Housing taxation in the Nordics : efficiency and equity

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Housing markets and housing policies in the Nordics

Peter Englund and Harry Flam

1 Background

Housing plays a central role for people's welfare. Its share of household consumption is about 25 percent on average, larger than that of any other item in a typical household's budget. It is not surprising that issues related to housing figure prominently in public discussion. Examples include social and ethnic segregation, historically high increases of prices and rents as well as costs of construction and land, affordability – or rather unaffordability – of housing for especially young people and others with low income and little savings, and increasing levels of mortgage debt and associated risks of financial instability.

This issue of Nordic Economic Policy Review is devoted to Nordic housing markets and housing policies. Nordic housing markets face more or less the same problems and challenges, but the ways policies and regulations deal with them differ in many respects. A comparison of policies, regulations and results across countries yields valuable lessons for policy makers.

The five articles in this issue cover some of the most important issues in the housing markets: the reasons for the large price increases of owner-occupied housing and the prevalence of bubbles; if investing in housing for profit amplifies price increases; the reasons for the large increase in the relative cost of construction; how housing taxation can improve social welfare; and how housing can be made affordable for low-income households and how policies can exacerbate or alleviate social and ethnic segregation.

2 House price bubbles

In recent decades, house prices have risen to historically high levels all over the world, not least in the Nordic countries. In Norway and Sweden, prices have continued to rise almost without interruption over the recent quarter century. In Denmark, in contrast, the price boom in the years leading up to the financial crisis was broken by a dramatic price fall, and house prices have yet to come back to the 2007 peak. In Finland, the price development has been less dramatic, with more modest price increases before the financial crisis and more or less constant prices thereafter. There are many fundamental reasons behind these developments, including increased income, rapid urbanization, lower interest rates, financial liberalization, and a favourable tax treatment. But there are also concerns that fundamentals alone cannot fully account for the price increases and that there may be elements of speculation and irrational expectations involved.

The paper by *André Anundsen* looks for indications of bubbles in prices of owner-occupied one-family houses. Two complementary approaches are used. The first method looks at the time series properties of house prices and asks whether there are signs of explosive behaviour, or, in technical terms, whether the house price series are non-stationary (have unit roots). The second method uses historical data to estimate relations between house prices and fundamentals, and compares predictions based on historical patterns to actual price developments. Are prices over-valued relative to fundamentals?

The first method finds no significant evidence of bubbles, with the exception of Denmark in the period before the financial crisis. A possible explanation for the Danish development is the changes in mortgage regulation that allowed households to take out amortization free loans, which may have triggered excess borrowing. Comparing actual prices predicted by fundamentals – disposable income, the housing stock, and the interest rate – Danish house prices again appear to be strongly overvalued pre-2008. According to this method, present house prices seem slightly overvalued in Norway and Sweden and undervalued in Denmark and Finland.

3 Buy-to-let housing investors in the Nordic countries

A significant segment of the rental housing market in Helsinki and Oslo consists of buy-to-let. The buy-to-let segment is smaller in Copenhagen due to rent regulation and practically non-existent in Stockholm due to rent regulation and restrictions on subletting. A typical buy-to-let investor is an individual who owns a dwelling for letting out to someone else. It has been argued that the existence of buy-to-let has amplified the increase in housing prices. An example is the market of secondary homes in Swedish ski resorts in the 1980s and 1990s. The demand in this market was to some extent fuelled by the expectation of capital gains. Prices increased rapidly until the economic crisis in the early 1990s and subsequently fell by about 50 percent.

Erlend Bø examines the role played by buy-to-let for housing price increases in

Helsinki, Oslo, and Stockholm. In his model, buy-to-let investors are not motivated by capital gains but by the return of letting out in a market with increasing demand and increasing prices and rents. Bø finds that actual population increases alone can more or less explain actual increases of prices and rents in Helsinki and Oslo. He then proceeds to examine the influence of a buy-to-let sector on housing prices. Simulated prices in Helsinki and Oslo without a buy-to-let sector in the model increase only about 60 percent as much as with a buy-to-let sector. Similarly, price increases without a buy-to-let sector in Stockholm are only about 60 percent of price increases when a buy-to-let sector is added in the model. This indicates that the existence of buy-to-let serves to amplify price increases.

4 Housing prices, land and construction costs

Explanations of increasing house prices tend to focus on the demand side. The paper by *Mats Bergman* and *Sten Nyberg* notes that Sweden also has seen a rapid increase in the cost of building. Not only has land prices increased, particularly in central locations in metropolitan areas, but so has construction costs. In fact, construction costs have increased more than land prices in Sweden, whereas they have not increased at all in countries like Germany and United States. To some extent, increasing construction costs could be the result of factor substitution, as higher land prices give incentives to build denser and use more capital intensive methods. But increased costs could also reflect regulatory obstacles and/or lack of competition in the construction industry.

