.881	0.170	0.971	0.933	0.905	0.992	0.767	0.987	0.479	0.629	0.961	-0.665	-0.622	-0.266	
NTHH	0.961	0.952	0.126	0.953	0.978	0.949	0.968	0.655	0.955	0.318	0.628	0.957	-0.649	-0.533	-0.202	
NSIZE	-0.922	-0.889	-0.164	-0.956	-0.923	-0.895	-0.963	-0.734	-0.955	-0.476	-0.628	-0.923	0.686	0.594	0.217	
HRTE	-0.199	-0.142	0.168	-0.314	-0.194	-0.104	-0.349	-0.484	-0.374	-0.258	-0.190	-0.209	0.069	0.280	-0.189	
RATDEF	-0.827	-0.846	-0.078	-0.834	-0.877	-0.827	-0.815	-0.530	-0.806	-0.270	-0.546	-0.852	0.700	0.507	0.170	
ELECTION	0.189	0.189	-0.245	0.063	0.167	0.182	0.157	0.043	0.131	-0.220	0.180	0.166	0.204	0.005	-0.535	
TWOMIL	0.878	0.901	0.217	0.848	0.854	0.871	0.758	0.185	0.731	0.305	0.593	0.831	-0.543	-0.409	0.004	
DPLSTABL	-0.142	-0.154	0.073	-0.231	-0.180	-0.150	-0.217	-0.353	-0.241	-0.370	0.143	-0.147	0.268	0.196	0.065	
SWSP	0.979	0.982	0.142	0.963	0.997	0.980	0.957	0.560	0.940	0.310	0.629	0.980	-0.654	-0.560	-0.215	
SWPG	0.483	0.414	-0.191	0.602	0.538	0.456	0.719	0.811	0.758	0.208	0.149	0.590	-0.177	-0.354	-0.008	
PPI	0.756	0.698	-0.044	0.848	0.800	0.732	0.933	0.890	0.954	0.394	0.399	0.843	-0.476	-0.565	-0.229	
NIIF	0.880	0.913	0.062	0.825	0.919	0.890	0.830	0.404	0.081	0.042	0.544	0.866	-0.576	-0.528	-0.077	
PHF	0.925	0.958	0.085	0.892	0.962	0.948	0.873	0.398	0.856	0.157	0.535	0.93	-0.571	-0.47	-0.164	

3. Factor Analysis and Factor Matrix

Factor analysis is a technique for reducing large sets of collinear data to a few synthetic variables according to given criteria. This analysis is a scientific way of screening redundant variables. It is primarily the choice of variables which determine the results, i.e., the factors that can be identified. Therefore, the selection of variables should be guided primarily by theoretical background i.e., by their expected relevance to the basic determinants underlying the housing investment. A principal component analysis is performed for using the principal component scores in a multiple regression. It is essential to perform this analysis to estimate the effect of a particular explanatory variable on the dependent variable. This principal component analysis has advantages of escaping from problems associated with multicollinearity and degrees of freedom. In view of findings of factorial determinants on housing investment, we look for variables associated with the following characteristics: (1) socio-economic status; (2) institutional setting; (3) demographic and urbanization; (4) housing conditions; (5) policy effect; and (6) foreign affairs effect. The independent variables enter the analysis and result in thirty six principal components, six of them with eigenvalues of one or above. The number of factors extracted equals the number of eigenvalues exceeding one. The 36 variables are selected from the period of 1953 to 1993, thus there is a 40 x 36 variables matrix. Table 36 presents this factor matrix.

Table 36 Summary of Major Factors and Variables

Factor	Variable Name	Definition and Units
Socio-Economic Status	PERGNPO	Per capita GNP (constant) 1000won
	PERGNPO2	Per capita GNP ² 1000 won
	TRO	Total Revenue (constant) Bil. won
	TEO	Total Expenditure (constant) Bil. won
	MSO	Money Supply (constant) Bil. won
	DEFLAT1	Deflator Index
	HSGEXPIN	Average expenditure per household in the national budget 1000 won
	CPI	Consumer Price Index (1970 base year)
	PPI	Producer Price Index
	DOMSAV	Ratio of Domestic Savings to GNP (1954-1992) %
Institutional Setting	ECRTE	Economic Growth Rate %
	RATDEF	Share of Defense Spending over Total Expenditure %
	SWSP	Social Welfare Spending in Mil. won (1962-93)
	SWPG	Social Welfare Spending in Percentage of GNP (1962-93) %
Policy Effect	PHF	Public Housing Fund by KHB
	NHF	National Housing Fund by KHB
	RNHNP	Share of number of public housing over total number of housing construction
	HPOL	Strength of anti-speculation measures
	HGLOPC	Per capita housing loan from Korea Housing Bank 1000 won
	GRMS	Growth Rate of Money Supply %
Housing Conditions	NTHH	Total Number of Households1000
	NSIZE	Person Per Each Households
	HHSRGRO	Growth Rate of Households %
	STOGRO	Growth Rate of Housing Units, %
Demographic and Urbanization	URBR	annual rate of growth of cities over 100,000 divided by average rate of growth in national population %
	DPOP	Rate of Growth %
	PDEN	Population Density Per Km ²
	IRUPOP	Increase rate of urban population
	URB	Rates of Growth in cities over 100,000
	URBPOP	Urban Population
	URBRTE	Urbanization Rate
Foreign Affairs Effect	INTR	Interest Rate %
	DCPI	Inflation Rate %
	EXCHAN	Exchange Rate of won to U.S. Dollar, won
	TRBALO	Trade Balance in million US dollars (constant) Mil. \$

Communality is defined as the percentage of the variance of each variable which can be explained by a regression on the remaining variables. The six principal factors extracted explain respectively 59.595%, 10.884%, 7.958%, 5.505%, 4.460%, and 3.276% of the total variance - a total of almost 91.678%. The principal factors are not unique but can be rotated to simplify the structure and improve the interpretability of the results. The following is a discussion of the rotation according to the Varimax criteria, which yield the best results for our research interests.

3-1. *Orthogonal Rotation with the Varimax Criterion*

The Varimax criterion maximizes the interpretability of factors by rotating the axes so that each factor has a minimum number of variables with large loading on it. The first four of the six factors obtained by this rotation explain most of the variance of the variables - 52.418%, 9.983%, 6.773%, and 13.066%. The rotation factor matrix is presented in Table 37. The fifth factor contributes only 4.707%.

Interpretation of the factors from the factor loadings is straightforward. The first factor is *socio-economic status* such as per capita GNP, Total Revenue, Total Expenditure, Deflator, etc. The significant relationships exist with several variables associated with housing conditions. These include number of total households, and size of dwelling units. The second factor is called *institutional setting*; it has high loadings on the variable associated with economic growth rate. The factor is correlated with variables associated with socio-economic status such as social welfare expenditure. The

third factor, called *policy effects*, has high loadings on the variables associated with the national housing fund variable and the housing policy variable. The fourth factor is termed *housing condition*; it has no high loadings on the variables associated with it and is thus somewhat ambiguous in its interpretation. The factor is correlated with variables associated with policy effect. The fifth factor is called *demographic and urbanization*, has its largest loadings on the two variables related to urbanization; the percentage of urban population, URB and URBR. The last factor is termed *foreign affair effect*. It has largest loadings on the inflation variable. In addition, there are high loadings on variables associated with the interest rate and exchange rate.

Table 37 Factor Matrix: Component Loadings

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
PERGNPO	0.962	0.172	-0.019	0.137	0.009	-0.073
PERGNPO2	0.941	0.214	-0.127	0.180	-0.023	-0.079
ECRTE	0.212	0.690	0.401	-0.241	-0.141	-0.163
TRO	0.981	0.057	0.059	0.001	0.015	0.017
TEO	0.985	0.053	-0.088	0.119	0.002	0.005
MSO	0.956	0.220	-0.036	0.151	-0.050	0.010
GRMS	0.211	0.350	0.091	-0.034	-0.710	0.434
DEFLA1	0.980	-0.150	0.062	0.036	0.053	0.045
EXCHANG	0.666	-0.574	0.363	-0.199	-0.054	0.029
CPI	0.967	-0.214	0.057	0.013	0.049	0.085
TRBALO	0.473	0.134	0.497	-0.395	-0.258	-0.062
PPI	0.866	-0.422	0.156	-0.054	0.085	0.129
DOMSAV	0.655	0.516	0.217	-0.027	0.183	-0.390
HSGEXPIN	0.983	0.039	0.017	0.069	0.063	0.098
INTR	-0.683	-0.390	-0.230	0.345	0.018	0.112
DCPI	-0.538	0.407	-0.205	0.433	0.355	-0.300
DPOP	-0.616	-0.172	-0.130	0.519	-0.330	-0.075
URB	-0.167	-0.191	-0.716	-0.466	-0.098	-0.137
URBPOP	0.985	-0.057	0.083	0.031	0.081	0.029
URBRTE	0.976	-0.137	0.080	0.020	0.082	0.022
URBR	-0.006	-0.129	-0.544	-0.756	0.220	-0.062
PDEN	0.976	-0.119	0.138	-0.021	0.048	0.031
IRUPOP	-0.452	0.541	0.068	0.117	0.290	0.395
NTHH	0.978	-0.072	-0.078	0.100	-0.039	-0.117
NSIZE	-0.964	0.115	-0.054	0.021	0.031	0.117
RATDEF	-0.834	-0.027	0.146	0.015	0.068	0.052
AEXPEN	0.985	0.045	-0.085	0.121	0.006	0.009
STOGRO	0.532	0.010	-0.612	-0.204	-0.082	-0.123
HHSGRO	0.174	0.395	0.109	-0.204	0.658	0.464
SWSP	0.983	0.051	-0.132	0.105	-0.003	-0.008
SWPG	0.666	-0.580	0.041	-0.052	0.114	0.230
NHF	0.851	0.103	-0.416	0.110	0.062	-0.052
PHF	0.905	0.132	-0.319	0.182	0.033	0.085
HGLOPC	0.953	0.130	-0.192	0.160	-0.030	-0.033
HPOL	0.202	0.669	0.365	-0.246	-0.100	-0.027
RNHNP	-0.086	-0.410	0.705	-0.046	0.254	-0.382

Note: Variance explained by components: factor 1 (21.454), factor 2(3.918), factor 3 (2.865), factor 4 (1.982), factor 5 (1.606) and factor 6 (1.18)

Table 38 Factor Matrix: Rotated Loadings

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
HGLOPC	0.978	0.132	-0.039	0.053	-0.019	0.105
SWSP	0.975	0.120	-0.038	0.166	0.007	0.063
TBO	0.971	0.128	0.004	0.181	0.019	0.059
AEXPEN	0.970	0.121	0.008	0.187	0.022	0.056
PHF	0.966	0.013	-0.101	-0.011	0.084	0.169
PERGNPO2	0.966	0.217	0.022	0.005	-0.016	0.079
NTHH	0.953	0.103	-0.026	0.241	-0.119	-0.031
PERGNPO	0.950	0.248	0.065	0.103	0.013	0.023
MSO	0.945	0.250	0.082	0.092	0.034	0.133
HSGEXPIN	0.931	0.143	0.055	0.276	0.132	0.047
NHF	0.927	0.016	-0.241	-0.063	0.014	0.073
URBPOP	0.909	0.141	0.058	0.360	0.085	-0.054
TRO	0.903	0.237	0.032	0.302	0.070	0.020
DEFLA1	0.902	0.067	0.042	0.411	0.044	-0.047
URBRTE	0.894	0.091	0.041	0.407	0.058	-0.082
CPI	0.878	0.017	0.023	0.466	0.050	-0.037
NSIZE	-0.877	-0.178	0.018	-0.379	0.094	0.084
PDEN	0.868	0.148	0.059	0.451	0.057	-0.064
RATDEF	-0.802	-0.152	0.131	-0.183	0.055	-0.069
PPI	0.735	-0.093	0.038	0.642	0.056	-0.121
DOMSAV	0.618	0.665	0.104	-0.130	0.082	-0.265
STOGRO	0.575	0.007	-0.598	-0.043	-0.121	0.128
SWSP	0.563	-0.322	-0.040	0.643	0.076	-0.097
INTR	-0.502	-0.711	0.054	-0.254	-0.022	-0.112
ECRTE	0.076	0.856	0.163	-0.067	0.094	0.089
HPOL	0.113	0.780	-0.077	-0.399	0.293	0.269
TRBALO	0.213	0.626	0.097	0.513	-0.050	0.047
URBR	-0.075	0.015	-0.932	0.129	0.177	-0.119
URB	-0.134	-0.176	-0.855	-0.066	-0.180	0.077
DCPI	-0.270	-0.072	0.129	-0.857	0.070	-0.258
EXCHANGE	0.449	-0.025	0.073	0.831	-0.112	-0.193
HHSGRO	0.134	0.165	0.000	-0.021	0.916	-0.060
IRUPOP	-0.372	0.073	0.221	-0.431	0.582	0.195
GRMS	0.100	0.316	0.166	0.159	-0.094	0.834
RNHNP	-0.226	0.090	0.374	0.414	-0.129	-0.705
DPOP	0.437	-0.435	0.262	-0.360	-0.453	0.161

