

Building Cycles, economic fluctuation, the real rate of interest and the urban landscape.

by
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A neo-classical economics 'trade-off' model of urban land use is applied to the City of Reykjavík. Whitehand (1972a,b) employs the concept of bid-rent curves to explain why demand for land, and therefore land-use patterns, varies across the urban area. Data on the volume of new residential buildings from 1929 until 2004 was collected from the department of the Director of Planning and Building. The spatial distribution of buildings that were erected during periods of economic downturns was identified using a geographical information system in combination with neo-classical economic theory and methods of urban morphology. The period is divided into three sub-periods: 1929 - 1975, 1976- 1986 and 1987 to 2004. It is shown that Whitehand's bid-rent curve theory applies to the first and last periods. During 1976 to 1986 it does, however, not explain the observed behaviour of residential investment. In this mid-period housing investment is driven by negative real interest rates. From the early seventies until the mid eighties the Icelandic economy was plagued by high inflation, while nominal interest rates were determined by policy authorities. It is a well documented fact that during this time house-building was probably the best form of savings available to households.

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1. Introduction

Urban landscapes of today's cities are a chaos of forms and elements, created as collective palimpsest of all time. To understand the urban landscape as it appears today it is necessary to know how it was formed. The urban layers, the footprint of each society, can in part be identified in the urban form. The city is a mirror of the people that inhabit it and have inhabited it: their values, culture and history. To understand the city, it is essential to examine its history.

“Housing has a unique set of characteristics: *necessity* (housing satisfies a basic human need, shelter), *importance* (for most households, it is the single most important item of consumption), *durability* (housing is the most durable of major commodities), *spatial fixity* (with only minor exceptions, a housing unit cannot be transported at reasonable cost), *indivisibility* (household typically do not mix fractions of housing units), *complexity and multi-dimensional heterogeneity* (a housing unit has a great number of characteristics), *thinness of the market* (housing units and households are sparse in characteristics space), *nonconvexities in production* (rehabilitation, demolition and reconstruction, and conversion involve discontinuous changes that are caused by production nonconvexities), *the importance of informational asymmetries* (e.g., potential occupants are not fully aware of each housing unit's characteristics, and landlord and tenant do not know each other's traits), *the importance of transactions costs* (search costs, moving costs, and transaction fees), and *the near-absence of relevant insurance and futures markets.*” (Arnott, R. 1998)

When explaining the formation of a city, economic factors are of central importance³. Shelter, i.e. housing, has always been one of the basic human needs. House building is in most cases the single largest investment a family undertakes. Housing investment is affected by a number of factors, such as the state of the economy, rate of interest, availability of mortgages, and the difference between house prices and building cost, to name a few. It is therefore necessary to look into whether economic factors can to some extent explain why the growth of a city is fast in some periods, and slower, even coming to a halt, in other periods. In particular the focus here is on what happens at the city fringe.

The aim of this paper is to see if and where economic downturns affected the city growth.

Refinancing without the sale of the property was virtually impossible in Iceland until August 2004. Prior to that government financed mortgages were the dominant method of financing. A sale was a necessary condition for new loans to be issued and therefore refinancing required a change of home. In August 2004 the commercial banks offered mortgages for refinancing without a sale. At the same time interest rates on loans for the purchases of dwellings dropped, debt ratios increased and more people opted for longer loans. This completely changed the housing market. The period under consideration here is from 1929 to 2003, i.e. before that change.

³ When analysing the urban landscape it is necessary to study physical, economic and social factors. This paper focuses on economic factors.

2. Theoretical background

This paper builds on the urban morphology approach developed by M.R.G. Conzen, but with a focus on the contemporary urban landscape. Conzen's approach is historical and evolutionary, looking at the form of the town as the result of the sequence of events in its formation. In fact those events are seen as part of the social and economic development of the local, regional and national context in which the town lies (Kropf 1993).

The centrifugal force continuously pushes certain land uses to the edge of the urban settlement (Whitehand 1967). The city extends outward, not steadily but in phases depending on such factors as a city's economic well-being and constraints placed upon the use of land at the urban fringe of which physical limitations are one important type. When the city undergoes changes during a halt in the outward advance of the built-up area a varied assortment of urban land uses normally seeking large, cheap, peripheral sites tend to occupy land immediately beyond the stationary urban fringe.

In reality cities do not form symmetrical zones: they grow at varying speeds in different directions. Thus, a city can expand in one direction (e.g. if there is more desired building land), but not necessarily in another direction if, for example, where an existing land use there deters residential development.

Conzen's methods have inspired many other researchers. The extension of his research can be divided into three types: morphological approaches, economic approaches and social approaches. The economic approaches explore urban-rent theory. This has for example been done by Whitehand (1972a, b, 1974, 1977), Openshaw (1974), and Barke (1974, 1976).

The main contribution comes from Whitehand. His approach is economically based, using a neo-classical economics 'trade-off' model of urban land use, which employs the concept of bid-rent curves, to explain why demand for land, and therefore land-use patterns, varies across the urban area. Whitehand's (1972b) theory is based on the changes that occur at the edge of the city, where land is developing from rural to urban land use. He compares residential and institutional land uses, the latter being representative of fringe belts (figure 1).

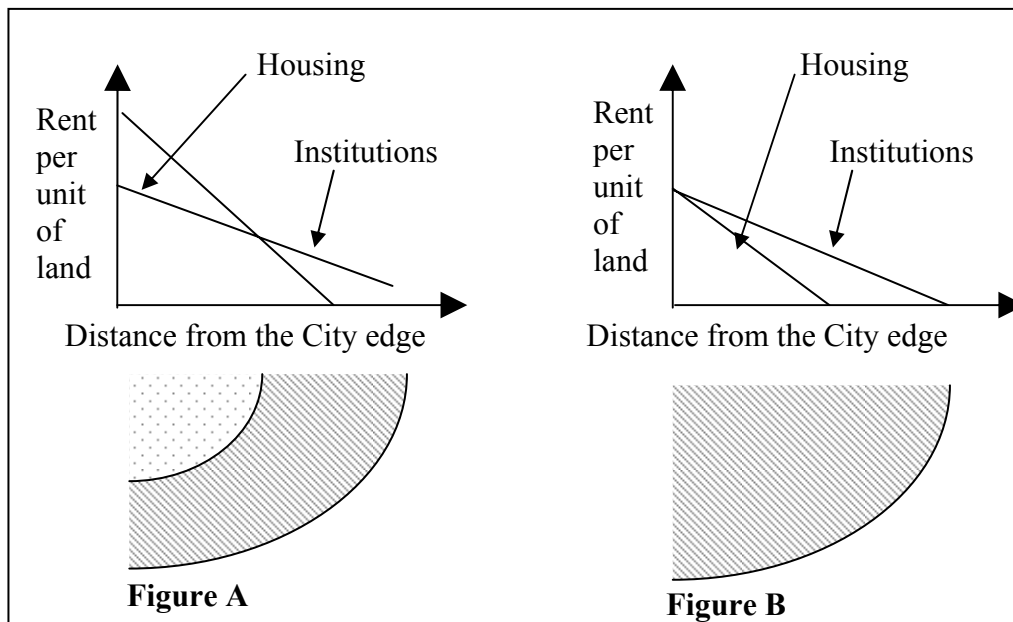


Figure 1. Hypothetical bid-rent curves and resulting landscapes, (A) during an economic boom, (B) during an economic slump (Whitehand 1972b p.216).

Figure 1A shows that during a boom in housing construction there is a high probability of housing being located on sites close to the edge of the built-up area and institutions on more distant sites. Figure 1B shows that during a housing slump there is a high probability of institutions acquiring sites close to the built-up area. This causes a series of zones characterized by different proportions of housing and institutions during a long-period of booms and slumps (Whitehand 1972 p.216).

3. Methods and data

To undertake this analysis, the geographic information system of the city of Reykjavík [LUKR] was used as a tool to apply the overlay method of map analysis. All spatial data were geo-referenced to a common projection (ISN93) and integrated into the geographical information system ArcMap GIS (Esri, Redlands, CA).