To understand the Swedish development, Bergman and Nyberg develop a simple model of two regions, one where land is scarce and salaries are higher, and one where the supply of land is unlimited but salaries are lower. Households are free to move across regions and, in equilibrium, the difference in land costs offsets the difference in salaries. As salaries increase over time, land prices increase in the region with scarce land, which induces substitution away from land. The model also shows that the impact of an increase in construction costs may cause the cost of land to increase in the region where land is scarce, but this effect is modified by migration to the other region.

The authors discuss various explanations for the Swedish development. *Regulatory requirements* impose extra costs and often cause costly legal delays. But this is only part of the story. In fact, there are some indications that housing supply is relatively elastic in Sweden compared to many other countries. The current form of *rent regulation*, where rents in new dwellings are tied to the rate of return on capital, induces a substitution of capital for land, making each housing unit more expensive. There are also indications of *weak competition* in the building industry. Many construction projects for municipal housing only attract one or two bidders. Furthermore, prices of building materials are higher than in other countries, and increased material prices account for a quarter of the housing price increase in recent years. The authors relate this to a system of rebates that protect incumbents in the building materials industry from competition.

5 Housing taxation

The paper by *Niku Määttänen* discusses the structure of housing taxation. He shows that the Nordic tax systems deviate from neutrality in two ways. They favour investment in owner-occupied housing over other investments and owner-occupied housing over private rental housing. This violates a basic principle of efficient taxation by steering capital away from other sectors into owner-occupied housing.

Määttänen develops an illustrative example where a household can choose between renting and investing in a house of its own. As a homeowner, the household may pay a tax on an imputed income from the house (or a property tax) and also a tax on any capital gains received when selling the house. As a renter, the household would invest in other assets, possibly including rental housing, in which case it would pay capital-income tax on the returns – dividends, capital gains and rents received. The tax system is shown to be neutral between owning and renting only if the taxable returns to housing – the sum of imputed rent and capital gains – correspond to the market return on other investments. Ideally, property taxes should mainly be based on land values. This would reduce the efficiency costs of taxation by shifting the tax burden towards an asset that is in fixed supply.

In contrast, in all Nordic countries the taxable returns from owner-occupied housing, if taxed at all, are calculated at rates below the typical return on other assets. Some countries – like Sweden, Denmark, and Finland – have property taxes, but at low rates and only Sweden levies a tax on capital gains. Furthermore, all countries allow mortgage interest payments to be deducted, although Finland is in the process of abolishing interest deductibility. This lack of neutrality is problematic not only on efficiency grounds, by favouring ownership over renting, but also on equity grounds since home owners tend to have higher income and more wealth than renters.

Favourable taxation has contributed to higher prices of owner-occupied houses, which has forced the average homeowner to take on more debt. Following the financial crisis, this has led to concerns about financial stability and caused many countries to impose tighter regulations on mortgage borrowing. Määttänen discusses how housing taxation can be used as an alternative tool. Increasing property taxes from their current relatively low levels would help to stabilize house prices and thereby to reduce household indebtedness.

6 Low-income housing policies: affordability and integration

All Nordic countries have policies that make housing more affordable and accessible for low-income households. They generally take two forms: pecuniary benefits to households to lower their effective rent – so-called tenant-based policies – and direct provision of low-rent housing or social housing – so-called place-based policies. Both forms of policies tend to concentrate low-income households to neighbourhoods with low-rent housing, mostly owned by municipalities or other non-profit landlords. They also tend to concentrate foreign-born tenants – immigrants or

refugees – to the same neighbourhoods, since they have relatively low incomes. Residential segregation based on income or ethnicity is generally seen as harmful. Policies to make housing affordable and accessible and policies to reduce segregation are therefore closely related.

The paper by *Essi Eerola* surveys housing policies in the Nordic countries aimed at providing affordable housing and reducing segregation. All countries have means-tested rental housing benefits and all provide some form of social housing. Benefits as a share of GDP vary greatly between countries. Finland and Denmark spend 0.9 and 0.7 percent of GDP, Sweden and Iceland 0.3 and 0.2 percent, and Norway only 0.1 percent. The share of non-profit rental housing of the total housing stock also varies greatly. It is 21 percent in Denmark, 11 percent in Finland and Iceland, and just 4 percent in Norway. Non-profit rental housing is means-tested. All rental housing in Sweden – public as well as private – is subject to what effectively amounts to a rate-of-return regulation, with rents that mostly are lower than market rents, especially in the major urban areas. Rental housing is not means-tested but rationed by queuing time, except for a small proportion provided by social authorities to households that otherwise would not have access to housing.

Eerola provides a detailed description of housing benefit and social housing programs over time in Finland and a survey of research about their effects. One issue in particular has been subject to public discussion, namely the effect of housing benefits on the rent level; benefits serve to increase demand for rental housing and may therefore increase rents and be counterproductive. Research has shown that the rent effect of housing benefits are small. The monetary value of lower rents in social housing, and how rent savings relate to the income distribution are other issues. Research has found that rate savings in municipal housing are considerable, but vary considerably depending on apartment size and location. On average, rent savings are comparable in value to housing benefits. Savings decrease with distance to the city center and are highest in expensive neighbourhoods. In contrast, rent savings in housing owned by non-profit organizations are on average significantly smaller. Housing benefits are much more concentrated to low-income households than rent savings. In fact, a sizable share of rent savings accrue to households with greater than median income.