Note: Variance explained by components: factor 1 (18.871), factor 2 (3.594), factor 3 (2.438), factor 4 (4.704), factor 5 (1.695) and factor 6 (1.703)

Table 39 Factor 1,2 and Determinants

Rank	Factor 1			Factor 2		
	Variables	Rotated Loadings	Determinants	Variables	Rotated Loadings	Determinants
1	HGLOPC	0.978	Policy Effect	SWSP	0.975	Institutional Setting
2	TEO	0.971	Socio-Economic Status	ECRTE	0.856	Institutional Setting
3	AEXPEN	0.970	Socio-Economic Status	HPOL	0.780	Policy Effect
4	PERGNPO2	0.966	Socio-Economic Status	INTR	-0.711	Foreign Affairs Effect
5	PERGNPO	0.950	Socio-Economic Status	DOMSA V	0.665	Socio-Economic Status
6	MSO	0.945	Socio-Economic Status			
7	HSGEXPIN	0.931	Socio-Economic Status			
8	NHF	0.927	Policy Effect			
9	TRO	0.903	Socio-Economic Status			
10	DEFLA1	0.902	Socio-Economic Status			
11	CPI	0.878	Socio-Economic Status			
12	PPI	0.735	Socio-Economic Status			

Table 40 Factor 3, 4 and Determinants

Rank	Factor 3			Factor 4		
	Variables	Rotated Loadings	Determinants	Variables	Rotated Loadings	Determinants
1	PHF	0.966	Policy Effect	NTHH	0.953	Housing Conditions
2	URBR	-0.932	Demographic & Urban	NSIZE	-0.877	Housing Conditions
3	URB	-0.855	Demographic & Urban	DCPI	-0.857	Foreign Affairs Effect
4	URBPOP	0.909	Demographic & Urban	EXCHANGE	-0.626	Foreign Affairs Effect
5	URBRTE	0.894	Demographic & Urban	SWPG	0.643	Institutional Setting
6	RNHNP	-0.705	Policy Effect			
7	STOGRO	-0.598	Housing Conditions			

Table 41 Factor 5, 6 and Determinants

Rank	Factor 5			Factor 6		
	Variables	Rotated Loadings	Determinants	Variables	Rotated Loadings	Determinants
1	HHSgro	0.916	Housing Conditions	GRMS	0.834	Policy Effect I
2	PDEN	0.868	Demographic & Urban	RATDEF	-0.802	Foreign Affairs Effect
3	IRUPOP	0.582	Demographic & Urban	TRABALO	0.047	Foreign Affairs Effect
4	DPOP	0.453	Demographic & Urban			

Principal component scores are saved, then utilize in a multiple regression analysis.

All regression results support accepting the null hypothesis -- Korea's economic and political variables affect the production of urban housing. The R^2 is 0.792, and adjusted R^2 is 0.743. Standard Error of Estimate is 0.886 and the F-ratio is 15.907. This regression is significant at 0.001 level. Table 42 presents the variables in the regression equation.

Table 42 The Level of Housing Investment Explained by Principal Component Scores

Variable	Coefficient	STD Error	STD COEF	T	P(2 TAIL)
Constant	4.062	0.157	0.000	25.928	0.000
FACTOR(1)	0.585	0.159	0.335	3.679	0.001
FACTOR(2)	1.016	0.159	0.581	6.382	0.000
FACTOR(3)	0.332	0.159	0.190	2.085	0.047
FACTOR(4)	0.830	0.159	0.475	5.212	0.000
FACTOR(5)	-0.126	0.159	-0.072	-0.794	0.435
FACTOR(6)	0.478	0.159	0.274	3.006	0.006

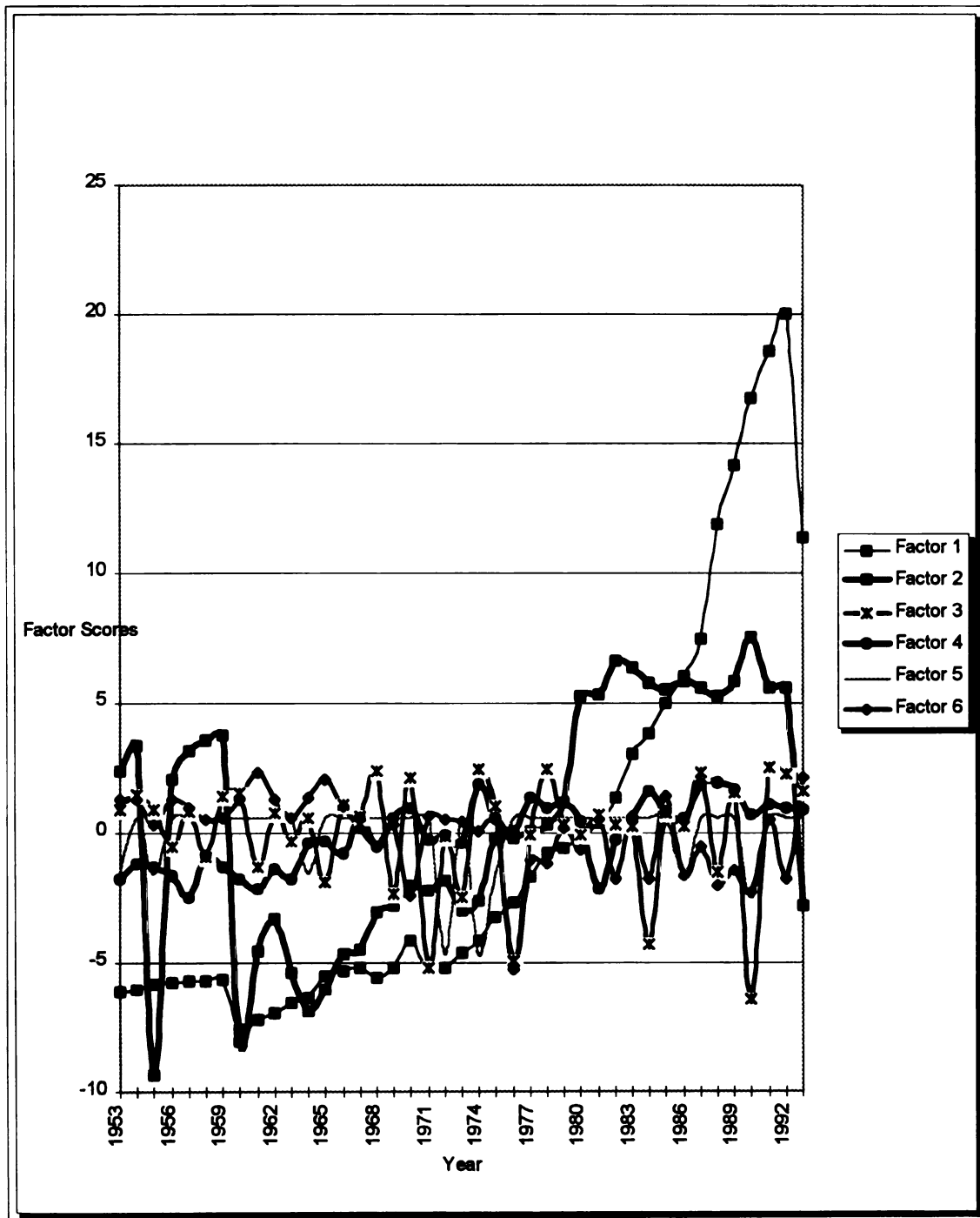
As shown in Table 42, domestic political and economic variables and institutional factors exercise a significant effect on the share of housing in the total output in Korea. The problems of multicollinearity and the number of degrees of freedom are solved. There is no correlation between the six factors: the problem of auto correlation is eliminated since the Durbin-Watson is 1.194 suggesting there is very

small autocorrelation (first order autocorrelation 0.391). This fact supports our hypotheses of socioeconomic effects on the level of housing investment.

Table 43 and Figure 15 demonstrate the results of factor scores by time-series.

Table 43 Factor Scores by Time-Series

Year	Factor 1		Factor 2		Factor 3		Factor 4		Factor 5		Factor 6	
	Scores	Rank	Scores	Rank	Scores	Rank	Scores	Rank	Scores	Rank	Scores	Rank
1953	-6.0783	36	2.3846	18	0.9145	16	-1.7803	36	-1.5885	2	1.2703	9
1954	-6.0469	35	3.3900	16	1.4934	11	-1.1962	31	0.5978	1	1.2844	8
1955	-5.8245	34	-9.3484	41	0.9328	15	-1.2977	33	-1.5885	2	0.3065	24
1956	-5.7688	33	2.0889	19	-0.4891	31	-1.6093	35	0.5978	1	1.2673	10
1957	-5.7357	32	3.2043	17	0.8568	17	-2.4984	41	0.5978	1	0.9434	12
1958	-5.6934	31	3.5794	15	-0.9002	32	-0.8187	30	0.5978	1	0.5224	18
1959	-5.6567	30	3.7668	14	1.4220	12	-1.2761	32	0.5978	1	0.5789	15
1960	-7.5790	41	-8.0338	40	1.5773	10	-1.7381	38	0.5978	1	1.3049	7
1961	-7.2346	40	-4.5318	35	-1.3256	33	-2.1138	39	0.5978	1	2.3682	1
1962	-6.9719	39	-3.3312	33	0.7608	19	-1.3882	34	0.5978	1	1.3244	6
1963	-6.5289	38	-5.3872	37	-0.3410	30	-1.7734	37	0.5978	1	0.5771	16
1964	-6.3944	37	-6.8675	39	0.5608	22	-0.3940	26	-1.5885	2	1.3406	5
1965	-5.4966	28	-6.0333	38	-1.8908	35	-0.2959	25	0.5978	1	2.0716	3
1966	-5.3024	27	-4.6761	36	1.1294	13	-0.7750	29	0.5978	1	1.0504	11
1967	-5.1967	25	-4.4521	34	0.6790	21	0.5569	18	0.5978	1	0.1746	26
1968	-5.5810	29	-3.0663	32	2.3730	4	-0.5117	28	0.5978	1	-0.5453	28
1969	-5.1716	23	-2.7647	29	-2.3390	36	0.6046	16	0.5978	1	0.3436	23
1970	-4.1821	21	-2.0378	26	2.1258	7	1.0063	9	0.5978	1	-2.4270	40
1971	-5.2714	26	-2.1784	27	-5.1802	40	-0.2832	24	0.5978	1	0.6362	14
1972	-5.1938	24	-1.8174	25	-0.1321	29	-0.0699	22	-4.6567	4	0.5205	20
1973	-4.6236	22	-2.9552	31	-2.4762	37	-0.4014	27	0.5978	1	0.4728	22
1974	-4.1696	20	-2.5819	28	2.4564	3	1.8526	3	-4.6567	4	0.0697	27
1975	-3.2226	19	-0.2096	24	1.0562	14	0.5949	17	-1.5885	2	0.5403	17
1976	-2.6767	18	-0.2245	23	-4.9263	39	0.0359	21	0.5978	1	-5.2461	41
1977	-1.6664	17	0.0587	22	-0.0422	26	1.3829	6	0.5978	1	-1.0069	31
1978	-0.7824	16	0.3105	21	2.4709	2	0.9689	11	0.5978	1	-1.1504	32
1979	-0.5736	15	1.1455	20	0.3498	23	1.1632	7	0.5978	1	0.2246	25
1980	-0.1737	14	5.2681	13	-0.0505	28	0.4607	20	0.5978	1	-0.6383	30
1981	0.4086	13	5.3469	11	0.7236	20	-2.1161	40	0.5978	1	0.4931	21
1982	1.3349	12	6.6112	2	0.3358	24	-0.2739	23	0.5978	1	-1.7517	36
1983	3.0598	11	6.3643	3	0.2762	25	0.4910	19	0.5978	1	0.6801	13
1984	3.8412	10	5.8117	6	-4.3061	38	1.6191	5	0.5978	1	-1.7732	37
1985	5.0263	9	5.5451	10	0.7880	18	0.8508	13	0.5978	1	1.4361	4
1986	6.0330	8	5.8305	4	0.2570	26	0.6137	15	-1.5885	2	-1.6301	34
1987	7.4428	7	5.5565	9	2.3442	5	1.8984	2	0.5978	1	-0.5022	28
1988	11.8644	5	5.2756	12	-1.4903	34	1.9358	1	0.5978	1	-1.9995	39
1989	14.1405	4	5.8230	5	1.5877	9	1.7143	4	0.5978	1	-1.4583	33
1990	16.7658	3	7.5066	1	-6.4065	41	0.6924	14	-2.4703	3	-1.9807	38
1991	18.5926	2	5.5909	7	2.5318	1	1.1322	8	0.5978	1	0.5215	19
1992	20.0110	1	5.5801	8	2.2951	6	0.9981	10	0.5978	1	-1.7318	35
1993	11.3524	6	-2.8018	30	1.6412	8	0.9393	12	0.5978	1	2.1479	2

Figure 15 Factors Scores of Housing Investment by Time-Series Analysis

4. Empirical Results and Interpretation

Multiple regression analysis is the technique which was finally applied in order to statistically express housing investment as a function of economic and political characteristics. Regression equations were derived for the four dependent variables chosen in the previous chapter. According to their characteristics, we define models as following.