Data on the volume of new residential buildings from 1929 until 2004 was collected from the department of the Director of Planning and Building. The spatial distribution of buildings that were erected during periods of economic downturns was identified using a geographical information system in combination with neo-classical economic theory and methods of urban morphology.

4. Study area

The case study area is the capital of Iceland, Reykjavík. The study area is indicated by the bold black line (figure 2). The boundary line follows the current jurisdiction line except to the east where it is drawn outside the urban area (this is indicated by a dotted line). The study area is bounded by the road to Rauðavatn. From there the boundaries follow a straight line to Hafravatn, continuing to the Úlfarsfell and on to the river Korpúlfsstaðaá where it merges again with the city boundaries. Today the City of Reykjavík owns land further east as well as north of the urban area. In fact the boundary follows the coast line even though the line is drawn in the ocean on the map. That is only done to indicate that all the land within the study area is included in the research. The islands are left outside the study area, because even though they are a part of the city, they are not used for settlement yet.

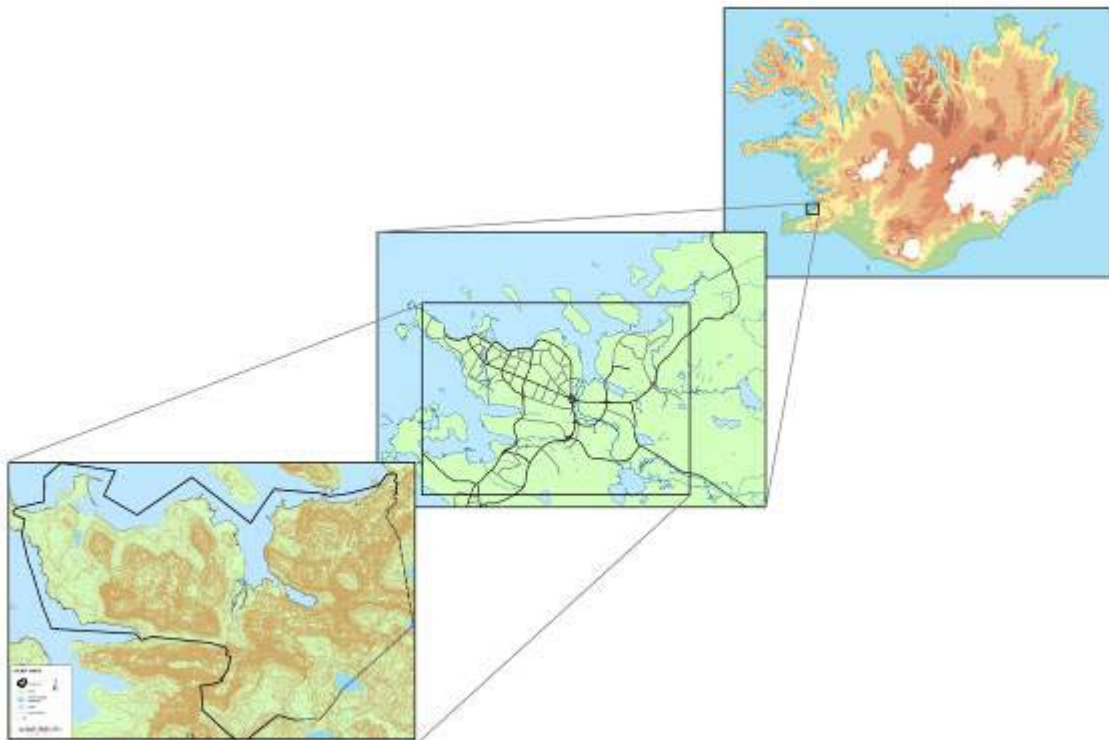


Figure 2. Case study area, Reykjavík, Iceland.

5. Building cycles

Data on the volume of new residential buildings in Reykjavík from 1929 to 2004 were collected from annual reports from the department of the Director of Planning and Building. This data series is shown on figure 3. Also shown on the graph is investment in non-residential building as a percentage of total building investment.

Residential and non residential building in Reykjavík, 1929-2003

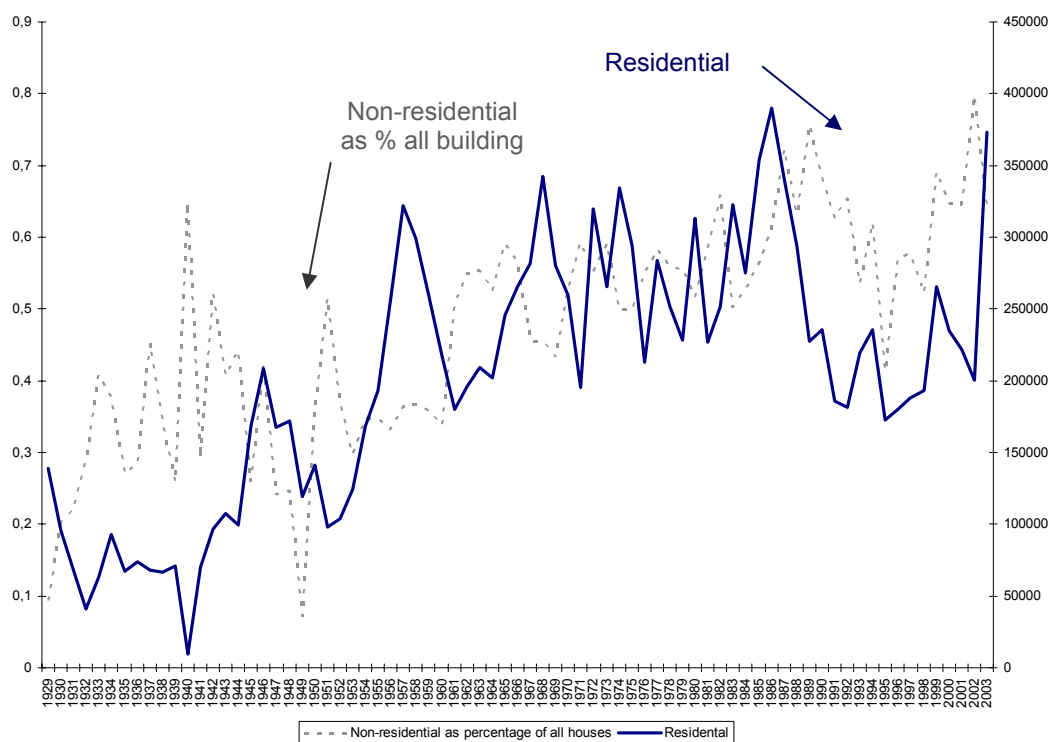


Figure 3. Building cycles. Cubic meters of residential houses that were built in Reykjavík from 1929 to 2003 (Data from the Department of the Director of Planning and Building).

Volume of new residential buildings (in cubic meters) was chosen as an indicator since this was the longest coherent series that could be constructed for the city of Reykjavík.

Non-residential housing as a percentage of all houses built (measured again in cubic meters) moves inversely with investment in residential houses (figure 3). This shows that when building of residential houses increases or decrease the building of non-residential houses is not as responsive (though it may move in the same direction).

Official data, from Statistics Iceland, on housing investment at constant prices are available from 1929 for all of Iceland. They are shown together with the volume of buildings (in m³) in figure 4. The behaviour of the two series is similar. Yet another measure is the number of completed dwellings, which is shown in figure 5. Swings in residential investment in Iceland and in Reykjavík are similar.