Turning to social housing and segregation, there is a clear residential sorting according to income both in the private segment and in the social housing segment of the rental market. Moreover, social housing tenants in the lowest income quintile live in lower quality neighbourhoods where people are poorer and less educated than tenants in the same quintile in the private rental market. This suggests that social housing programs may lead to more segregation than housing benefit programs, even when social mixing is an explicit aim of the social housing program.

7 Lessons learned

In most countries, including the Nordics, house prices have been an increasing trend for several years. This can largely be explained by falling interest rates. In fact, the cost of housing consumption has not increased for most owner-occupants. But owner-occupied housing has become less accessible for many households with limited financial resources. The papers in this volume address the causes and consequences of this price development from different angles.

The paper by Anundsen confirms the picture from other studies, namely that house and apartment prices largely are well explained by fundamental factors. Beyond interest rates, increasing income has played a role. The major metropolitan areas, where land is limited supply, have increased their attraction and prices have increased more in those regions. Other papers throw light on the impact of other fundamentals in addition to interest rates and income.

Production costs offer one possible explanation. If income and other demand factors were the main explanation, then this would show up in land prices. Bergman and Nyberg note, however, that the increase in land costs has been moderate in Sweden compared to other European countries, whereas construction costs have increased more than elsewhere. This observation suggests that other factors, such as building codes and limited competition in the construction and building materials industries, play a role.

Housing costs – user costs for owner-occupiers and rents for renters – should be about the same for similar dwellings if markets function well. But housing markets have many frictions. Denmark and Sweden in particular regulate rents, and all countries have tax systems that favour owning over renting. Finland and Norway have a significant buy-to-let segment in the rental market. The analysis in the paper by Bø indicates that this serves to amplify increasing prices and rents following a demand shock (population increase).

All Nordic countries tax returns from financial assets, such as interest, dividends and capital gains. In contrast, returns from investments in owner-occupied housing are taxed lightly, if at all. This asymmetry, together with deductibility of interest on mortgage debt, benefits owner-occupation over renting and may account for some of the increase in the price level of owner-occupied homes. Määttänen shows how a neutral tax system may be constructed based on a tax on the imputed income from owner-occupied properties.

Several possible policy reforms emerge from the papers in this volume. Housing can become more affordable through increased competition, liberalized building codes and a more neutral tax system. But even with such reforms adequate housing will be beyond the means of many low-income households. The choice between household-based support in the form of housing allowances, and place-based support in the form of social housing, may depend on differences in the impact on social and ethnic segregation. Contrary to expectation, social housing with an explicit aim of mixing households with different incomes can have a less favourable effect on segregation than housing allowances, as the Finnish experience indicates.

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House price bubbles in Nordic countries?

André K. Anundsen

Abstract

I estimate fundamental house prices for Denmark, Finland, Norway, and Sweden over the past 20 years. My results suggest that house prices were overvalued in all countries in the years preceding the global financial crisis, but that prices quickly returned to equilibrium following the ensuing housing market bust. Results suggest that house prices were undervalued in Denmark and Finland towards the end of 2019, and that they were overvalued in Norway and Sweden. Applying a separate test for bubbles, I only detect signs of a bubble in the Danish housing market in the period before the global financial crisis.

Keywords: Fundamental house prices, housing bubbles, housing markets.

JEL codes: C22, C32, C51, C52, C53, G01, R21.

1 Introduction

House prices have grown substantially in most industrialized countries since the 1990s, with a substantial drop in the aftermath of the 2008 global financial crisis.[1] The Danish, Finnish, Norwegian, and Swedish housing markets are no exceptions. Developments after the global financial crisis have, however, been less synchronized across the Nordic countries. Looking at the past 20 years, real house prices have been growing markedly in Norway and Sweden, with cumulative real growth rates of 109 percent and 147 percent, respectively. House price developments have been more moderate in Finland, where real house prices are up by 27 percent over the same period, while they increased by 49 percent in Denmark between 2000 and 2019.

An important question is whether these price increases can be explained by underlying economic fundamentals, or whether there are signs of imbalances in the Nordic housing markets. A presence of imbalances in the housing market is important to detect, given the large effects a collapse in house prices may have on financial stability and real economic activity. The real economic consequences of a house price bust were clearly shown during the Great Recession (see e.g., Ferreira et al. 2010, Mian et al. 2013, Mian & Sufi 2014, Brown & Matsa 2020, and also Duca et al. 2020 for an excellent review). The literature has documented both consumption wealth effects (Aron et al. 2012, Mian et al. 2013) and self-reinforcing effects between the housing market and the credit market (Hofmann 2003, Fitzpatrick & McQuinn 2007, Gimeno & Martinez-Carrascal 2010, Anundsen & Jansen 2013). In addition, Leamer (2007) and Leamer (2015) have shown that large drops in housing investments are a strong indicator of future recessions in the US economy – a result that has gained international support in a recent study by Aastveit et al. (2019). Against this backdrop, I ask one main question: Have there been signs of systematic overvaluation in Nordic housing markets over the period 2000–2019?