1) Housing Investment Share Model (using CONNP as dependent variable) 2) Housing Construction Area Model (using PHAREA as dependent variable) and 3) Housing Investment Household Model (using HIHSH as dependent variable) (shown in Table 44).

For the question of how much does each independent variable contribute to an explanation of the share of housing investment over total output, eleven socioeconomic and political variables, also chosen in the previous chapter, were used as independent variables.

The stepwise method of variable selection process was used to derive regression equation. Three measures, elasticities and standardized regression coefficient (beta) and the coefficient of determination (R^2), will be applied in interpretation of equations.

Table 44 Classification of Housing Investment Models

Dependent Variables	Housing Investment Share	Housing Construction Area Model	Housing Investment Household Model
Independent Variables	Open Model	Open Model	Open Model
	National Allocation	National Allocation	National Allocation
	Policy Effect Model	Policy Effect Model	Policy Effect Model
	Financial Model	Financial Model	Financial Model
	Comprehensive Model	Comprehensive Model	Comprehensive Model

For interpretation, we consider regression coefficients meeting the 90 percent confidence criterion as statistically significant. A t -test is used for measuring the significance of individual coefficients; and F-test is used to measure the joint statistical significance of all variables in an equation. With thirty-eight degrees of freedom in each equation, there is 10 percent of the true difference is not zero if the t value is 1.684 or greater; at a higher level of confidence, with a five percent chance of a true non-zero value, $t=2.021$; and, at the one percent level, the value of t must equal or exceed 2.704.

We specify five groups of models classified by each main model which follows dependent variables.

4-1. *Housing Investment Share Models*

To determine the relationship between share of housing investment and the per capita GNP, we assume that the decisions in the housing sector are strongly associated with political and institutional settings, economic policies, and urban activities and their interrelationships. First, the level of income tests the effect of economic capacity on housing investment. This variable generates estimates for income elasticities. The rate of increase in the total population is used to gauge the impact of population growth. The rate of increase in urban population is used to analyze how the pressures of urbanization might influence decisions on housing investments.

According to the regression model specified earlier Ch. Five Equation (4), the estimated regression model found for housing investment, including all variables, is

$$\begin{aligned} \text{CONNP} = & 18.911 + .002 \text{ PERGNPO} -.056 \text{ PERGNPO2} + .073 \text{ URB RTE} + \\ & .518 \text{ DPOP} -.160 \text{ DPOP2} -.001 \text{ TRO} + .024 \text{ INTR} + .113 \text{ DOMSAV} + \\ & .048 \text{ AEXPEN} - .189 \text{ DENG NP} - .031 \text{ SWPG} + .038 \text{ CPI} -.193 \text{ PPI} - \\ & .004 \text{ NHO} -1.896 \text{ NSIZE} + .001 \text{ NTHH} + .234 \text{ TWOMIL} -.365 \\ & \text{DPLSTABL} +.018 \text{ ELECTION} -.001 \text{ TRBALO} -.007 \text{ EXCHANG} +2.792 \end{aligned}$$

$$R^2 = .97$$

This complete equation explains over 97 percent of the variance in the dependent variable, i.e., housing investment as a share of GNP, and is significant at the .001 level. However, not all variables should be included in the equation in order to make a significantly large contribution to the explanatory power of the equation. Consequently, stepwise regression procedures are utilized in order to sort out the lesser contributing variables in terms of *beta* coefficient.

4-1-1. Stepwise Selection of Variables for Models

Although stepwise regression do not solve to find best fitting model, this technique can imply plausible models. Table 45 shows the results of housing investment share model by this stepwise selection. However, we have to understand that stepwise analysis is usually of no theoretical significance.

Table 45 The Housing Investment Share Model by Stepwise Selection

Variable	Coefficient	STD Error	STD COEF	Tolerance	T	P(2 TAIL)
Constant	5.226	2.795	0.00	-	1.87	0.072
SAVR	0.104	0.017	0.589	0.314	5.975	0.000
NSIZE	-1.107	0.523	-0.446	0.069	-2.119	0.043
TRABALO	-0.001	0.00	-0.60	0.428	-7.107	0.000
PPI	0.015	0.009	0.326	0.070	1.556	0.131
INTR	0.063	0.043	0.108	0.575	1.482	0.150

The results of the estimation of Equation (1), explaining the socioeconomic effects on the housing investment are found in Column 1 of Table 46. They are as expected: the share of housing investment is a positive function of per capita GNP and interest rate, and a negative function of the trade balance and military spending. The t-statistics of all other variables indicate statistical significant.

Table 46 Regression Results: Housing Investment Share Model

	dependent variable (CONNP)	with financial consideration	with policy effect consideration	CONNP with saving rates	CONNP with households variables
Constant	-0.122 (-0.196)	10.126 (3.610) ¹⁾	-3.851 (-3.169) ¹⁾	7.438 (2.879) ¹⁾	-3.368 (-4.922) ¹⁾
PERGNPO	0.014 (9.245) ¹⁾	0.021 (6.012) ¹⁾	0.018 (3.428) ¹⁾	0.014 (2.359) ²⁾	
PERGNPO2		-0.013 (-2.569) ²⁾	-0.03 (-5.194) ¹⁾	-0.009 (-1.174)	
TRBALO	-0.001 (-3.661) ¹⁾	-0.001 (-8.056) ¹⁾	-0.001 (-7.56) ¹⁾	-0.001 (-6.47) ¹⁾	-0.001 (-6.533) ¹⁾
HRTE		-0.126 (-3.78) ¹⁾		-0.087 (-2.913) ¹⁾	
INTR	0.123 (2.425) ³⁾	-0.018 (-1.984) ²⁾			
IRUPOP		0.077 (1.645)			
RATDEF	-0.03 (-2.838) ²⁾	-0.013 (-1.175)			
ELECTION	-0.313 (-1.225)				
GRMS		0.011 (1.399)			
DOMSAV				0.035 (1.475)	0.084 (5.375) ¹⁾
DENGPN				-0.115 (-1.226)	0.368 (3.108) ¹⁾
HPOL			0.227 (2.183) ²⁾		
NTHH			0.001 (0.994)		0.000 (4.006) ¹⁾
TWOMIL	-1.07 (-1.777)		1.382 (2.231) ²⁾		0.868 (2.022) ²⁾
R ²	0.888	0.945	0.937	0.938	0.934
F	34.998	53.717	64.939	70.172	76.865
SEE	0.672	0.475	0.486	0.492	0.488

Notes: t-statistics in parenthesis, (1) significant at 0.001 level, (2) significant at 0.01, and (3) significant at 0.1 level.

Test Results

Hypotheses 1

Null Hypotheses (H_0) : *one of the most important determinants of the level of housing investment is not socio-economic factors in Korea.*

If any variable from domain 1 has a p -value ≤ 0.05 then reject H_0 :

Table 47 Testing: Relationships Between the Independent Variables and Socioeconomic Variables

Variable	Coefficient	STD Error	STD COEF	Tolerance	T	P (2 TAIL)
Constant	-8.771	4.126	0.00	-	-2.126	0.048
PERGNPO	0.014	0.014	1.280	0.002	0.965	0.347
PERGNPO2	-0.064	0.031	-3.363	0.001	-0.036	0.972
TRO	-0.002	0.001	-2.083	0.008	-3.248	0.004
TEO	-0.000	0.003	-0.080	0.001	-0.036	0.972
MSO	0.000	0.00	0.430	0.006	0.579	0.569
DEFLA1	0.009	0.017	0.166	0.031	0.517	0.611
HSGEXPIN	-0.004	0.013	-0.289	0.004	-0.318	0.754
EXCHANGE	-0.010	0.003	-1.360	0.019	-3.324	0.004
CPI	-0.009	0.017	-1.469	0.000	-0.488	0.632
PPI	0.061	0.083	1.359	0.001	0.738	0.470
PDEN	0.043	0.016	1.310	0.013	2.615	0.018
DOMSAV	0.103	0.041	0.633	0.051	2.530	0.021
SWSP	0.000	0.000	4.365	0.001	2.995	0.008

Note: 1. F-Ratio 22.870

2. Durbin-Watson D Statistic 2.483

3. First Order Autocorrelation -.264

The p values of TRO, Exchange, PDEN, DOMSAV, and SWSP ≤ 0.05 .

Therefore we can reject H_0 . The socioeconomic factors can predict the level of housing investment in Korea.

Hypotheses 2

Null Hypotheses (H_0) : *housing investment as a share of total output are not explained by the demographic and urbanization factors in Korea.*

If any variable from domain 1 has a p -value ≤ 0.05 then reject H_0 :

Table 48 Testing: Relationships Between the Dependent Variables and Demographic and Urbanization Variables

Variable	Coefficient	STD Error	STD COEF	Tolerance	T	P (2 TAIL)
Constant	-2.182	1.023	0.000	-	-2.133	0.040
URB	-0.015	0.028	-0.066	0.357	-0.522	0.605
URBR	0.015	0.033	0.059	0.337	0.457	0.650
URBRTE	0.102	0.012	0.884	0.511	8.383	0.000
DPOP	-0.024	0.270	-0.013	0.291	-0.091	0.928
IRUPOP	0.033	0.086	0.036	0.643	0.381	0.706

Note: 1. F-Ratio 28.587
 2. Durbin-Watson D Statistic 1.095
 3. First Order Autocorrelation .439

The p value of URBRTE ≤ 0.05 . Therefore we can reject H_0 . The demographic and urbanization factors can predict the level of housing investment in Korea.

Hypotheses 3

Null Hypotheses (H_0) : *the level of housing investment is not determined by the policy effects in Korea.*

If any variable from domain 1 has a p -value ≤ 0.05 then reject H_0 :

Table 49 Testing: Relationships Between the Dependent Variables and Policy Effect

Variable	Coefficient	STD Error	STD COEF	Tolerance	T	P (2 TAIL)
Constant	2.463	0.349	0.000	-	7.062	0.000
ELECTION	1.199	0.519	0.315	0.660	2.312	0.028
TWOMIL	3.420	0.631	0.623	0.928	5.421	0.000
REALPLY1	-2.208	1.181	-0.265	0.610	-1.870	0.071
REALPLY2	1.706	1.060	0.205	0.756	1.609	0.118
REALPLY3	3.025	0.950	0.363	0.942	3.184	0.003
GRMS	0.008	0.019	0.053	0.822	0.437	0.665
PARK	1.541	0.593	0.339	0.717	2.596	0.014
DPLSTABL	-1.181	0.890	-0.171	0.734	-1.327	0.194

Note: 1. F-Ratio 6.339

2. Durbin-Watson D Statistic 1.323

3. First Order Autocorrelation .188

The p value of ELECTION, TWOMIL, RELAPLY1, REALPLY2, REALPLY3, and PARK ≤ 0.05 . Therefore we can reject H_0 . The policy effect factors can predict the level of housing investment in Korea.