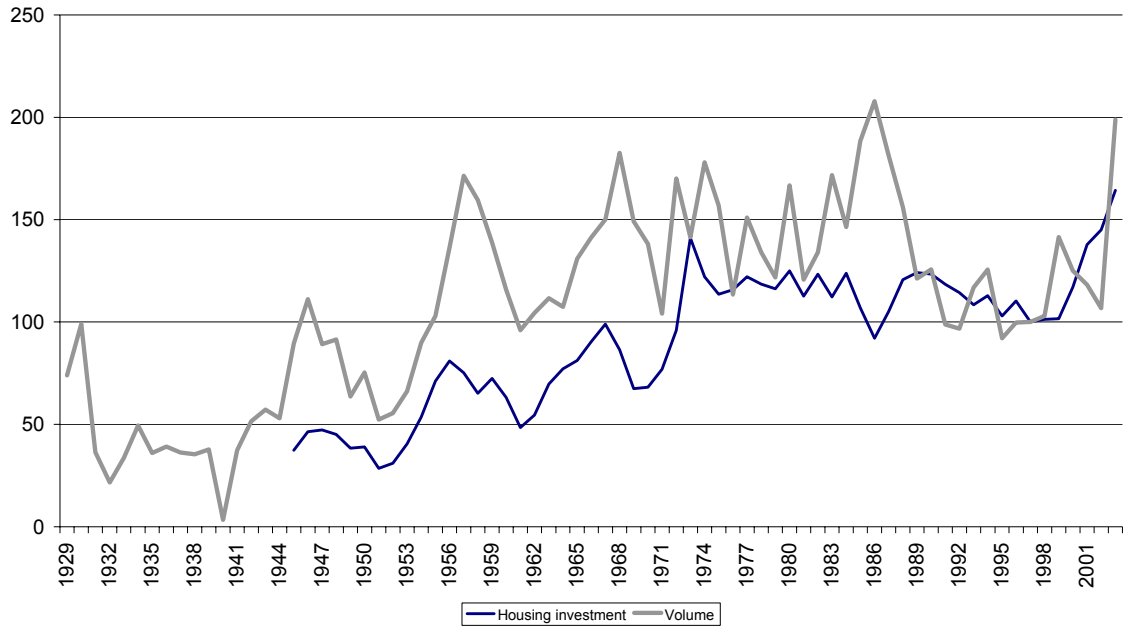


Figure 4. The thin dark line is an index based on official data on investment in residential houses at constant prices (Statistics Iceland www.hagstofa.is). The thick grey line is an index based on the cubic meters measure shown in figure 3.

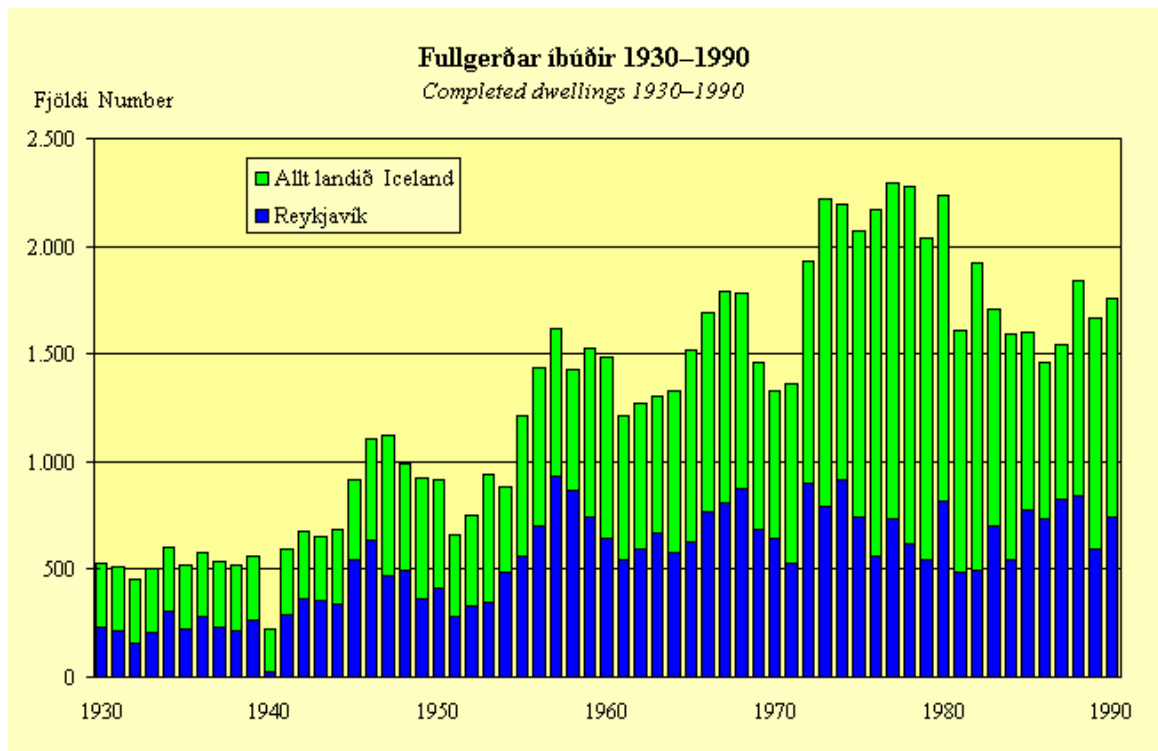


Figure 5. Completed dwellings in Iceland and in Reykjavík 1930 – 1990 (Jónsson and Magnússon 1997).

This is a different measure of housing investment, which shows the same general behaviour as the indices shown on figure 4. The number of new dwellings in Reykjavík grew from 1930 to 1945 (with the exception of 1940 when hardly any new

dwellings were built). From 1951 to 1957 the number increased again, but from then on it fluctuated between 500 and 800 units.

Almost all of the current stock of houses in Reykjavík was built during the past hundred years, and most of it after the Second World War. There was dire need to replace the Old Icelandic houses which, at the beginning of the twentieth century, were most made of turf (figure 6).

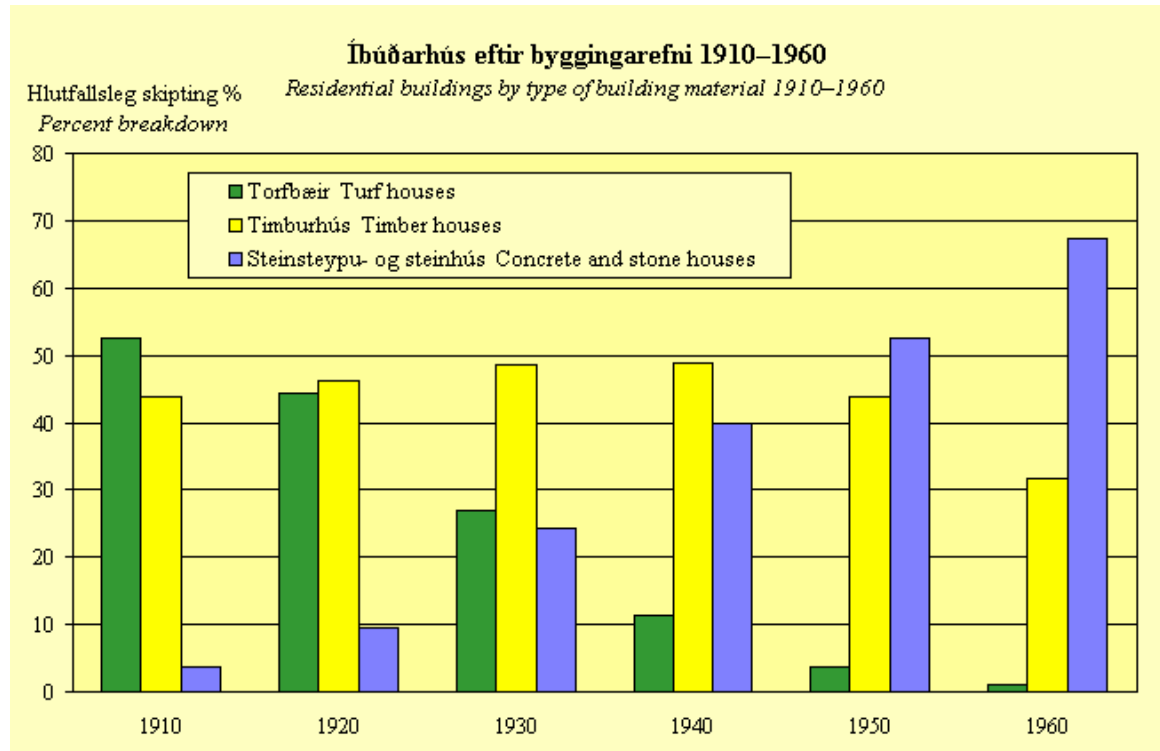


Figure 6. Residential buildings by type of building material 1910 – 1960 (Jónsson and Magnússon 1997).