In the first part of my analysis, I test for house price bubbles by applying the methodology of testing for explosivity suggested by Phillips et al. (2015a, 2015b) (PSY). As discussed in Phillips and Shi (2020), this methodology has increasingly been adopted by central banks as a real-time monitoring device (Yiu et al. 2013, Amador et al. 2018, Gomez et al. 2018, Caspi 2016). The PSY-procedure also serves as an early warning device for future financial market meltdowns and crises, as shown in Anundsen et al. (2016) and Phillips and Shi (2019). Using the PSY-approach, I find no evidence of explosive developments in real house prices in Finland, Norway, or Sweden at any point during the past 20 years. For Denmark, the approach suggests that house prices had an explosive development in the years preceding the global financial crisis.

Independent of the presence of bubbles or not, house prices may at times be over- or undervalued. I therefore take another approach to determine whether house prices have evolved in line with the trajectory predicted by developments in underlying economic fundamentals. In particular, I follow Anundsen (2019) and calculate a fundamental house price path for the period 2000–2019 using the system-based

1. Duca (2020) has shown an increased synchronization of global house price developments. House price developments in Denmark, Finland, Norway, and Sweden resemble those in many other countries.

cointegration approach of Johansen (1988). This fundamental path is calculated based on information and parameter estimates that were available in 1999. Having constructed the trajectory of fundamental house prices, I investigate how actual house prices developed relative to model-implied fundamental prices in the period thereafter. As noted in Anundsen (2019), this approach relies on the bubble definition provided by Stiglitz (1990, p.13), which states that a bubble exists if the reason why the price is high today is only that investors believe that the selling price will be high tomorrow when 'fundamental' factors do not seem to justify such a price.

My results indicate an overvaluation of house prices in all countries in the years leading up to the global financial crisis. In 2007, the estimated overvaluation was 57 percent in Denmark, 13 percent in Finland, and 17 percent in Norway. Swedish real house prices were overvalued by 4 percent. The correction in real house prices following the Great Recession brought prices back to equilibrium within two years. After this, the Nordic countries have seen different developments in actual house prices relative to the value implied by economic fundamentals. Danish house prices have fluctuated around the fundamental path, but have remained mostly undervalued. At the end of 2019, my estimates suggest that Danish house prices were undervalued by 9 percent. In Finland, actual prices stagnated and have fluctuated around their equilibrium value. At the end of 2019, my estimates suggest that Finnish house prices were undervalued by 3 percent. In Norway, I find that prices were undervalued until 2016 and overvalued thereafter. At the end of 2019, I find that Norwegian house prices were overvalued by 9 percent. For Sweden, my estimates suggest that house prices have been systematically overvalued since 2014. Towards the end of the period, the gap between actual and fundamental prices was 7 percent in Sweden. The only country were my results point in the direction of a systematic overvaluation is Sweden, but the gap between actual and fundamental prices has remained relatively small.

Although the build-up of national housing market imbalances and bubbles are particularly important to detect from a financial stability point of view, it is well known that there are large regional differences in house price developments (Ferreira & Gyourko, 2012) and that national developments may be driven by certain local markets (Glaeser et al. 2008, Capozza et al. 2004, Malpezzi & Wachter 2005). The Nordic countries are no exceptions in this regard, with a particularly strong house price growth in the capitals. To explore whether there are signs of bubble-like developments in house prices in Copenhagen, Helsinki, Oslo, and Stockholm, I perform separate tests for explosive house price dynamics using the PSY-approach on city-level house price data. My results show that there are no signs of bubbles in the capitals over the period 2010–2019.

As a final contribution, I discuss the main drivers of fundamental house prices at the national level over the past 20 years. In estimating fundamental prices, I estimate semi-elasticities of real after-tax interest rates on house prices, as well as elasticities of house prices with respect to changes in real per capita disposable income and the housing stock per capita. I also discuss what factors may contribute to imbalances in the housing market, and tools that may be used to prevent imbalances from building up. I conclude that favourable income developments have been the main driver of fundamental house prices, and that the Nordic markets are vulnerable to interest

rate hikes. Further, the low supply elasticities in Nordic countries (Caldera & Johansson 2013, Cavalleri et al. 2019) make them sensitive to demand shocks and greater house price volatility over the course of a boom-bust cycle (Huang & Tang 2012, Glaeser et al. 2008, Anundsen & Heebøll 2016).