Hypotheses 4

Null Hypotheses (H_0) : *the level of housing investment is not determined by housing conditions in Korea.*

If any variable from domain 1 has a p -value ≤ 0.05 then reject H_0 :

Table 50 Testing: Relationships Between the Dependent Variables and Housing Conditions

Variable	Coefficient	STD Error	STD COEF	Tolerance	T	P (2 TAIL)
Constant	-9.813	6.073	0.000	-	-1.616	0.119
NTHH	0.002	0.001	2.593	0.008	2.639	0.014
NSIZE	1.438	0.750	0.566	0.088	1.917	0.067
NHO	-0.002	0.002	-1.223	0.007	-1.210	0.238
HPOL	0.162	0.169	0.092	0.835	0.961	0.346
HHSIRO	0.062	0.052	0.143	0.533	1.192	0.244
STOGRO	-0.005	0.087	-0.006	0.650	-0.052	0.959

Note: 1. F-Ratio 17.619
 2. Durbin-Watson D Statistic 1.120
 3. First Order Autocorrelation .437

The p value of NTHH ≤ 0.05 . Therefore we can reject H_0 . The housing conditions factors can predict the level of housing investment in Korea.

Hypotheses 5

Null Hypotheses (H_0): *among the most important determinants of the level of housing investment are not governmental and institutional factors in Korea. The budget constraints factors do not have affected the level of housing investment in Korea.*

If any variable from domain 2 has a p -value ≤ 0.05 then reject H_0 :

Table 51 Testing: Relationships Between the Independent Variables and Institutional Settings Variables

Variable	Coefficient	STD Error	STD COEF	Tolerance	T	P (2 TAIL)
Constant	2.208	0.918	0.000	-	2.405	0.023
ECRTE	0.047	0.057	0.105	0.892	0.828	0.415
RATDEF	0.022	0.027	0.102	0.897	0.805	0.428
SWPG	0.000	0.000	0.761	0.975	6.262	0.000

Note: 1. F-Ratio 13.834
 2. Durbin-Watson D Statistic .610
 3. First Order Autocorrelation .654

The p value of SWPG ≤ 0.05 . Therefore we can reject H_0 . The institutional setting factors can predict the level of housing investment in Korea.

Hypotheses 6

Null Hypotheses (H_0) : *housing investment as a share of total output is not previously determined by global and foreign affairs affect in Korea.*

If any variable from domain 1 has a p-value ≤ 0.05 then reject H_0 :

Table 52 Testing: Relationships Between the Dependent Variables and Global and Foreign Affairs Effect

Variable	Coefficient	STD Error	STD COEF	Tolerance	T	P (2 TAIL)
Constant	3.202	1.263	0.000	-	2.536	0.016
INTR	0.110	0.105	0.171	0.775	1.044	0.303
TRBALO	0.001	0.000	0.536	0.775	3.266	0.002

Note: 1. F-Ratio 5.499
 2. Durbin-Watson D Statistic .532
 3. First Order Autocorrelation .714

The p value of TRBALO ≤ 0.05 . Therefore we can reject H_0 . The global and foreign affairs effect factors can predict the level of housing investment in Korea.

Hypotheses 7

Null Hypotheses (H_0) : *some combination of main effect variables from six different domains will not generate a predictive model of housing investment that is a better predictor than the main effect variables selected from any one domain, based upon predictor variables containing a p-values ≤ 0.05 and an overall regression p-value ≤ 0.05 .*

If any combined set of variables from the six different domains has a p-value ≤ 0.05 and an adjusted R^2 value that is higher than any single main effect predictor, then reject H_0 :

Table 53 Testing: Results from Stepwise Regression Analysis of Combined Main Effect Variables, illustrating the best equation

Variable	Coefficient	STD Error	STD COEF	Tolerance	T	P (2 TAIL)
Constant	9.773	1.870	0.000	-	5.226	0.000
ELECTION	0.390	0.113	0.110	0.655	3.468	0.003
TRBALO	-0.001	0.000	-0.415	0.369	-9.878	0.000
NSIZE	-0.814	0.229	-0.319	0.081	-3.560	0.002
PPI	0.066	0.011	1.423	0.011	5.814	0.000
STOGRO	0.066	0.027	0.083	0.558	2.431	0.025
URBRTE	-0.152	0.036	-1.284	0.007	-4.272	0.000
SWPG	-0.266	0.110	-0.103	0.363	-2.432	0.025
BCRTE	-0.160	0.088	-0.304	0.024	-1.823	0.084

Note: 1. F-Ratio 151.243
 2. Durbin-Watson D Statistic 2.548
 3. First Order Autocorrelation -.308

The p values of ELECTION (policy #5), TRBALO (foreign affairs #6), NSIZE (housing conditions #4), STOGRO (housing conditions #4), PPI (socioeconomic #1), SWPG (institutional settings #2), and URBRTE(demographic and urbanization #3) p value ≤ 0.05 . Therefore we can reject H_0 . Some combination of main effect variables

from six different domains will generate a predictive model of housing investment that is a better predict than the main effect variables selected from any one domain.

Synthesis of the Hypotheses Testing Results of Regression Analyses

Table 54 demonstrates that the results of seven hypotheses testing support our alternative hypotheses.

Table 54 Synthesis of the Hypotheses Testing Results of Regression Analysis

Test Results	H_a : Null Hypotheses	H_a : Alternative Hypotheses
Hypothesis 1	reject	accept
Hypothesis 2	reject	accept
Hypothesis 3	reject	accept
Hypothesis 4	reject	accept
Hypothesis 5	reject	accept
Hypothesis 6	reject	accept
Hypothesis 7	reject	accept

4-1-2. Global Open Model (Foreign Affairs and Domestic Housing Investment Approach)

A. Income Effect

Economic criteria such as per capita GNP was examined in order to explain variation in the level of housing investment, compared to demographic criteria, such as

population growth and urbanization rate. We assume that the major factors explaining changes in share of housing investment over GNP are the socioeconomic variables rather than the demographic variables.

As the importance of per capita income to housing investment is considered in conventional studies, the relationship between the per capita GNP and housing investment was proved to be significant. For testing of this assumption, we try to four approaches - linear, quadratic, reciprocal, and log from of per capita GNP. The linear or the quadratic form of per capita GNP is important for housing investment. This economic development level is the key variable in housing investment. Although standard economic development theory as well as the results of statistical analysis generally supports the importance of the economic development level in housing investment, it is not clear why the share of housing investment tends to decline at high levels of economic development. Furthermore, we cannot define what specific level of economic development will housing investment drop.

Table 55 Nonlinear Relationship between the Share of Housing Investment (CONNP) and GNP Per Capita

	EQ. 1 (CONNP)	EQ. 2 (CONNP)	EQ. 3 (LCONNP)	EQ. 4 (LCONNP)
Constant	1.37 (4.922) ¹	2.284 (8.469) ¹	0.298 (9.427) ¹	-2.72 (-6.184) ¹
PERGNPO	0.018 (6.122) ¹	0.009 (8.882) ¹	0.001 (8.666) ¹	-0.000 (-1.808) ³
PERGNPO2	-0.016 (3.085) ²			
RGNP (1/GNP)		3.317 (0.072) ³		
LPERGNPO				0.655 (6.870) ¹
R ²	0.795	0.765	0.664	0.852
F	73.764	61.872	75.107	106.802
SEE	0.858	0.919	0.135	0.091

Note: Equation 1 : $Y = a + bx + cx^2$

Equation 2 : $Y = a - b/x^2$

Equation 3 : $\ln Y = a - bx$

Equation 4 : $\ln Y = a + b \ln x$

t-statistics in parenthesis, (1) significant at 0.001 level, (2) significant at 0.01, and (3) significant at 0.1 level.

The logarithmic transformation shows the relationship between the percentage of change in per capita GNP and in housing investment, i.e., the per capita GNP elasticity of housing investment. The estimated values of t are over 2.0 for the linear and squared per capita GNP terms except Equation 3 RGNP (1/GNP). This RGNP is not statistically significant. Furthermore, the statistical results (Equation 1) show that per capita income alone can explain about 79.5 percent of the housing investment variation. In Korea, quadratic form of per capita GNP fits the fluctuations of socioeconomic transformation.

B. Demographic and Urbanization Effect

We can assume that of the two demographic measures, urbanization is a far more important determinant of the level of housing investment than population growth at the national level.

Table 56 Relationship between the Share of Housing Investment (CONNP) and Demographic and Urbanization Variables

	EQ. 1	EQ. 2	EQ. 3	EQ.4	EQ.5
Constant	5.245 (9.920) ¹⁾	1.491 (2.671) ²⁾	-2.249 (-4.760) ¹⁾	-6.595 (-2.034) ³⁾	0.040 (0.132)
PERGNPO		0.018 (5.057) ¹⁾		-0.006 (1.314)	
PERGNPO2		-0.016 (-2.565) ²⁾			
DPOP	-0.926 (-3.524) ¹⁾	-0.068 (-0.163)			
DPOP2		0.007 (0.064)			
URBRTE			0.104 (12.865) ¹⁾	0.287 (2.201) ³⁾	
URBRTE2				-0.002 (-1.458)	
URBPOP					0.00 (12.769) ¹⁾
R ²	0.246	0.783	0.813	0.824	0.811
F	12.417	31.604	165.519	56.098	163.054
SEE	1.599	0.894	0.796	0.794	0.801

Note: t-statistics in parenthesis, (1) significant at 0.001 level, (2) significant at 0.01, and (3) significant at 0.1 level.

As you see results of Equation 4, urbanization variable (URBRTE) has more statistical significance than population growth variables. However, as you see Equation 1, value for DPOP is -3.524 which is significant at the marginal level of ten percent.

C. Housing Conditions Effects

Housing conditions effects can be represented by the impacts of housing supply ratio, size of households, and number of households. However, we consider that the housing supply ratio (HRTE) as a pre-condition for housing investment. In somehow, HRTE already implies the level of existing housing investment. HRTE is the one of existing housing stock variable as measured by the ratio of total dwelling units to total households. Because HRTE is considered to be the theoretical precondition for housing investment, it is not included in these housing investment models. The housing stock variable, however, is examined before building the model. Equations 1 and 2 show that HRTE is statistically significant. This is one of reasons why HRTE is called “pre-condition”. In any event, we also tests HRTE variable in the models as a comparison. Equation 1 and 2 show that the t-statistics of the HRTE indicate statistical significant.

Table 57 Relationship between the Share of Housing Investment (CONNP) and Housing Conditions Variables

	EQ. 1	EQ. 2	EQ. 3	EQ. 4	EQ.5	EQ.6
Constant	23.287 (7.186) ¹⁾	11.625 (4.018) ¹⁾	13.586 (10.297) ¹⁾	-3.532 (-0.770)	-0.891 (-1.693) ³⁾	-2.747 (-1.679) ³⁾
PERGNPO		0.007 (6.244) ¹⁾		0.022 (3.831) ¹⁾		-0.006 (-1.197)
PERGNPO2				-0.017 (-2.555) ²⁾		
HRTE	-0.256 (-5.961) ¹⁾	-0.119 (-3.271) ¹⁾				
NSIZE			-1.921 (-7.281) ¹⁾	0.858 (1.114)		
NTHH					0.001 (9.733) ¹⁾	0.001 (3.050) ²⁾
R ²	0.518	0.783	0.624	0.755	0.753	0.765
F	35.531	57.708	53.011	30.796	94.734	48.746
SEE	1.260	0.859	1.105	0.921	0.883	0.877

Note: t-statistics in parenthesis, (1) significant at 0.001 level, (2) significant at 0.01, and (3) significant at 0.1 level.

D. Foreign Affairs and Trade Balance Effects

As global and foreign affairs variables, we may see the effects of interest rate and trade balance at Table 46 column 1. The equation proves that share of housing investment is significantly related to the global and foreign affairs effect, showing strong statistical significance of effects of interest rate and trade balance.

4-1-3. National Allocation Models

Institutional setting effects and military spending effects are major national allocation components of national allocation models.

A. Institutional Setting Effects

In order to prove effects of institutional settings, we try to find the effects of economic growth rate, military spending, and social welfare spending. Among them, only military spending has a statistical significance.

B. Military Spending Effects

While housing subsidies encourage the production of housing services, increasing military expenditures decreases housing investments. This implies that it is up to the government to consider military expenditures and the transfer of housing investments because public policies affect housing production and consumption. Excess military spending leaves little for the production of housing.