Changes in demographics during the past century are another factor contributing to the growth of housing investment in Reykjavík. The population of the city grew from about 28,000 in 1929 to roughly 113,000 in 2003, i.e. it quadrupled (figure 7). This is by far the largest increase of any municipality in Iceland (figure 8).

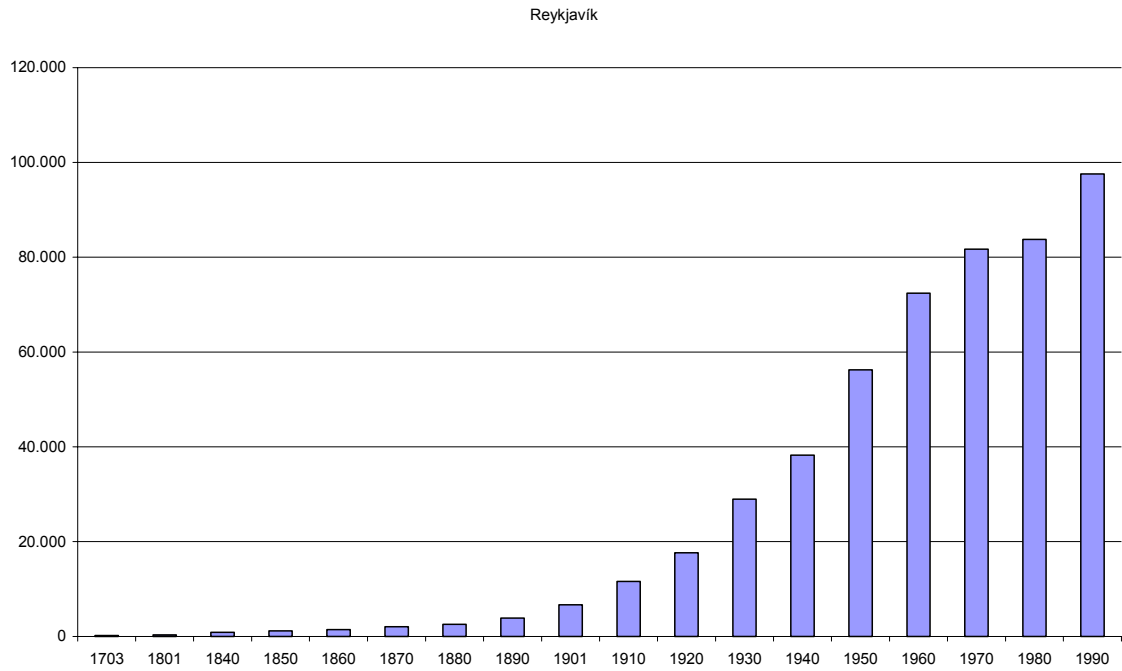


Figure 7. Population of Reykjavík 1703 – 1990 (Jónsson and Magnússon 1997).

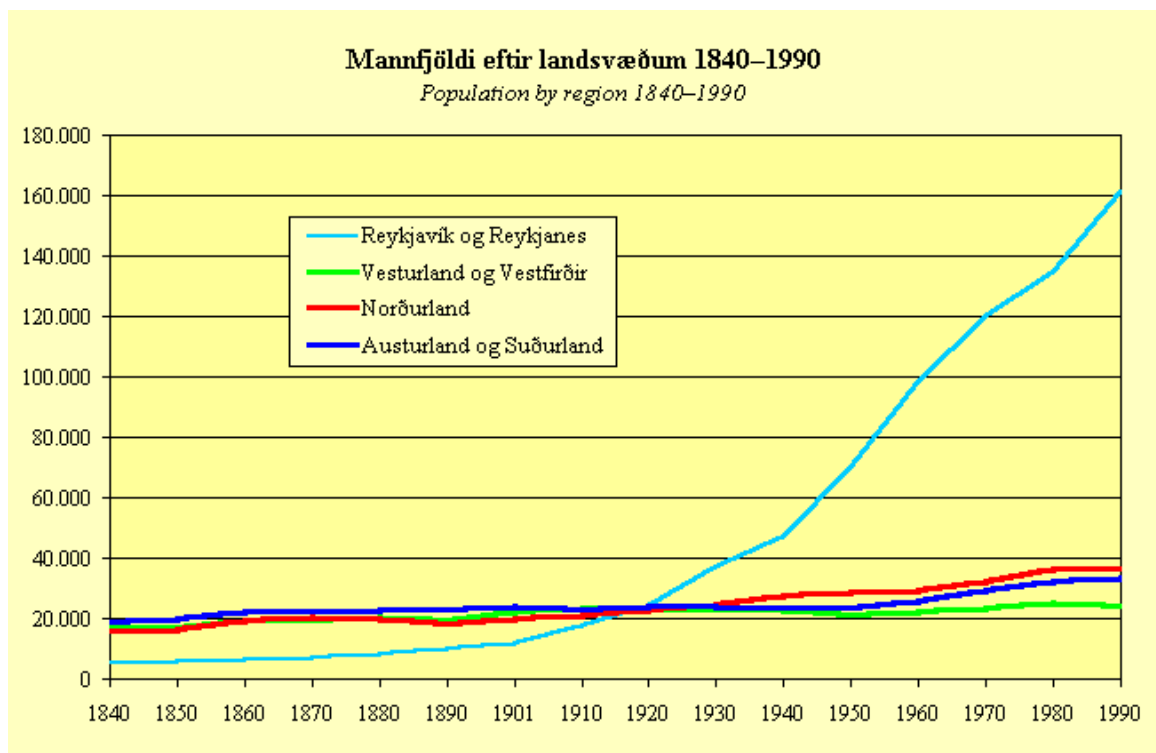


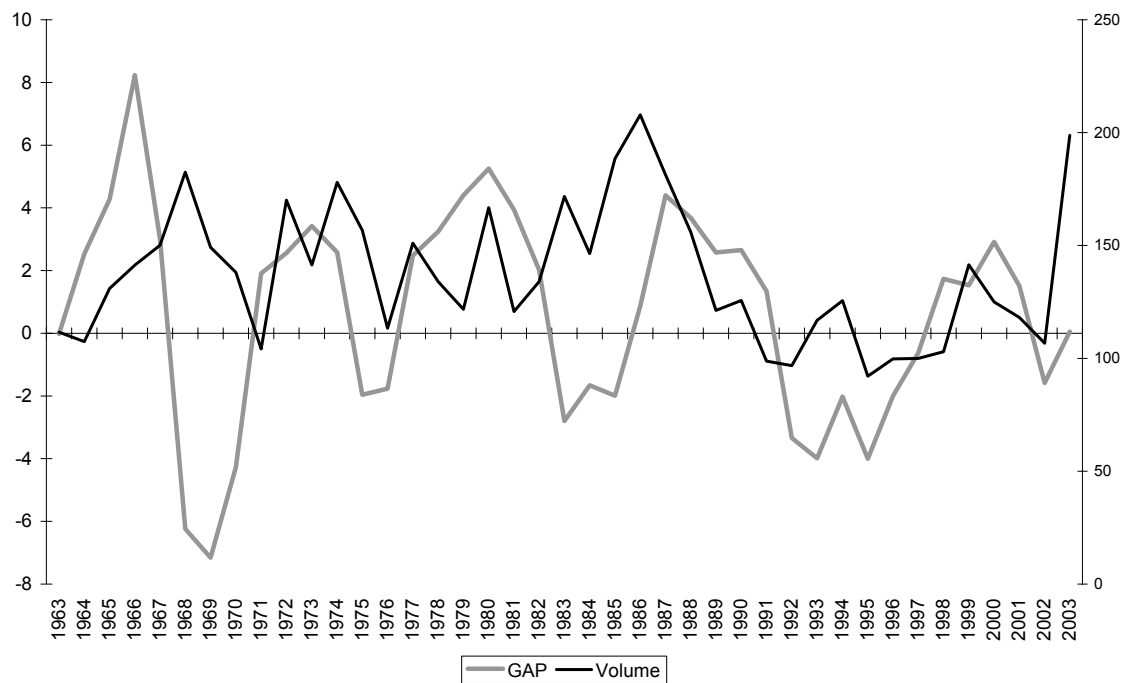
Figure 8. Population by region 1840 – 1990 (Jónsson and Magnússon 1997).