Other approaches to testing for housing market imbalances and housing bubbles that have been considered in the literature include the regime-switching bubble-tests of Brooks and Katsaris (2005), the user-cost valuation approach of Himmelberg et al. (2005), and tests for cointegration break-down, as in Anundsen (2015). In monitoring the housing market, an eclectic mix of approaches seems useful, since all approaches have their strengths and weaknesses. In this paper, I offer results based on two approaches that have shown to be useful in detecting the US house price bubble in the 2000s at an early stage (see Anundsen 2019).

Several studies have asked whether house price developments in the Nordic countries have been developing along a sustainable trajectory. The European Commission estimated that Finnish house prices were consistently overvalued over the period 2003–2011 and that the overvaluation reached 15 percent in 2006–2008 and 2010–2011 (Marrez & Pontuch 2013). For the case of Norway, Moody's (2017) estimates that Norwegian house prices have been consistently overvalued since 2010. The IMF has warned about developments in house prices in both Norway, Sweden, and Finland over the years. Geng (2018) presents a panel data analysis of 20 countries over the period 1990–2016, in which both Denmark, Finland, Norway, and Sweden are included in the analysis. House prices are estimated to have been overvalued in all four countries in the period preceding the financial crisis. The author concludes that Norwegian and Swedish house prices were overvalued at the end of the sample, whereas Danish and Finnish house prices were undervalued. This is consistent with the findings in this paper. The underlying model developed in Geng (2018) is used by the IMF in monitoring house price developments. Updates in the 2019 Article IV consultations (IMF 2019a, 2019b, 2019c) conclude that Norwegian and Swedish house prices were still overvalued, but far less so. For Finland, there was little evidence of overvaluation.

Another study in which both Denmark, Finland, Norway, and Sweden are analysed is Dermani et al. (2016), who use a panel data approach for the 1995–2015 period. The authors find no evidence of overvaluation in any of the countries once indebtedness is included in the model. When indebtedness is not included, there are signs of overvaluation in Norway and Denmark, but not in Sweden or Finland. The study concludes that this finding may be suggestive of imbalances in the Norwegian and Danish housing markets. My results suggest that these conclusions may be related to the panel-approach adopted in Dermani et al. (2016), which imposes equal effects across countries of changes in fundamentals on house prices. My country-by-country results suggest that both Norway and Denmark are far more sensitive to changes in fundamentals than the other countries.

In contrast to Dermani et al. (2016), Bergman and Sørensen (2018) find that there is a high probability that Swedish house prices have been overvalued for quite some time, which is consistent with the findings in this paper. My results also corroborate the findings of Dam et al. (2011), who estimate that Danish house prices were

overvalued in the period before the financial crisis.

The rest of the paper proceeds as follows. In the next section, I present the data that are used throughout the paper, and I discuss house price developments in Denmark, Finland, Norway, and Sweden over the past 30 years. I also look at the capitals Copenhagen, Helsinki, Oslo, and Stockholm. I briefly discuss the methodologies employed throughout the paper in the same section. In Section 3, I start by presenting results from tests for bubbles at the national level. After this, I estimate the degree of over- or undervaluation of house prices over the past 20 years. The section ends by presenting results from tests for bubbles in the capitals. In Section 4, I discuss what the main drivers of fundamental house prices have been. The final section concludes.

2 Data, house price developments, and methodology

2.1 Data

I have collected data at both the national level and for the capitals Copenhagen, Helsinki, Oslo, and Stockholm. This section briefly describes the data.

National data

The aggregate data used in the analysis are collected with a quarterly frequency. House price developments are measured by national indices and deflated by CPI to obtain real house prices. Income is measured by disposable household income, whereas the housing stock is measured by the real housing stock in fixed prices for Denmark and Norway.[2] Due to data availability, the housing stock is measured through the number of dwellings for Finland and Sweden.[3] Both income and the housing stock are divided by the total population to obtain per capita measures.[4]

For Norway, Sweden, and Finland, the interest rate series are weighted nominal mortgage rates across all maturities. This is similar to the data definitions applied for the same countries in the panel study by Dermani et al. (2016). For Denmark, I was not able to access a similar series, and have therefore followed Dam et al. (2011) and weighted the interest rates on 30- and 1-year bonds, controlling for the minimum amortization rate. In all countries, I consider after-tax interest rates by adjusting the nominal rates for tax deductions. Real after-tax interest rates are constructed by subtracting overall CPI-inflation over the past four quarters, which is similar to Dermani et al. (2016) and Geng (2018).[5] Details on data sources are given

2. The total stock of houses is calculated according to the perpetual inventory method.
3. Data on number of dwellings is only available at annual frequency, and have been interpolated to quarterly frequency using linear interpolation.
4. For Denmark and Finland, I was only able to collect population data at annual frequency. Quarterly time series where constructed using linear interpolation.
5. An alternative to using actual inflation for calculating the real interest rate is to use survey data on inflation expectations, or – alternatively – to use an inflation rate consistent with the inflation target in the different countries. However, this is not feasible due to lack of relevant data for the sample period. Survey data on inflation expectations are not available for the whole period for all countries, and the countries adopted

in Table A.1 in the Appendix.