Table 58 Relationship between the Share of Housing Investment (CONNP) and Military Spending Variables

	EQ. 1	EQ. 2 (LCONNP)	EQ. 3
Constant	5.146 (8.209) ¹⁾	0.265 (4.390) ¹⁾	1.060 (1.115)
PERGNPO		0.003 (7.067) ¹⁾	
PERGNPO2		-0.003 (-4.537) ¹⁾	
RATDEF	-0.056 (-2.709) ¹⁾	-0.002 (-1.728) ³⁾	
DENGNP			0.173 (0.940)
R ²	0.162	0.807	0.624
F	7.339	50.089	53.011
SEE	1.686	0.105	1.105

Note: t-statistics in parenthesis, (1) significant at 0.001 level, (2) significant at 0.01, and (3) significant at 0.1 level.

As shown Table 58, share of nation defense over total expenditure (RATDEF) has more statistical meanings than defense spending as percentage of GNP (DENGNP). The regression results support our assumption and proved to be statistical significant.

4-1-4. Policy Impact Model

In order to find out whether the political setting plays any roles in affecting housing investment behavior, we evaluate the effects of direct policy variables. The effects of direct government intervention, such as *Two-Million Houses Program*, *election effect*, *real estate regulation policy effect*, and *Park's regime*, and *political stability dummy variables* are analyzed.

A. Two-Million Houses Program's Effect

Table 59 Relationship between the Share of Housing Investment (CONNP) and Policy Effect Variables

	EQ. 1 (LCONNP)	EQ. 2	EQ. 3	EQ. 4
Constant	0.255 (7.734) ¹⁾	1.870 (8.539) ¹⁾	2.551 (8.659) ¹⁾	1.708 (8.305) ¹⁾
PERGNPO	0.002 (7.967) ¹⁾	0.009 (8.94) ¹⁾		0.009 (12.06) ¹⁾
PERGNPO2				
TWOMIL	-0.270 (-2.777) ¹⁾		3.518 (5.418) ¹⁾	
ELECTION			0.936 (2.086) ²⁾	
DHPOL		0.601 (1.838) ³⁾		
REALPLY3			2.978 (3.028) ¹⁾	1.462 (2.408) ²⁾
PARK			1.196 (2.202) ²⁾	1.018 (3.091) ¹⁾
R ²	0.722	0.765	0.142	0.755
F	48.545	61.783	3.145	30.796
SEE	0.125	0.920	1.757	0.921

Note: t-statistics in parenthesis, (1) significant at 0.001 level, (2) significant at 0.01, and (3) significant at 0.1 level.

As shown Table 59, domestic policies affect housing production in Korea. Two-Million Houses Program is more sensitive than the general housing policy effect and political stability variables. Election dummy variable appeared strong in housing investment as well as Park's regime, and real estate deregulation measures.

4-1-5. Financial Model

Table 60 represents that how important finance is to housing investment? Interest rate, producer price index, consumer price index, and deflator have affect the level of housing investment. For the more detailed analysis such as sensitivity analysis is not included in this study, however, we try to find whether housing finance increases housing investment.

Table 60 Relationship between the Share of Housing Investment (CONNP) and Finance Variables

	EQ. 1	EQ. 2	EQ. 3	EQ. 4
Constant	0.955 (2.378) ²⁾	1.280 (5.249) ¹⁾	-0.307 (-0.435)	1.659 (6.019) ¹⁾
PERGNPO	0.019 (6.362) ¹⁾	0.004 (3.003) ¹⁾	0.016 (5.358) ¹⁾	0.012 (2.266) ²⁾
PERGNPO2	-0.017 (-3.241)		-0.01 (-1.915) ²⁾	
DEFLATER	0.018 (1.416) ¹⁾			
DOMSAV		0.086 (4.515) ¹⁾		
INTR			0.138 (2.621) ²⁾	
PPI				0.059 (2.164) ²⁾
CPI				-0.009 (-1.5) ¹⁾
R ²	0.806	0.832	0.823	0.784
F	51.147	91.367	55.706	44.836
SEE	0.847	0.775	0.806	0.893

Note: t-statistics in parenthesis, (1) significant at 0.001 level, (2) significant at 0.01, and (3) significant at 0.1 level.

4-1-6. Comprehensive Housing Investment Share Models

Table 61 Summary of Comprehensive Housing Investment Share Models

	EQ. 1	EQ. 2	EQ. 3	EQ. 4	EQ. 5	EQ. 6
Constant	1.388 (4.451) ¹	3.62	4.758 (6.688) ¹	1.475 (2.549)	2.058 (2.314)	0.438 (0.863)
PERGNPO	0.018 (5.609) ¹			0.018 (4.888) ¹	0.015 (3.131) ²	
PERGNPO2	-0.016 (-2.726) ³			-0.016 (-2.496)	-0.012 (-1.595)	
RGNP (1/GNP)					-2.094 (-0.866)	1.773 (0.624)
DPOP			-0.213 (-0.286)	-0.018 (-0.039)	-0.157 (-0.318)	
DPOP2			-0.191 (-1.023)	-0.005 (-0.045)	0.007 (0.059)	
URB	-0.009 (-0.379)	-0.063 (-1.401)		-0.008 (-0.342)	-0.006 (-0.252)	
URB2	0 (0.232)	0.003 (1.026)		0 (0.214)	0 (0.008)	
DOMSAV						0.155 (8.636) ¹
RDOMSAV						1.403 (1.302)
R ²	0.784	0.052	0.267	0.784	0.789	0.803
F	31.692	1.012	6.739	19.955	17.082	49.032
SEE	0.893	0.052	1.598	0.919	0.922	0.849

Notes: t-statistics in parenthesis, (1) significant at 0.001 level, (2) significant at 0.01, and (3) significant at 0.1 level.

We focus on estimating elasticities of the economic variables believed to be the most important determinants by theorists and previous empirical studies.

Table 62 Elasticities and Beta Coefficients, Investment Analysis

<i>Independent Variable</i>	<i>Elasticity</i>	<i>Beta Coefficient</i>
Per capita GNP	-0.1275	-0.063
DPOP	-0.415	-1.6865
URB	-0.076	-0.17

Relative Importance of the Determinants

Elasticities are weights in non-dimensional units which measure the relative responsiveness of the dependent variable to changes in values of the independent variables. Point elasticities for the individual variables are calculated as follows. (Burns and Grebler, 1976:42)

$$Y' = a + b_1 X + b_2 X^2 + \dots$$

the partial derivative of Y' with respect to X is taken to yield

$$\frac{\delta Y'}{\delta X} = b_1 + 2b_2 X$$

At the means of X and Y', denoted $\bar{X}$ and $\bar{Y}$, this becomes

$$\frac{\delta (Y' / \bar{Y})}{\delta (X / \bar{X})} = (\bar{X} / \bar{Y})(b_1 + 2b_2 \bar{X})$$

Beta Coefficient⁴⁷

This coefficient indicates better measure of the relative importance of several independent variables.

⁴⁷ Beta Coefficient measure the statistical contribution of a variable to the explanatory power to the equation.

4-2. Housing Construction Area Models

4-2-1. Stepwise Selection of Variables for Models

Table 63 The Housing Construction Area Model by Stepwise Selection

Variable	Coefficient	STD Error	STD COEF	Tolerance	T	P(2 TAIL)
Constant	227.409	97.474	0.00	-	2.333	0.038
DEFPG	-188.744	32.757	-0.214	0.083	-5.762	0.000
HHSIRO	5.012	2.017	0.033	0.645	2.485	0.029
HPOL	75.051	9.009	0.121	0.539	8.331	0.000
PARK	-129.751	44.009	-0.092	0.117	-2.948	0.012
PERGNPO2	8.272	1.388	1.037	0.004	5.960	0.000
RATDEF	24.576	4.500	0.224	0.068	5.462	0.000
TWOMIL	224.164	45.663	0.125	0.176	4.909	0.000
POPUM	0.027	0.003	0.195	0.311	10.177	0.000
DPLSTABL	-125.432	31.595	-0.052	0.672	-3.970	0.002
DPOECRT	-1.635	0.777	-0.030	0.560	-2.104	0.057
HGLO	0.406	0.023	1.411	0.018	17.504	0.000
PRSAV	-0.067	0.006	-1.777	0.004	-10.365	0.000

Testing the behavior of PHAREA

The use of CONNP as the only indicator of housing investment is not enough to substantiate the argument and check on the specification of the independent variables. Share of housing as a percent of per capita GNP does not capture the real total worth of newly produced dwellings. Using stepwise selection, we can find the empirical results of Table 63. Military spending and political stability, housing loan has affected the determination of housing investment. For detail of effect of the government allocation of

bank loans, the total volume of construction loans at constant prices show the statistical significance of housing investment.

Table 64 Basic Regression Equation: The Relation Between PHAREA and Other Variables

	EQ. 1	EQ. 2	EQ. 3	EQ. 4	EQ. 5	EQ. 6	EQ. 7
Constant	2.252 (0.042)	-24.168 (-0.424)	597.546 (4.341) ¹	1118.737 (4.048) ¹	31.617 (0.304)	147.889 (0.929)	-636.953 (-2.505) ³
PERGNPO	2.527 (4.293) ¹	2.509 (4.251) ¹			2.607 (3.982) ¹	2.065 (2.39) ³	
PERGNPO2	3.234 (2.959) ²	3.303 (3.014) ²			3.147 (2.73) ³	3.884 (2.806) ²	
RGNP (1/GNP)						-417.248 (-0.964)	1035.093 (0.732)
DPOP				-183.573 (-0.635)	-91.746 (-1.1)	-119.367 (-1.352)	
DPOP2				-44.2 (-0.61)	22.67 (1.06)	25.134 (1.166)	
URB		2.591 (0.628)	-22.708 (-1.329)		4.19 (0.949)	4.618 (1.039)	
URB2		0.171 (0.601)	1.428 (1.191)		0.16 (0.552)	0.093 (0.314)	
R ²	0.948	0.951	0.052	0.246	0.953	0.954	0.664
F	338.123	169.11	1.01	6.029	110.444	94.597	23.08
SEE	162.822	163.029	696.12	620.833	164.866	165.042	422.182

Notes: t-statistics in parenthesis, (1) significant at 0.001 level, (2) significant at 0.01, and (3) significant at 0.1 level.

Table 65 Housing Construction Model

	Investment Area Model (PHAREA)	IAM with institutiona l setting	IAM with policy effect considerati on	IAM with foreign affairs
Constant	1760.82 (2.103) ²⁾	2323.527 (2.679) ¹⁾	2043.729 (2.516) ¹⁾	1193.258 (2.013) ²⁾
PERGNPO	1.488 (1.41)	2.134 (2.011) ³⁾	2.663 (2.639) ³⁾	4.089 (6.9329) ²⁾
PERGNPO2	4.79 (3.103) ¹⁾	5.057 (3.280) ¹⁾	4.686 (3.26) ¹⁾	
TRBALO	-0.115 (-2.197) ²⁾	-0.114 (-2.258) ³⁾	-0.124 (-2.637) ³⁾	-0.151 (-3.614) ¹⁾
HRTE	-22.757 (-2.312) ²⁾	-27.696 (-2.755) ¹⁾	-24.092 (-2.552) ¹⁾	-15.621 (-2.165) ²⁾
DEFLA1		-4.939 (-1.785) ³⁾	-5.865 (-2.261) ³⁾	-3.268 (-1.368)
RATDEF		-5.074 (-1.642)	-5.401 (-1.884) ³⁾	-4.465 (-1.656)
ELECTION			-143.796 (-2.336) ³⁾	-94.536 (-1.584)
TWOMIL				486.881 (4.028) ¹⁾
R ²	0.958	0.962	0.970	0.974
F	165.695	100.314	120.725	139.746
SEE	155.253	156.28	138.355	0128.857

Notes: t-statistics in parenthesis, (1) significant at 0.001 level, (2) significant at 0.01, and (3) significant at 0.1 level.

Trade balance has explained the determination of housing investment. Political effects such as election, and two million houses programs show the statistical significance. Other institutional settings like military spending also exert a serious impact on PHAREA.

4-3. *Housing Investment Household Model*

4-3-1. Stepwise Selection of Variables for Models

Table 66 The Housing Investment Household Model by Stepwise Selection

Variable	Coefficient	STD Error	STD COEF	Tolerance	T	P(2 TAIL)
Constant	191.585	63.258	0.00	-	3.029	0.006
DEFLA1	-0.165	0.156	-0.123	0.056	-1.055	0.303
EXCHANGE	0.011	0.021	0.061	0.062	0.551	0.587
GRMS	0.269	0.129	0.075	0.583	2.088	0.049
NSIZE	-14.110	8.620	-0.229	0.039	-1.637	0.117
PERGNPO	0.501	0.082	1.866	0.008	6.120	0.000
REALPLY3	18.645	6.236	0.106	0.605	2.990	0.007
SWPG	-5.498	3.415	-0.085	0.275	-1.610	0.122
TRBALO	-0.021	0.003	-0.350	0.306	-7.040	0.000
NHO	-0.035	0.012	-0.999	0.007	-2.973	0.007
CPI	0.031	0.042	0.214	0.009	0.725	0.476

Examining HIHSH's behavior

The set of equations, presented in Table 67, confirms the theoretical model and the results previously presented. Equation 1 shows that per capita income is a decisive element in the households' housing investment as presented by the t-ststistic.