6. Explaining investment at the fringe

The main economic variable explaining housing investment is the ratio of its market price to the cost of investment. This is referred to as the q -ratio. Investment in housing increases when the market price of houses is higher than the building cost, i.e. when the q -ratio is greater than 1. Housing investment falls if the building cost rises, e.g. if the cost of financing goes up.

The Central Bank of Iceland applied the q -theory to the market for private housing in Iceland (Central Bank of Iceland 2004). That study concludes that the q -ratio explains the rate of investment in private housing fairly well. The q -ratio is also found to be correlated with the output gap, which measures the deviation of production in the economy from its potential. A positive output gap therefore indicates that the economy is expanding faster than is sustainable in the long run, while a negative output gap results when factors of production are not used to their full potential. For the period from 1970 to 2002 it is found that q is correlated with the output gap but lags it by about two years. It can therefore be concluded that the volume of housing investment fluctuates with the state of the economy, with a lag of perhaps two years (see figure 9). This is precisely the relationship that Whitehand (1972b) uses, when applying the theory of bid-rent curves to development at the city edge. Following periods of economic boom, demand for housing has increased, due to various factors such as higher disposable income and increased wealth. The q -ratio therefore rises, and areas, such as at or beyond the city limits, where building was previously too expensive, now become attractive sites for new houses.

A



B

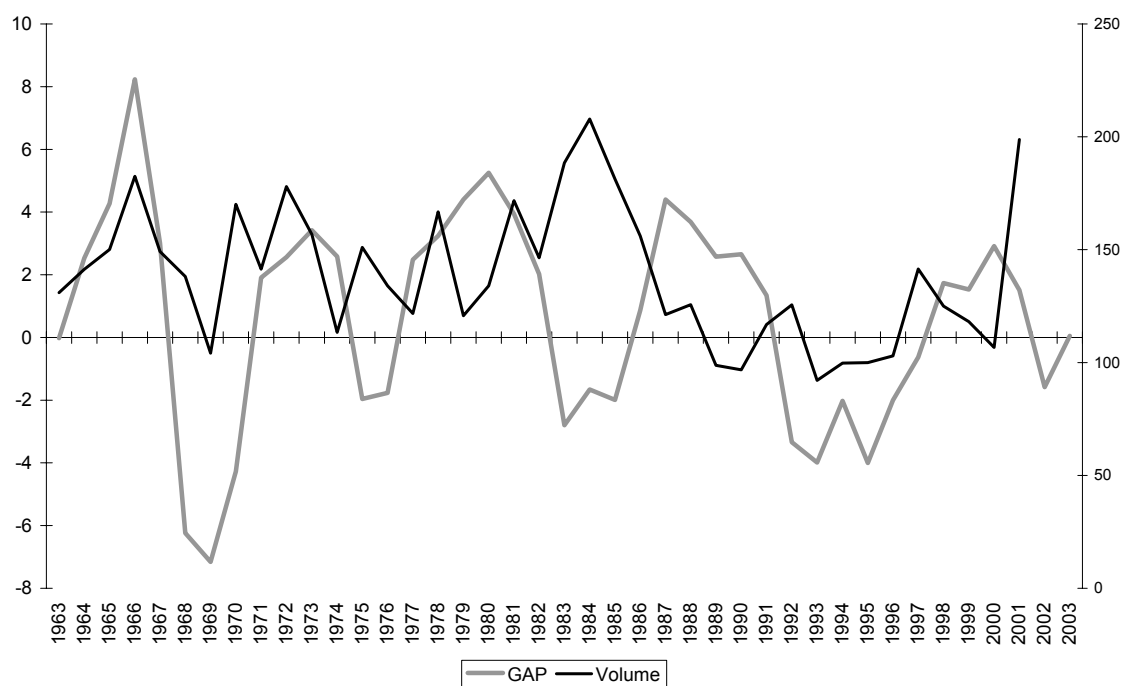


Figure 9. Output gap in Iceland and volume of new residential houses. Panel A shows data for 1963 – 2003. In panel B the volume index is moved back two years.

7. Episodic analysis

Behaviour of housing investment changed considerably over the period (see figure 3). The time period from 1929 to 2003 is therefore split into three sub-periods as shown on figure 10. Each will be studied in turn.

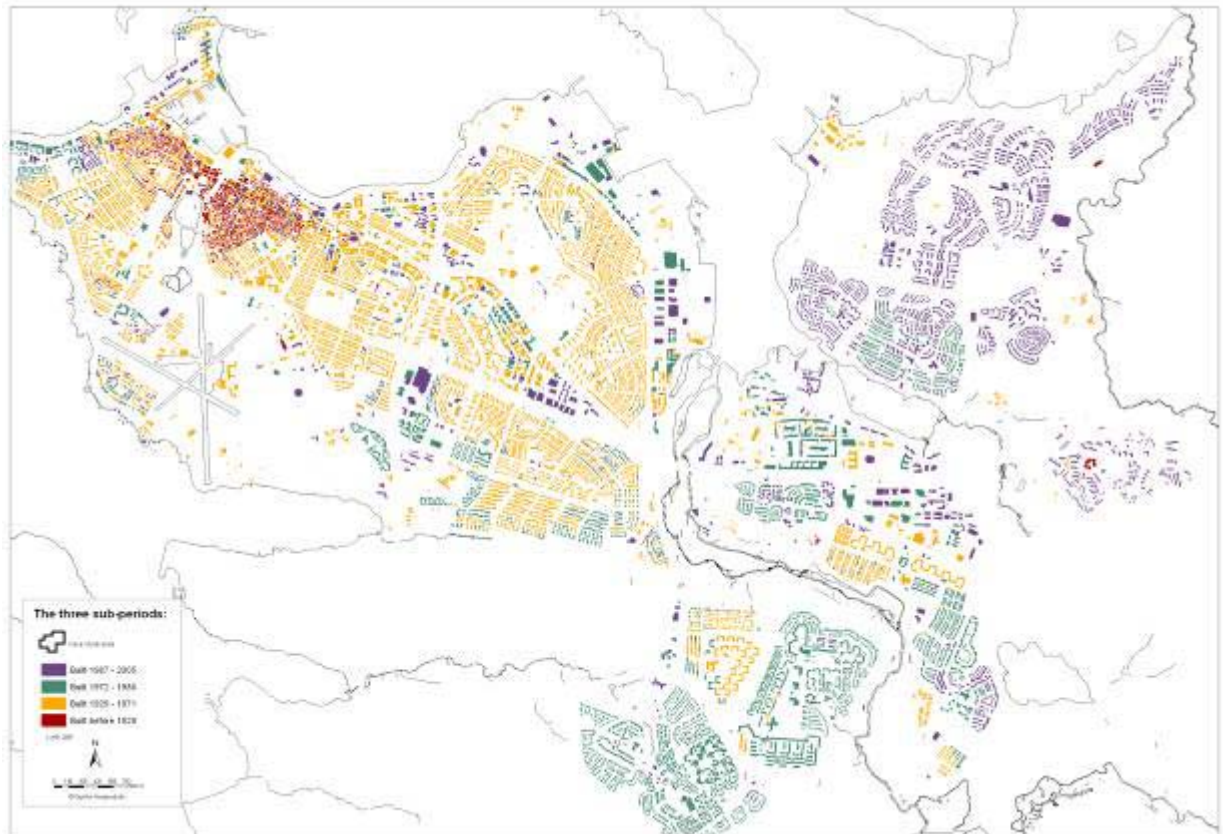


Figure 10. The spatial distribution of the buildings built during the three sub-periods.