The analysis ends in 2019 for all countries. The sample's starting point is 1990 for Sweden,[6] while Danish, Finnish, and Norwegian data start in 1985.

Data for the capitals

Income and housing stock data are not readily available for the capitals, which prevents me from calculating fundamental prices at this aggregation level. House price data are, however, available at a monthly frequency. I therefore test for bubbles in the capitals using the PSY-procedure. To obtain measures of real house prices, I deflate nominal house price indices by national CPI indices. The sample ends in 2019 for all capitals, and the sample start is set to 2006.[7] Details on data sources for the local house price indices are given in Table A.1 in the Appendix.

2.2 House price developments

National house price developments

Figure 1 shows real house price developments in Denmark, Finland, Norway, and Sweden over the past 30 years, while Table 1 shows cumulative growth rates in real house prices for 5- and 10-year periods, and the cumulative growth over the full sample period, 1990–2019, as well as cumulative growth rates from 2000 to 2019. I have also added the cumulative growth rates from 2000 to the peak in prices before the financial crisis (boom),[8] as well as the drop in prices from peak to trough (bust).[9]

All countries experienced increasing house prices in the period leading up to the 2008 global financial crisis. The cumulative growth rate was highest in Sweden, and lowest in Finland. The drop in house prices during the bust was largest in Denmark, with a drop of 22 percent. In Finland and Norway, real house prices dropped by 9 and 12 percent. In Sweden, house prices dropped by 6 percent. Real house prices exceeded pre-crisis levels already in early 2010 in Finland, Norway, and Sweden. In Denmark, real house prices were still below the previous peak at the end of 2019. After 2010, the countries have followed quite different paths.

In Finland, house prices stagnated, and were 5 percent lower in 2019 than in 2010. In Norway, prices increased by 29 percent over the same period, whereas Sweden had the highest real house price growth with 35 percent cumulative growth between 2010 and 2019. In Denmark, prices were 12 percent higher in 2019 than in 2010.

inflation targets at different points in time, Finland in 1995, Norway in 2001, Sweden in 1993, while Denmark still has a fixed exchange rate regime.

6. I was not able to collect data on the housing stock dating further back.
7. For Oslo, data with a monthly frequency are available from 2003. For Stockholm they start in 2005, while data for Copenhagen start in 2006. For Helsinki, monthly data are only available from 2015, so I have linearly interpolated quarterly data for Helsinki.
8. The peak in real house prices for the different countries are: Denmark (first quarter of 2007), Finland (third quarter of 2007), Norway (second quarter of 2007), and Sweden (third quarter of 2007).
9. The troughs for the different countries are: Denmark (second quarter of 2009), Finland (first quarter of 2009), Norway (fourth quarter of 2008), and Sweden (first quarter of 2009). Note that Danish house prices had a new drop later on, but I use the trough around the financial crisis in calculating the fall in prices during the bust.

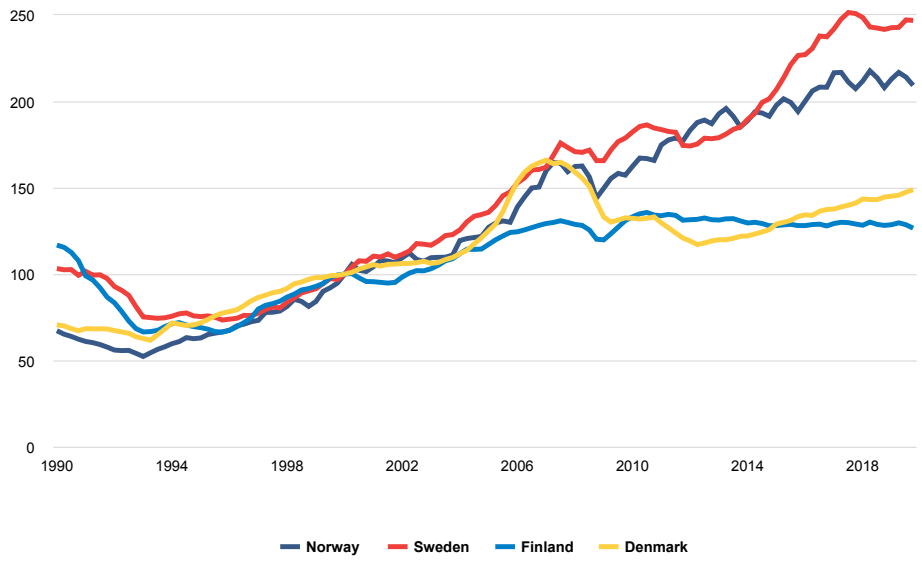
Table 1 Cumulative real house price growth over different periods