Table 67 Basic Regression Equation: The Relation Between HHSH and Other Variables

	EQ. 1	EQ. 2	EQ. 3	EQ.4	EQ.5	EQ.6	EQ.7
Constant	-353.601	-468.546	8604.287	16025.99 7	10.598	971.353	- 10703.953
PERGNPO	(-0.411)	(-0.499)	(3.92) ¹	(3.628) ¹	(0.006)	(0.36)	(-1.343)
PERGNPO2	30.952 (3.377) ²	28.097 (2.89) ²			27.77 (2.533) ²	23.287 (1.592)	
RGNP (1/GNP)	66.116 (4.064) ¹	74.554 (4.129) ¹			74.706 (3.869) ¹	80.796 (3.447) ²	
DPOP				- 2259.369 (-0.489)	-458.384	- 3447.722 (-0.471)	22391.11 2 (0.823)
DPOP2				-832.042 (-0.719)	(-0.328)	(-0.459)	(0.406)
URB		65.121 (0.958)	-338.504 (-1.242)		87.309 (0.244)	107.746 (0.295)	339.262 (0.334)
URB2					72.683 (0.983)	76.221 (1.013)	121.187 (0.583)
DOMSAV		-1.068 (-0.227)	18.816 (0.984)		-1.166 (-0.241)	-1.712 (-0.34)	
RDOMSAV							933.396 (4.488) ¹
R ²	0.952	0.947	0.042	0.235	0.947	0.948	0.628
F	378.072	156.222	0.82	5.678	98.606	82.557	7.474
SEE	2655.11	2686.182	11100.65 9	9922.967	2760.941	2794.098	7504.677

Notes: t-statistics in parenthesis, (1) significant at 0.001 level, (2) significant at 0.01, and (3) significant at 0.1 level.

Table 68 Housing Investment Household Model

	Investment Household Model (HIHSH)	IHM with policy effect	IHM with institutiona l setting
Constant	110.513 (1.917) ²⁾	100.058 (1.732) ³⁾	91.508 (1.591)
PERGNPO	0.501 (3.452) ¹⁾	0.522 (3.583) ¹⁾	0.522 (3.626) ¹⁾
PERGNPO2	-0.193 (-1.283)	-0.299 (-1.808) ³⁾	-0.285 (-1.734) ³⁾
TRBALO	-0.018 (-6.219) ¹⁾	-0.018 (-6.259) ¹⁾	-0.018 (-6.395) ¹⁾
HRTE	-1.182 (-2.287) ²⁾	-1.088 (-2.099) ²⁾	-0.983 (-1.893) ²⁾
URB	0.254 (1.662)		
URBRTE	-1.244 (-1.678)	-1.161 (-1.582)	-1.148 (-1.581)
ELECTION			-4.09 (-1.263)
TWOMIL		16.155 (1.781) ²⁾	13.065 (1.406) ¹⁾
R ²	0.977	0.978	0.979
F	187.196	189.93	166.746
SEE	7.221	7.17	7.089

Foreign affairs, domestic politics, and institutional settings affect housing production in Korea as shown Table 68. Trade Balance, and per capita GNP, Two Million Houses Program exert extensive influence on housing production. However, changes in population do not have a significant effect on HIHSH. Urbanization does affect HIHSH.

CHAPTER SEVEN

CONCLUSION AND FUTURE DIRECTIONS

1. Introduction

This concluding chapter discusses the overall result of the study. Throughout this study, we have found some limitations of the explanatory models. On the other hand, we suggest some recommendations for future studies for the behavior of housing investment. The policy recommendations, and the conclusion of this study are addressed in this final chapter.

2. Summary of findings

Korea's macroeconomic plans are linked to housing conditions and development that has been organized through a series of five-year plans. Central organizing structures of development have had a strong impact on private sector investment in housing through strong linkages with the macroeconomy. These circumstances indicate a significant impact on the general components of the Korean housing market.

A general review of housing theory discloses that more and better housing was used as a solution to societal stress, and that state intervention was justified in the provision of housing. While existing models for housing investment related to overall allocation of resources in a country, they failed to consider adequately macroeconomic

factors. To resolve that omission, a new model is proposed. The Burns and Grebler model serves as the base of departure because it has confirmed the effects of the socioeconomic factors and urbanization. With the addition of new macroeconomic and international factors we contribute to analysis of housing in developing countries.

However, in our review of previous studies of housing investment, we point out that they suffered from several major shortcomings. (1) They focus only on socioeconomic variables, not policy effect. (2) They focus only on domestic affairs without considering factors related to the global setting and foreign affairs. (3) They do not consider national allocation effects within budget constraints. (4) They do not factor in the effects of institutional settings and arrangements.

We have overcome these weaknesses by creating a new approach based on the data from Korea from 1953 to 1993. The time series data demonstrate historical sequences in which macroeconomic issues are apparently significant. Our model then includes both the housing data and macro-economic factors. This comprehensive approach determines statistically what is otherwise only an apparent relationship between macroeconomic factors and housing related policy experiments. For example, the *Two-Million Houses Program* and several anti-real estate regulation enactments have been tested. The result is that state policy can no longer ignore the housing sector or treat it as a separate domain of policy when calculating the effect of macroeconomic issues on general budgetary allocations.

Our modeling of the housing investment in Korea has been guided by what we expect to be the most important determinants of residential investment. By first

defining a broad spectrum of determinants in six categories of factors, we allow for a generous and broadly defined test. By testing for significance and variance the determinants are narrowed to about forty-seven variables divided into the six categories, which are Socio-Economic Status, Demographic and Urbanization, Policy Effect, Housing Condition, Institutional Setting, and Foreign Affairs. Of these exchange rates, balance of payment, trade balance, and interest rates are considered macroeconomic, which in final analysis allow us to concentrate on how the macroeconomic sector impinges upon the dynamics of the housing investment; and the influence of various aspects of global and foreign affairs and policy. In addition, the domestic factors allow us to correlate these macro-economic issues with the structure of institutional arrangement and how political factors affect housing investment.

The empirical results of the new model reveal some important aspects of housing investment in Korea. Several interesting observations emerged from the study. Global and foreign factors are extremely influential determinants of the general economy of Korea and the housing investment within that context.

Analysis reveals a statistically significant relationship between historical patterns of investment in the housing sector and the structure of Korea's total investment. Based on our theoretical framework, factor analysis, Pearson Correlation Analysis, and stepwise regression analysis are used to select variables. Regression models using time-series data are estimated to establish the empirical relationships. Results show that housing investment in Korea is statistically explained by levels of income, military spending, political stability, housing policy, foreign affairs, and

global context of finance. Demographic pressure did not show any significant relationship on the level of housing investment. Urbanization, as measured by the ratio of urban population over total population, does correlate with levels of housing investment. These results are made more meaningful by adding international, domestic, and institutional variables to the context in which housing policy was formulated.

This dissertation will help to clarify factors that influence the level of housing investment in Korea. It also helps to emphasize the relationship between housing and macro-economic factors, thus elevating housing to higher level of policy consideration. It provides housing researchers with new insights into the nature of decision making as affected by macroeconomic and political contexts, while including a social-historical context. The conceptual and empirical models, though based on Korea's example, could be used to test for generalization for other developing countries, where housing is used as a tool for economic development.

3. Limitations of the Study

Because the socio-economic and historical context of Korea includes prominent government intervention to alleviate serious housing problems, this research has strong implications concerning policy for government intervention. Yet in terms of the explanation of housing investment, there are several major limitations in our models.

The first limitation is that this study relies on the validity and accuracy of the two data sources, official housing production statistics and census data published by the government. With respect to reliance on government data, there is a question of its dependability. Because the research of almost all of our sources is built on data which are always questionable, we keep in mind that our sources are valid only insofar as these data are valid.

The second limitation of our models is that several variables, including households (NTHH), dwelling size (NSIZE), total revenue (TR), and total expenditures (TE) cannot be tested successfully in our models because of multicollinearity problems. It might be caused by the high correlation between the share of housing investment over the GNP and these variables. It might be possible to develop a more sophisticated model for explaining the relationship between variables and the behavior of housing investment.

Finally, a general limitation is an inadequate description of the private housing sector, which can hinder the full understanding of housing policy formulation; for example, who dominates the private housing sector, Chaebol, investment companies, or corporations? This information of inside structure of the construction industry will enhance the reliance of analysis. In addition, the cycle of the construction business assumes the strong correlation relationships with the general housing investment. These issues affect the impact of government regulation on the housing construction sector and the general housing investment, which present an area for future research and study.

4. Recommendations for Further Research

The limitations of the study discussed above should be taken into consideration for further research in this subject.

First, the relationship between housing stock and housing investment in Korea can be tested further. One might analyze more intensively whether the maturity of the housing stock condition (representing over 1 housing supply rate) is the major determinant of the stabilized behavior of housing investment. We may further investigate this preliminary finding by a cross-national study which includes the conditions of maturity and non-maturity of housing stock.

Second, further research will find new approaches to deal with several multicollinearity problems. One method is to select new indicators of economic development, urbanization, and population growth. Another is to find different analytical techniques. In addition, an adaptation of the model tested here is needed to be able to apply this Korean case to other developing countries. The adaptation has to deal with cross-section pooled time series analysis.

Third, if further study focuses on how government can intervene to alleviate serious housing problems facing developing countries, one must overcome the limitations of dummy variables that evaluate the effect of structural changes. One must maintain the assumption of homoscedasticity. For example, one might consider a hazard model and path analysis as new alternative methodologies. A hazard model can

examine each phase of capital formation and each ruling regime separately. A path analytic technique permits the testing of direct and indirect casual effects in the determination of a dependent variable.

5. The Application of the Theoretical Basis to The Key Housing Problems

Throughout this study, we assess the implications for public policy. Generally speaking, there are two components of concepts of housing. First, housing is used as a solution to social problems and, second, housing is considered as only one of several government economic policies. In the first case, Strassman indicates that changes in certain government policies may lead to increases or decreases in the production of dwelling units. Government involvement through rent control, for example, discourages development and diverts funds from the housing market.

One of the important tests of a housing system is the equity in the distribution of housing welfare. Housing problems in Korea may be identified in terms of the following variables: urbanization, formation of nuclear households, income distribution, dwelling price increases, land development policy, and financial repression.

With respect to housing demand, some of the measures could be proposed for the expansion of supply such as the development of housing finance, low cost of land and dwelling, and a cut in the size of dwelling units will surely increase the housing demand across the board. The rationale for government intervention in housing has been justified, and the role of government is important in dealing with relationships

between economic and political structures and the established housing system. The Korean government should keep this view in mind: government has role in housing because of its social responsibility and housing should not be left entirely to free market forces.

6. Policy Reorientation and Policy Recommendation

Korea's housing problems manifest themselves in terms of absolute housing shortages, relatively poor quality, over crowding, lessening affordability, and skewed distribution of housing welfare. The most obvious reason for these housing problems is the rapid increase in housing demand caused by urbanization, accelerated formation of nuclear households, and past demolition of a great number of dwellings. Korea's housing shortage has been due essentially to three variables: skewed income distribution, skewed wealth distribution, and rapidly rising dwelling prices.

The results indicate that government intervention has a significant impact on housing, yet the housing sector is also coupled with macro-economic factors that are outside the view normally taken by domestic planners. Therefore, Korea and other countries with an apparent need for significant government involvement should re-think housing investment problems and type of government involvement, based simply on uncertainty of macro-economic affects as well as on domestic issues, such as slum clearance, land pricing systems, and public housing that have been shown to distort the market.

The whole question of whether housing is an infrastructure like water supply, sewage and road facilities should be examined, especially with respect to those individuals such as the elderly and handicapped, who have limited market relations because of fixed income and/or state dependency. Safer government involvement would address market imperfections which are in the context of a larger global market, therefore respecting the increasing alignment between domestic and international factors. Deregulation and incentives, for example, can promote development of an efficient private sector within a domestic environment, while accommodating exchange and interest rates which are internationally determined. Korea's new housing policy should be formulated in light of these principles. Finally, for any housing policy to succeed, the public should be invited to participate in the planning process.