The period is divided into three sub-periods: 1929 - 1971, 1972 - 1986 and 1987 - 2004. The spatial correlation of the built form and how the form and structure of the settlement has occurred within the urban landscape of Reykjavik is shown on figure 10. It gives an overview of formation of urban form as well as the relationship between the built forms and the city as a whole, from the formative years of the city to its subsequent transformations. Black represents the buildings built before 1929. A large amount of the city was constructed during the first period (1929-1971). During the second and the third period neighbourhoods were created at the edge of the city and the city became denser. Especially around the main transportation lines. Also areas that before were too expensive and difficult to build on are being built up, i.e. wetland, infill, and finally land that been reserved for a new downtown that never materialized.

7.1. First period (1929 – 1971)

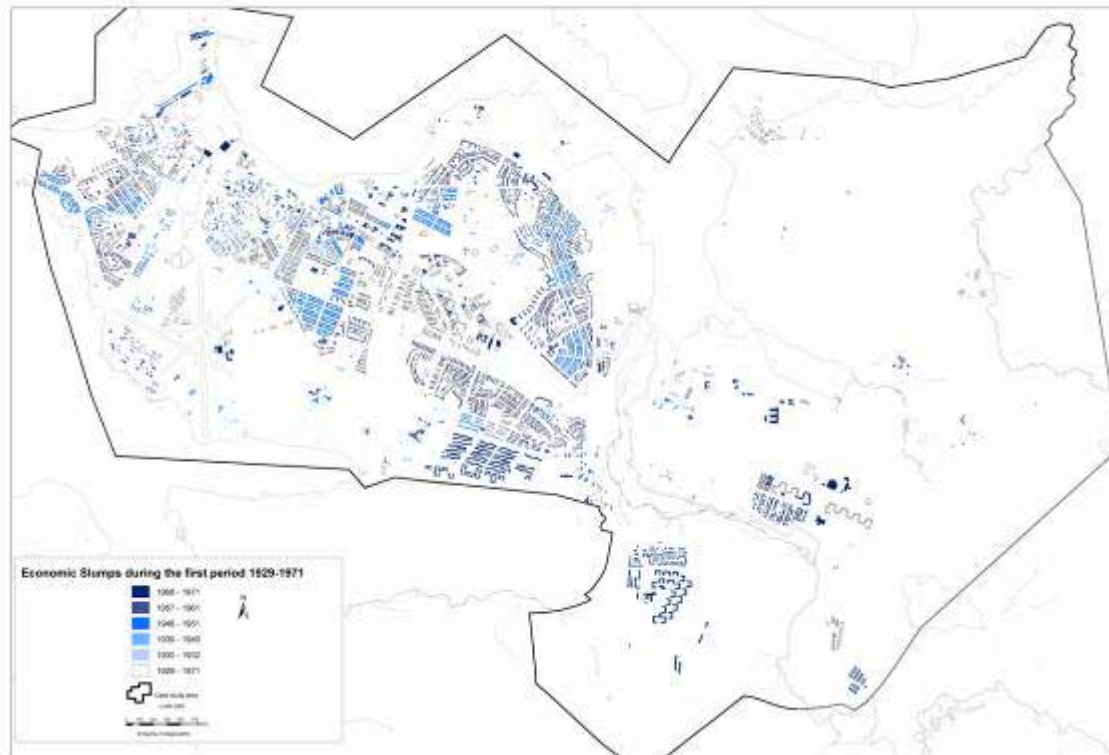


Figure 11. During the first period (see figure 37) there are five cycles in housing investment with slumps in 1930-32, 39-40, 46-51, 57-61 and 68-71.

During the first half of the time period (1929 to 1971) the volume of new houses went through long swings with 11 to 16 years between successive tops, moving roughly in phase with the business cycle (albeit lagged by about 2 years). The upswings are somewhat sharper than the downturns in this period. This is seen in the first part of figure 3, where the economy goes through one full cycle between 1963 and 1971 and the building cycle shows a pattern closely following the business cycle. The sudden downturn following over-fishing of the Icelandic herring in 1968, when unemployment rose to 2.5%, which is far above the normal level during that time. Unemployment in Iceland was below 1% throughout the 70's and 80's

This implies that the method applied by Whitehand (1972b) to identify periods when the city mass expands beyond the previous boundaries should apply.

During the first period there were five cycles in housing investment with slumps in 1930-32, 39-40, 46-51, 57-61 and 68-71. The first downturn followed the great depression, which, although it affected the Icelandic economy, had a considerably milder impact than in many other countries (see for example Snævarr 1993). The second slump in housing investment followed a long period of constant, but rather low economic growth. This was a period when pressure on the currency, which was becoming increasingly overvalued, was met with restrictions on trade. A reduction in the rate of housing investment from 1945 to 1952 followed a major expansion period in Iceland (during the Second World War) which e.g. brought investment back to a long run trend. There was a sizable reduction in economic growth in 1956 and 1957 due to a reduction in fish catch, and unfavourable change in the terms of trade, and a slump in housing investment followed. The last downturn followed the recession in

1967 – 1968, which was caused by serious over-fishing of herring. As expected there was a slump in housing investment following the recession, i.e. in 1968 – 1971.

7.2 Second period (1972 – 1986)

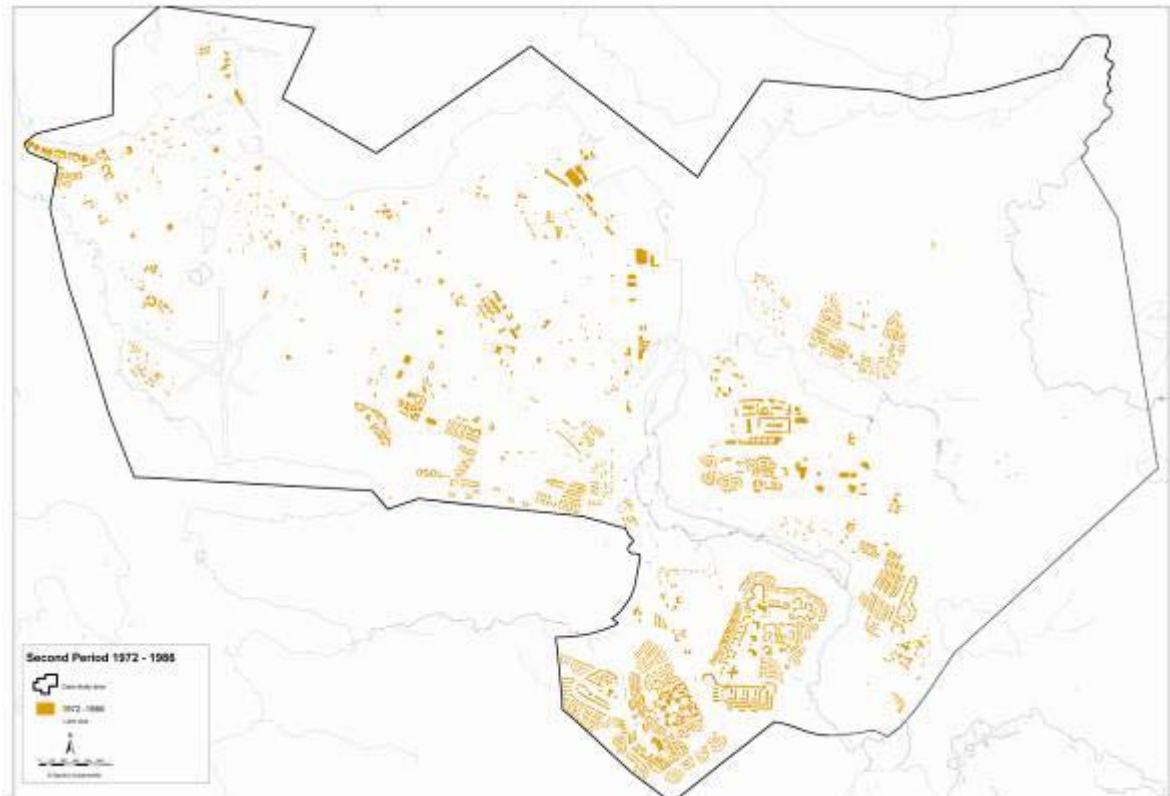


Figure 12. This period stands out for numerous reasons.