Period	Denmark	Finland	Norway	Sweden
5-year cumulative growth				
1990q1–1995q1	1.8	-41.0	-6.3	-27.0
1995q1–2000q1	39.3	45.0	58.8	32.7
2000q1–2005q1	25.1	17.2	27.1	35.8
2005q1–2010q1	5.8	13.7	27.8	34.3
2010q1–2015q1	-2.5	-3.8	21.8	13.5
2015q1–2019q4	15.4	-1.2	5.8	19.3
10-year cumulative growth				
1990q1–2000q1	41.7	-14.4	48.8	-3.1
2000q1–2010q1	32.3	33.2	62.4	82.3
2010q1–2019q4	12.5	-5.0	28.8	35.5
Cumulative growth rates over the boom-bust				
Boom	66.0	30.9	64.6	75.9
Bust	-21.6	-8.5	-12.4	-5.8
Cumulative growth 2000–2019				
	48.9	26.6	109.3	146.9
Cumulative growth 1990–2019				
	110.9	8.4	211.4	139.2

Note: The table shows cumulative real house price growth for 5- and 10-year periods from 2000 for Denmark, Finland, Norway, and Sweden. The boom is defined as the period from 2000 to the peak before the financial crisis, which for the different countries was: Denmark (first quarter of 2007), Finland (third quarter of 2007), Norway (second quarter of 2007), and Sweden (third quarter of 2007). The bust is defined as the period from peak to trough. The troughs for the different countries are: Denmark (second quarter of 2009), Finland (first quarter of 2009), Norway (fourth quarter of 2008), and Sweden (first quarter of 2009). Note that Danish house prices had a new drop later on, but I use the trough around the financial crisis in calculating the fall in prices during the bust. The final two rows show the cumulative growth rates for the period 2000-2019, and for the full sample period, 1990-2019. Real house prices are calculated by deflating national house price indices by the national CPI.

Source: Own calculations.

Figure 1 Real house price developments



Note: The figure plots real house price developments in Norway, Sweden, Finland and Denmark from 1990 to 2019. Real house prices are constructed by deflating nominal house price indices with national CPI. I have normalized each series so that the real house price index equals 100 in the first quarter of 2000 for all countries.

Source: Own calculations.

House price developments in the capitals

Figure 2 plots developments in real house prices for Copenhagen, Helsinki, Oslo, and Stockholm over the period 2006–2019. In Table 2, I show cumulative growth rates for 5- and 10-year periods. The table also summarizes the cumulative growth in house prices from 2006 to 2019.

Compared to the national house price growth, house prices have grown substantially more in the capitals over the past ten years. In Oslo and Stockholm, real house prices increased by 62 and 56 percent over this period, which is about twice of the national house price growth. In Helsinki, real house prices grew less, with a cumulative growth of about 16 percent. At the national level, prices fell by 5 percent. In Copenhagen, prices increased by 56 percent, whereas the national average was just below 10 percent.

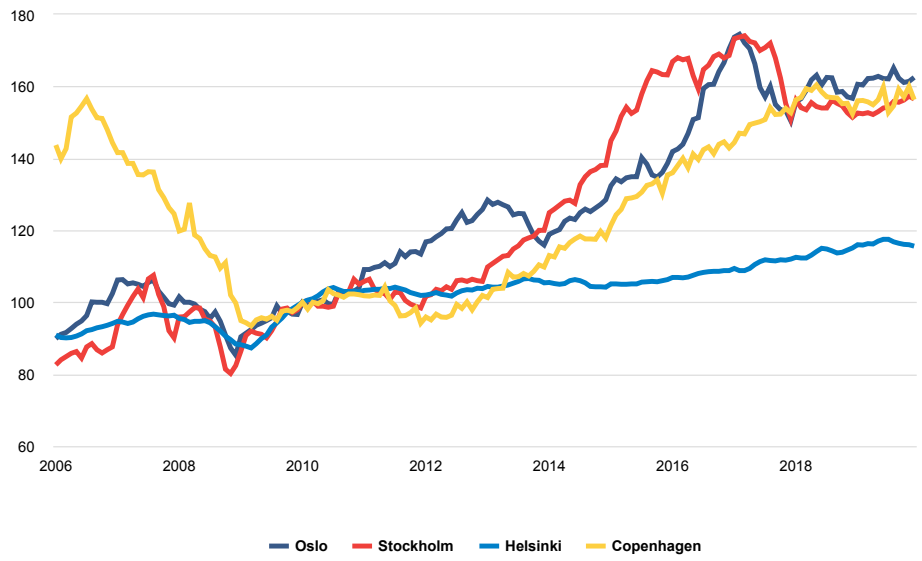
Table 2 Cumulative real house price growth for the capitals over different periods

Period	Copenhagen	Helsinki	Oslo	Stockholm
5-year cumulative growth				
2006m1–2010m1	-30.4	10.0	11.2	21.1
2010m1–2015m1	21.4	5.1	32.4	44.9
2015m1–2019m12	28.7	10.0	22.7	8.1
10-year cumulative growth				
2010m1–2019m12	56.3	15.6	62.5	56.5
Cumulative growth 2006–2019				
Full sample	8.8	27.2	80.7	89.5

Note: The table shows cumulative real house price growth for 5- and 10-year periods from 2006 for Copenhagen, Helsinki, Oslo, and Stockholm. The final row shows the cumulative growth for the full sample period, 2006-2019. Real house prices are obtained by deflating nominal house price indices for the four cities with the national CPI. For Helsinki, monthly data are only available from 2015, so I have linearly interpolated quarterly data for Helsinki.