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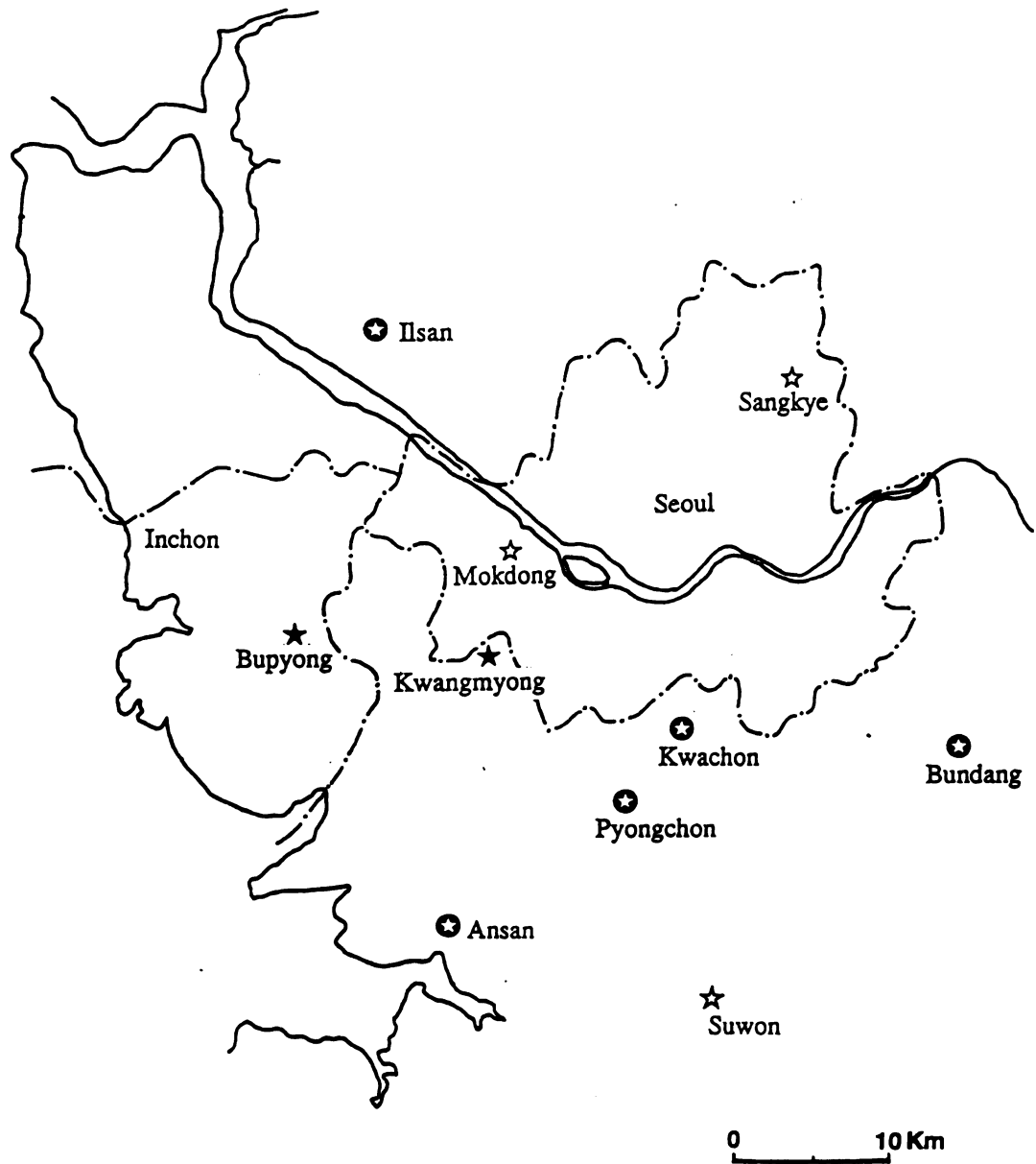
APPENDICES

APPENDIX 1. List of Variables

Label Name	Contents	Units
GNPU	Current GNP	Bil. won
GNPD	Constant GNP in US dollar at 1990	10 Mil. \$
GNPO	Constant GNP (W)	Bil. won
GDPU	Current GDP	Bil. won
GDPO	Constant GDP	Bil. won
NI	National Income	Bil. won
NIO	National Income (constant)	Bil. won
NDI	National Disposable Income	Bil. won
NDIO	National Disposable Income (constant)	Bil. won
GFCFU	Current fixed capital formation	Bil. won
GFCFO	Constant fixed capital formation	Bil. won
GDCFU	Current Gross Domestic Capital Formation	Bil. won
GDCFO	Constant Gross Domestic Capital Formation	Bil. won
IRFCE	Increase Rate of Final Consumption Expenditure	%
IRGFCF	Increase Rate of Gross Fixed Capital Formation	%
IRGFCF1	Increase Rate of Gross Fixed Capital Formation (constant)	%
CONSU	Construction	Bil. won
CONSO	Construction (constant)	Bil. won
RESU	Current Capital Formation in Resid. Bldg	Bil. won
RESO	Constant Capital Formation in Resid. Bldg	Bil. won
IRHINVE	Growth Rate of Level of Housing Investment	%
IRHIV	Growth Rate of Level of Housing Investment (constant Reso based)	%
CONPCT	Constant Housing Investment as % of Constant GDP	%
GPCPO	Constant GDP per Capita	1000won
GPCPO2	(GDP/Constant Capita) ²	1000won
CONNP	Constant Housing Investment as of Constant GNP	%
PERGNP	Per capita GNP	1000won
PERGNPO	Per capita GNP (constant)	Mil.won
RGNP	1/GNP	-
GNPIND	GNP Index	-
ECRTE	Economic Growth Rate	%
TR	Total Revenue	Bil. won
TRO	Total Revenue (constant)	Bil. won
TE	Total Expenditure	Bil. won
TEO	Total Expenditure (constant)	Bil. won
MS	Money Supply	Bil. won
MSO	Money Supply (constant)	Bil. won
GRMS	Growth Rate of Money Supply	%
DEFLATOR	Deflator Index	-
DEFLA1	Deflator Index	-
GRDEFA	Growth Rate of Deflator	%
EXCHAN	Exchange Rate of won to U.S. Dollar	won.
CPI1	Consumer Price Index (1953 base year)	-

CPI	Consumer Price Index (1970 base year)	-
TRBAL	Trade Balance in million US dollars	Mil. \$
TRBALO	Trade Balance in million US dollars (constant)	Mil. \$
GRTRBAL	Growth Rate of Trade Balance	%
PPI	Producer Price Index	-
SAV	Gross Saving	Bil. won
SAVR	Ratio of Private Saving to disposable Income	%
DOMSAV	Ratio of Domestic Savings to GNP (1954-1992)	%
RDMSAV	1/DOMSAV	-
NIPC	Per Capita National Income	1000 won
PERGNPO2	Per capita GNP ²	1000 won
HSGEXPIN	Average expenditure per household in the national budget (1962-92)	1000 won
INTR	Interest Rate	%
DCPI	Growth Rate at Consumer Price Index	%
PRSAV	Private Saving	Bil. won
PERGNPD	Per Capita GNP in US dollar	\$
RTPERGNP	Growth Rate at Per Capita GNP	%
HIPC	Housing Investment Per Capita	won
IRCONNP	Growth Rate at Constant Housing Investment as of Constant GNP	%
POPU	Population	1000
POPO	Pop. In cities over 100,000	1000
DPOP	Rate of Growth	%
DPOP2	(Rate of Growth) ²	-
URB	Rate of Growth in cities over 100,000	%
URB2	(Rate of growth in cities over 100,000) ²	-
POPUM	Pop. in millions	1000
POPOM	Pop in cities over 100,000 (in millions)	Mil.
URBPOP	Urban population	1000
RURPOP	Rural Population	1000
URBRTE	Urbanization Rate	%
URBRTE2	Urbanization Rate ²	-
URBR	annual rate of growth of cities over 100,000 divided by average rate of growth in national population	%
URBR2	URBR ²	-
PDEN	Population Density	Per Km ²
IRUPOP	Increase rate of urban population	%
PABC	Permit Authorized for building construction: Total, Number of building	dwelling unit
PABCFLO	Permit authorized for building construction: total, floor area	1000 m ²
PABCFLODW	Permit authorized for New Housing Construction by dwelling use by floor area	1000 m ²
PBB CDW	Permit authorized for New Housing Construction by dwelling use by du	dwelling unit
NTHH	Total Number of Households	1000
NSIZE	Person Per Each Households	-
NHO	Number of Housing Units	1000
GRPABCFLO	Growth Rate of the New Housing Construction by floor area	%
GRPB CDW	Growth Rate of the New Housing Construction by dwelling unit	%
HRTE	Housing Supply Rate	%

HNC	Number of Housing Constructed.	1000
NDEX	National Defense Expenditure	Bil. won
NDEXO	National Defense (constant)	Bil. won
RATDEF	Share of National Defense over Total Expenditure	%
DEFSP1	Defense spending in Mil. won	Mil.W.
DEFR	Defense spending rate of growth	%
DEFGP	Defense spending as percentage of GNP	%
STCF	Share of Fixed Capital Formation	%
SHTOGD	Share of GDP over Residential Building	%
YPCNI	Share of housing investment over national income	%
LGPCPC	log form of constant GDP per capita	-
LNIPC	log form of per capita national income	-
LPERGNP	log form of per capita GNP	-
LCONPCT	log form of constant housing investment as % of constant GDP	-
LYPCNI	log form of share of housing investment over national income	-
LCONNP	log form of share of housing investment over GNP	-
PHAREA	Per Capita new housing construction area	0.001 m ²
LPHAREA	log form of PHAREA	-
AEXPEN	per capita average expenditure in the national budget	1000 won
LAEXPEN	log form of AEXPEN	-
PARK	The Park's Regime:dummy variable	-
ELECTION	The Election Dummy Variable	-
TWOMIL	The Two Million Housing Construction Plan Dummy variable	-
DPLSTABL	The political stability dummy variable	-
STOGRO	growth rate of housing units (NHO)	%
HHSIRO	growth rate of households (NTHH)	%
DENGNP	Defense spending as percentage of GNP	%
TBR	Tax Burden Rate	%
UMM	Unregualted interest on money markets	%
SWSP	Social Welfare Spending in Mil. won (1962-93)	Mil . won
SWR	Growth Rate of Social Welfare Spending (1962-93)	%
SWPG	Social Welfare Spending in Percentage of GNP (1962-93)	%
SWPB	Social Welfare Spending as Percentage of Budget (1962-93)	%
HIHSH	Per Household Housing Investment	1000 won
HGLOPC	Per capita housing loan from Korea Housing Bank	1000 won
HGLO	Total Housing loan from Korea Housing Bank	Billion won
NHF	National Housing Fund by KHB	Billion won
PHF	Public Housing Fund by KHB	Billion won
HPOL	Strength of anti-speculation measures	
NHGUN	Total number of Housing Construction	dwelling units
NHGUNP	Total number of public housing construction	dwelling units
NHGUNE	Total number of private housing construction	dwelling units
HCFUN	Total Housing Construction Fund	Billion won
RINT	Real Interest Rate	%
WPI	Wholesale price index (1970=100)	%
MSGNP	M ₂ /GNP	%
DSGNP	Domestic Savings as percentage of GNP	%
FSGNP	Foreign Savings as percentage of GNP	%
EXGNP	Exports as percentage of GNP	%

APPENDIX II. Site of New Towns Around Seoul

APPENDIX III. List of Sample Nations In Model

BG model (39 countries)	Annez and Wheaton model (38 countries)
Australia	Australia
Belgium	Belgium
Bolivia	Bolivia
Canada	Canada
Chile	Chile
Colombia	Colombia
Costa Rica	Costa Rica
Denmark	Denmark
El Salvador	El Salvador
Finland	Finland
France	France
Greece	Greece
Honduras	Honduras
Iceland	Iceland
Iraq	Iraq
Ireland	Ireland
Israel	Israel
Italy	Italy
Jamaica	Jamaica
Japan	Japan
Kenya	Kenya
Luxembourg	Malta
Malta	Netherlands
Netherlands	Norway
Norway	Panama
Panama	Philippines
Philippines	Portugal
Portugal	Puerto Rico
Puerto Rico	South Africa
South Africa	South Korea
South Korea	Spain
Spain	Sweden
Sweden	Switzerland
Switzerland	Thailand
Thailand	Turkey
Turkey	U.S.
U.S.	United Kingdom
United Kingdom	West Germany
West Germany	