The period between 1972 and 1986 stands out for two reasons. First building was taking place at a high rate over the whole period and was clearly above any trend line for the observation period. Secondly the amount built per year fluctuated more from year to year over this period than either before or after.

The reason for this is that economic policy over that period was expansionary, aiming above all at full employment, which resulted in high inflation (between 20 and 100% per year). During this period the interest rates on most forms of saving were determined by the authorities, resulting in negative real interest rates (figure 13). The only option for most people to store value and save for retirement was by investing in houses.

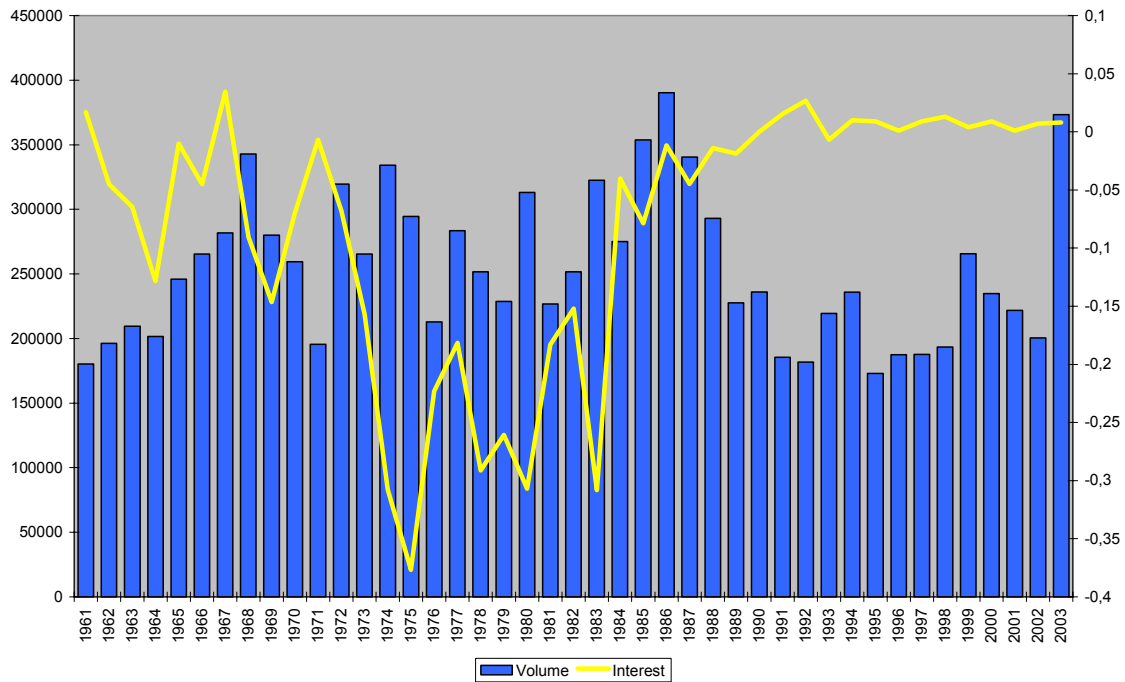


Figure 13. The figure shows the volume of new houses built (from figure 3) and the real rate of interest.

Investment in housing therefore remained high throughout this period, despite otherwise unfavourable conditions in 1975 and 1983 – 1984, and the correlation between the output gap and the q -ratio was not maintained during this period (see Central Bank of Iceland 2004). It should thus be expected that considerable construction of residential housing is going on and the city’s physical boundaries are expanding, irrespective of the state of the economy between 1971 and 1986 (see figure 13).

Although this was a much shorter period than the first one (spanning 16 years compared to 42), it contained five periods when housing investment was falling according to the data (figure 9). Each such period was short, one or two years, and the level of investment fluctuated much more than either before or after this period. The 1970s were also characterised by a high rate of economic growth, due to favourable terms of trade and increased fishing, following a two step expansion of the jurisdiction, first from 12 to 50 nautical miles in 1972 and then to 200 miles (or half line between neighbouring countries if that was closer) in 1976.

7.3 Third period (from 1987)

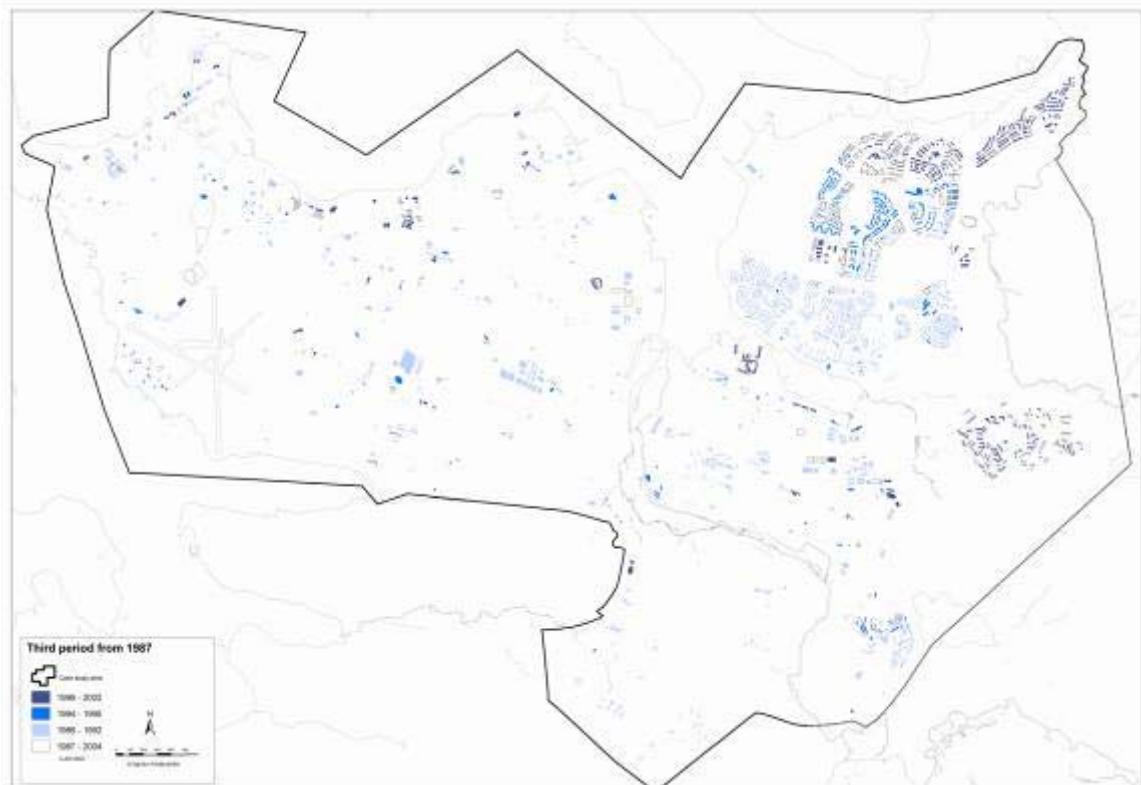


Figure 14. Three slumps occurred within this period.

Investment in residential housing dropped quickly to a lower and more stable level in 1987, after the commercial banks received freedom to determine their own interest rates. Again, it can be seen (figure 9), that housing investment and the business cycle were moving roughly in phase, so again it is not surprising that construction of residential houses would be moving beyond the previous boundaries following the long downturn of 1992 to 1995.

Two or three slumps in housing investment occurred in this period. The first was between 1986 and 1992, following a sharp recession in 1983 to 1985. The year of 1987 stands out in the data, due to changes in the tax system the income during that year was newer taxed. The output gap was again negative from 1992 to 1997, and housing investment fell again from 1994 to 1995, and stayed at a low level until 1998. The final decrease in investment in this period was from 1999 to 2002. It is not clear whether these swings should be counted as consisting of two or three cycles. The amplitude was smaller than in previous cycles. The initial downturn in 1986 was still large, and so is the current upswing starting in 2003.

A new expansionary period is currently taking place, following a recent change is the form of government subsidised housing loans to the public, which has resulted in lower interest rates on housing debt than before. This has boosted the market price of housing, driving it far above the building cost. This may result in an even greater expansion in 2004 and possibly 2005.

8. Conclusions

The factors described here are drawn together on the map of the Economic Frame (figure 15). It is shown that Whitehand's bid-rent curve theory applies to the first and last periods. During the period from 1972 to 1986 it does, however, not explain the observed behaviour of residential investment. In this mid-period housing investment was driven by negative real interest rates. From the early 1970s until the mid 1980s the Icelandic economy suffered by high inflation, while nominal interest rates were determined by policy authorities. It is a well documented fact that during this time house-building was probably the best form of savings available to households.

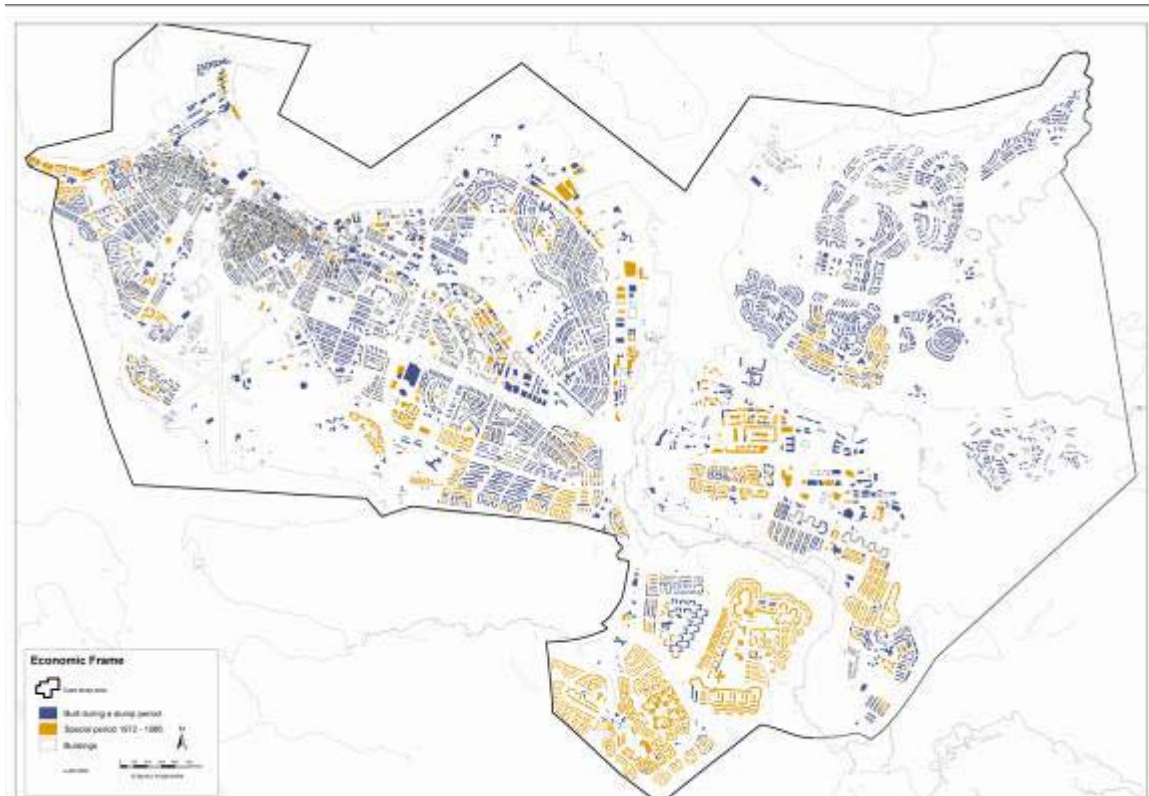


Figure 15. Economic frame.

In this sense it appears that during this period in Reykjavik the bid-rent curve analysis does not apply. However, over much of the longer term one implication of the theory, i.e. that buildings for other than residential use seek peripheral location still appears strongly (see map Land use frame (fig. 16)). The same is true for the third period. As already said the building volume follows a pattern that differs from the business cycle during the high inflation period between 1972 and 1986.

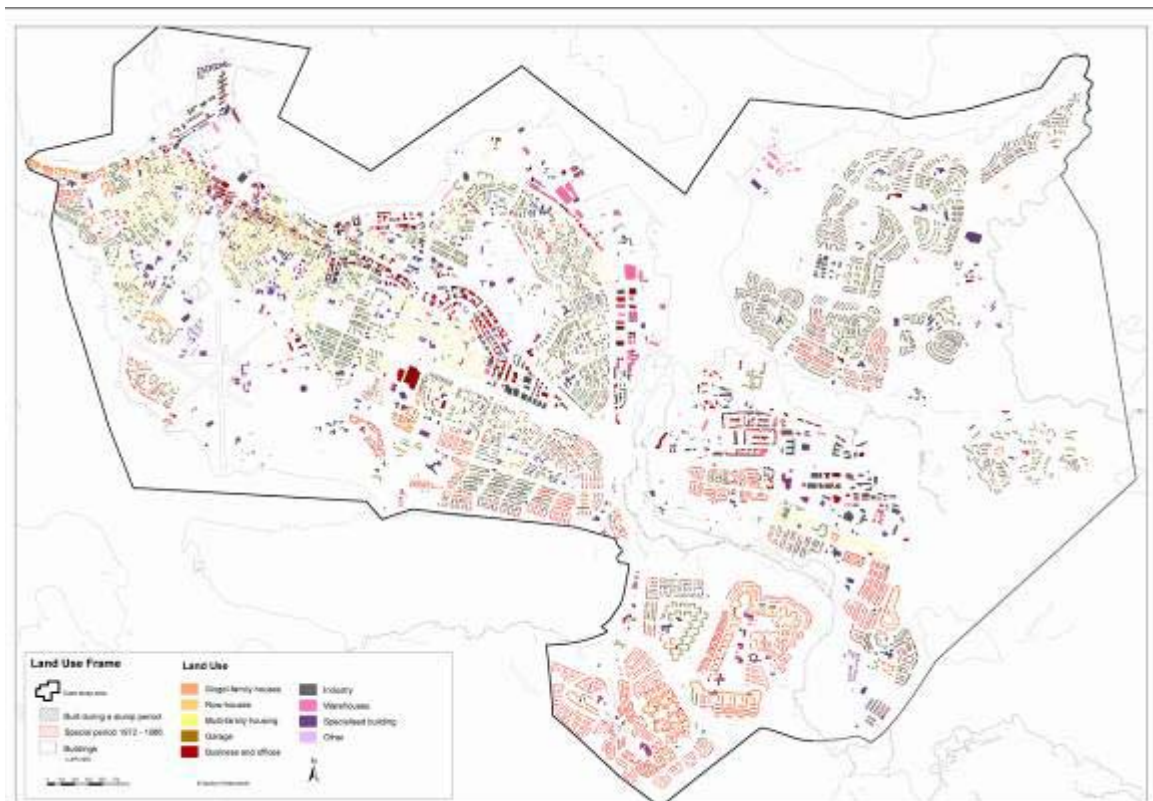


Figure 16. Land use.

One has to bear in mind that this research takes place in an entirely different environment from those investigated by Whitehand and Conzen. One difference is that in Reykjavík there has been a continuous current of people moving to the city, thus requiring a number of new dwellings each year, with plenty of land available. This commonly results in addition of entire neighbourhoods with little attention to the development of older parts of the city. Another difference is that the first plan of Reykjavík actually dates back to 1921 which is quite early considering other small European cities at that time. It is greatly influenced by the Garden City movement, with an emphasis on zoning, i.e. the separation of housing from other types of land use in order to create a healthier environment. This could also be the reason why non-residential buildings are located at the city-fringe.

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