APPENDIX IV. Glossary

<i>Chaebol</i>	conglomerate dominating the Korean economy, as a group of companies under a single and centralized control whose level of total sales is one of the highest throughout all industries. For more detail see Kim, Eun Mee. 1990, 1991, 1992.
<i>Chonse</i>	the tenant pays a large cash deposit - its size is usually a third to a half of the price of the housing - to the landlord at the beginning of the tenancy instead of monthly rental payments. The deposit is refunded at the end of the lease period. The landlord takes the interest on the deposit as rent.
housing services	a phrase that defines the utility a resident gets by living in a dwelling units. It refers to the sum of all services, inclusive of neighborhood attribute provided by a housing unit during some period of time such as space, privacy, availability and dependability of utilities, and other features of the unit which provide comfort and pleasure.
Sal-Wol-Sei	substantial deposit with monthly rent
<i>Elasticities</i>	weights in nondimensional units that assess the response of the dependent variable to changes in the explanatory variable.
housing program	components of a wide array of public policies with multiple goals.
pyung	the standard measurement unit for housing is the pyung; it is equal to 3.3 m ²

APPENDIX Variables For Time-Series Analysis

A. Dependent Variables for Time-Series Analysis

- (a) CONNP: national housing construction investment as a percentage of the GNP (GNPO) (1953-1993) Unit: %
 CONNP is GNPO divided by RESO.
 Source: Bank of Korea, *Economic Statistics Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.
- (b) PHAREA: housing construction area per person (1962-1992)
 PHAREA is PABCFLO(the national new housing construction area) divided by the total population size(POPU). Unit: 0.001 m²
 Source: Bank of Korea, *Economic Statistics Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.
- (c) HIHSH: housing construction investment household (1953-1993)
 HIHSH is RESO(the national housing construction investment) divided by the total number of households (NTHH)
 Source: Economic Planning Board, *Housing Census*, 1990. 1985. 1980.
 Economic Planning Board, *Economic Statistical Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.

B. Independent Variables for Time-Series Analysis

Independent variables are classified into six categories: socio-economic status, institutional setting, urbanization and demographic change, housing conditions, policy effect, and global and foreign affairs effect.

A. Socio-Economic Status Variables

In order to investigate the relationship between housing investments and key variables in the national economy, we focus on estimating the elasticity of housing

investments with respect to income. In addition to income and price variables, we can include several other independent variables which may affect housing investment.

- (a) PERGNPO: per capita constant gross national product (1953-1993)
 PERGNPO is GNP divided by the total population (POPUL).
 Unit: 1000 won
 Source: Economic Planning Board, *Economic Statistical Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.
- (b) TRO: constant total revenue; Unit: Billion won
 Source: Economic Planning Board, *Economic Statistical Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.
- (c) TEO: constant Total Expenditure; Unit: Billion won
 Source: Economic Planning Board, *Economic Statistical Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.
- (d) MSO: constant money supply; Unit: Billion won
 Source: Economic Planning Board, *Economic Statistical Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.
- (e) Deflator: deflator index based on 1970
 Source: Economic Planning Board, *Economic Statistical Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.
 Bank of Korea, *National Accounts*, 1987.
- (f) INTR: interest rate; Unit (%)
 Source: Economic Planning Board, *Economic Statistical Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.
- (g) DOMSAV: ratio of domestic savings to GNP (1954-1992)
 Source: Economic Planning Board, *Economic Statistical Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.
 Bank of Korea, *National Accounts*, 1987.
- (h) UMM: unregulated interest on money markets
 Source: Economic Planning Board, *Economic Statistical Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.
 Bank of Korea, *National Accounts*, 1987.
- (i) DCPI: growth rate at consumer price index
 Source: Economic Planning Board, *Economic Statistical Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.

Bank of Korea, *National Accounts*, 1987.

- (j) SAVR: ratio of private savings to disposable income; Unit: %
Source: Economic Planning Board, *Economic Statistical Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.
Bank of Korea, *National Accounts*, 1987.
- (k) AEXPEN: average expenditure per person in the national budget (1962-1992)
AEXPEN is the national budget divided by the total population size (TOTPOP).
Source: Economic Planning Board, *Economic Statistical Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.
- (l) HSGEXPIN: average expenditure per household in the national budget; Unit :
1000 won
Source: Economic Planning Board, *Economic Statistical Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.
- (m) CPI: Consumer Price Index based on 1970
Source: Economic Planning Board, *Economic Statistical Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.
- (n) PPI: Producer Price Index based on 1970
Source: The Bank of Korea, *Price Statistics Summary*, 1994.

B. Institutional Setting Variables

These variables are related to the role of government action in constructing more housing.

- (a) DEFSP: defense spending in mil. won (1961 - 1993)
Source: National Statistics Office, *Korea Economic Indicator*, 1965, 1970, 1975, 1980, 1985, 1990.
- (b) DEFR: defense spending rate of growth (1961 - 1993)
Source: National Statistics Office, *Korea Economic Indicator*, 1965, 1970, 1975, 1980, 1985, 1990.
- (c) DEFPG : defense spending as a percentage of GNP (1961-1993)
Source: National Statistics Office, *Korea Economic Indicator*, 1965, 1970, 1975, 1980, 1985, 1990.

- (d) DEFPB : defense spending as a percentage of budget (1961-1993)
Source: National Statistics Office, *Korea Economic Indicator*, 1965, 1970, 1975, 1980, 1985, 1990.
- (e) SWSP: social welfare spending in mil. won (1961 - 1993)
Source: National Statistics Office, *Korea Economic Indicator*, 1965, 1970, 1975, 1980, 1985, 1990.
- (f) SWR: social welfare spending rate of growth (1961 - 1993)
Source: National Statistics Office, *Korea Economic Indicator*, 1965, 1970, 1975, 1980, 1985, 1990.
- (g) SWPG: social welfare spending as percentage of GNP (1961 - 1993)
Source: National Statistics Office, *Korea Economic Indicator*, 1965, 1970, 1975, 1980, 1985, 1990.
- (h) SWPB: social welfare spending as percentage of the budget (1961 - 1993)
Source: National Statistics Office, *Korea Economic Indicator*, 1965, 1970, 1975, 1980, 1985, 1990.
- (i) PDEN: population density; Unit: Per Km²
Source: Economic Planning Board, *Population and Housing Census*, 1985.
- (j) ECRTE: economic growth rate; Unit: %
Source: Economic Planning Board, *Economic Statistical Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.
- (K) RARDEF: share of defense spending over total expenditure Unit: %
Source: Economic Planning Board, *Economic Statistical Yearbook*, 1965, 1970, 1974, 1980, 1981, 1986, 1989, 1990, 1991, 1993, 1994.

C. Demographic and Urbanization Variables

These variables include the growth rate of the total population and the ratio between the rural and urban population.

- (a) DPOP: annual rate of increase in the total population (1953-1993)
DPOP is the rate of increase in the total population size (POPU).
Source: Economic Planning Board, *Population and Housing Census*, 1985.
- (b) IRUPOP: rate of increase in the urban population (1953-1993)

IRUPOP is based on the aggregate population of cities which includes cities and *Eup* (population of over 20,000).

Source: Economic Planning Board, *Population and Housing Census*, 1985.

(c) URB RTE: rate of urbanization

Source: Ministry of Home Affairs, *Municipal Yearbook of Korea*, 1970, 1980, 1990.

Economic Planning Board, *Population and Housing Census*, 1985.

(d) RURPOP: rural area population

Source: Ministry of Home Affairs, *Municipal Yearbook of Korea*, 1970, 1980, 1990.

(e) URBPOP: Urban area population includes that of *Eup* with more than 20 thousand residents; Unit: Thousand Person.

Source: Economic Planning Board, *Population and Housing Census*, 1985.

(f) POPU: nation-wide population

Source: Economic Planning Board, *Population and Housing Census*, 1985.

(g) URB R: annual rate of growth of cities over 100,000 divided by the average rate of growth in the national population; Unit: %

URBR is IRPOPU divided by DPOP.

Source: Economic Planning Board, *Population and Housing Census*, 1985.

(h) URB: rate of growth in cities over 100,000

URB is based on the aggregate population of cities which includes cities over 100,000 (POPO).

Source: Economic Planning Board, *Population and Housing Census*, 1985.

D. Housing Condition Variables

(a) HRTE: Housing Supply Rate

Source: Ministry of Construction, *Yearbook of Construction Statistics*, 1993.

(b) NHO: Number of Constructed Housing Units: 1000 units

Source: Economic Planning Board, *Major Statistics of Korean Economy*, 1977, 1982.

Ministry of Construction, *Yearbook of Construction Statistics*, 1993.

(c) NTHH: Total Number of Households

Source: Economic Planning Board, *Major Statistics of Korean Economy*, 1977, 1982.

Ministry of Construction, *Yearbook of Construction Statistics*, 1993.

- (d) NSIZE: number of persons per household (1953-1993)
 NSIZE is the total population size (POPUL) divided by the total number of households (NTHH).
 Source: Economic Planning Board, *Major Statistics of Korean Economy*, 1977, 1982.
 Ministry of Construction, *Yearbook of Construction Statistics*, 1993.
- (e) ROWNHO: Ownership Occupied Rate
 Source: Ministry of Construction, *Yearbook of Construction Statistics*, 1993.
- (f) PABC: Number of buildings
 Source: Economic Planning Board, *Economic Statistics Yearbook*, 1994.
 Economic Planning Board, *Korea Statistical Handbook*, 1978, 1979, 1980, 1985, 1986, 1987, 1988
- (g) PABCFLO: Permits authorized for building construction
 Source: Economic Planning Board, *Economic Statistics Yearbook*, 1994.
 Economic Planning Board, *Korea Statistical Handbook*, 1978, 1979, 1980, 1985, 1986, 1987, 1988
- (h) PABCFLODW: dwelling by floor area
 Source: Economic Planning Board, *Economic Statistics Yearbook*, 1994.
 Economic Planning Board, *Korea Statistical Handbook*, 1978, 1979, 1980, 1985, 1986, 1987, 1988
- (i) PBBCDW: dwelling by use
 Source: *Economic Statistics Yearbook*, 1994.
 Economic Planning Board, *Korea Statistical Handbook*, 1978, 1979, 1980, 1985, 1986, 1987, 1988
- (j) HNC: amount of Housing Constructed. Unit: 1000 Houses
 Source: *Economic Statistics Yearbook* 1994.
 Economic Planning Board, *Korea Statistical Handbook*, 1978, 1979, 1980, 1985, 1986, 1987, 1988

E. Policy Effect Variables

- (a) TWOMIL: the *two million house program* dummy variable (1953-1993)
 1 = 1987-1992, 0 = other years
- (b) DPLSTABL: the political stability dummy variable (1953-1993)
 1 = 1979, 1980, 1981, 1988, 0 = other years

(c) PARK: Park's Regime dummy variable

(d) ELECTION: the election dummy Variable

E. Foreign Affairs Effect

(a) TRBALO: trade balance in million US dollars

Source: Economic Planning Board, *Major Statistics of Korean Economy*, 1977, 1982.

(b) EXCHANG: exchange rate of won to the U.S. dollar; Unit: won Economic

Source: Planning Board, *Korea Statistical Handbook*, 1978, 1979, 1980, 1985, 1986, 1987, 1988

Economic Planning Board, *Major Statistics of Korean Economy*, 1977, 1982.

(C) INTR: interest rate: unit: %

Source: Economic Planning Board, *Korea Statistical Handbook*, 1978, 1979, 1980, 1985, 1986, 1987, 1988

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APPENDIX VI. Exchange Rates, Weight, and Measures

Exchange Rates To U.S. Dollar

	won = \$1
	won = \$1
	won = \$1
	won = \$1
	won = \$1
	won = \$1
	won = \$1
	won = \$1
	won = \$1

Source: IMF, IFS. 1977.1

Economic Planning Board, *Major Statistics of Korean Economy*, 1977.

The Bank of Korea, *Economic Statistics Yearbook*, 1991, 1992, 1993, 1994.

2. Measures

1 pyung equals 3.3 m^2

1 kilometer = 1000 meters = 0.5397 miles = 39,370 inches = 3,281 feet

$1 \text{ kilometer}^2 = 1.55 * 10^9 \text{ inches}^2 = 1.076 * 10^7 \text{ feet}^2 = 0.3862 \text{ mile}^2$

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