Source: Own calculations.

Figure 2 Real house price developments in the capitals



Note: The figure shows real house price developments in Oslo, Stockholm, Helsinki and Copenhagen in 2006–2019. Real house prices are obtained by deflating nominal house price indices for the four cities with the national CPI. For Helsinki, monthly data are only available from 2015, so I have linearly interpolated quarterly data for Helsinki. Real house prices are normalized at 100 in January 2010.

Source: Own calculations.

2.3 Methodology

Two different econometric methods are used to test for bubbles and to detect imbalances in the Nordic housing markets over the past 20 years. The first method is that developed by Phillips et al. (2015a, 2015b) to detect explosive developments in a time series. This test is used to test for the presence of bubbles. The second approach is that of Anundsen (2019), which compares developments in actual and fundamental prices. This is not a test for bubbles per se, but rather a way of detecting both short- and long-term imbalances in the housing market, where large and systematic imbalances over a sustained period of time may be interpreted as signalling a bubble (Anundsen 2019). This section briefly describes the two methods.[10]

Testing for explosivity

I apply the framework suggested by Phillips et al. (2015a, 2015b) to explore whether there are signs of explosive developments in real house prices.[11] This procedure investigates whether there are signs of a bubble (explosive developments) in house prices at different points in time.[12] I apply this test to real house prices, both at the national level and for the capitals.

At the national level, I use data from 1990 to 2019 and set the minimum window size to 41 quarters, so that the first test is done for the first quarter of 2000. For the analysis of house prices in the capitals, I use data for the period 2006–2019. I set the minimum window size to 49 months, so that the first test is done for January 2010.[13]

Further details on this econometric approach are provided in Appendix B of a previous version of this paper, see Anundsen (2020).

Estimating fundamental house prices

A commonly used theory for the drivers of house prices is the life-cycle model of housing (see e.g., Meen 1990, 2001, 2002). This theoretical framework takes as a starting point a standard representative-agent model, in which an agent maximizes her lifetime utility with respect to consumption of housing goods and 'other' goods. One can show that this implies an inverted demand equation for housing, which has been used in numerous studies that investigate house price determination (see e.g., Buckley & Ermisch 1983, Hendry 1984, Meen 1990, Holly & Jones 1997, Meen & Andrew

10. Technical details are described in Appendix B of a previous version of this paper, see Anundsen (2020).
11. This approach has a clear link to asset pricing theory, in which the current value of the asset (the house) should be equal to the expected discounted stream of pay-offs in the next period. This framework is similar to a standard present value model (see e.g., Gordon and Shapiro 1956, Blanchard and Watson 1982, and Clayton 1996, who argue that it may equally well be considered for housing).
12. More formally, the procedure uses a recursive algorithm to estimate a Dickey-Fuller (Dickey & Fuller 1979) regression to detect possible explosiveness in a time series over certain periods.
13. A deterministic trend is included in the ADF-regression, both at the national level and when analysing the capitals. I use 4 lags in the ADF-regressions at the national level (quarterly data) and 12 lags when looking at the capitals (monthly data). Critical values depend both on the sample size, nuisance parameters, lag length, and the minimum window size. To calculate the sequence of finite sample critical values, I use the Matlab program accompanying Phillips et al. (2015a), using 5 000 Monte Carlo replications.

1998, Meen 2001, Duca et al. 2011a, 2011b and Anundsen 2015). This inverted demand equation implies that house prices are determined by income, the user cost, and the housing stock.

I start by applying the system-based test for cointegration in Johansen (1988) to analyse the long-run relationship between real house prices, real per capita disposable income, the housing stock per capita, and the real user cost (approximated by real after-tax interest rates).[14] My estimation period is 1985–1999 for Denmark, Norway, and Finland, and 1990–1999 for Sweden.[15] The estimation period ends in 1999 for all countries. The parameters are therefore determined before the evaluation period (2000–2019). To save degrees of freedom, I impose the restriction that the coefficient on income and housing stock is the same, but with opposite signs. This implies an income elasticity of demand equal to one, which is in accordance with what Meen (2001), Duca et al. (2011b), and Anundsen (2015) find for US data, and it is one of the central estimates of Meen (2001).[16] Detailed results from the cointegration analysis are shown in Table A.2 in the Appendix.

Having estimated the parameters in the long-run relationships, I construct the implied fundamental house price path during the period 2000–2019. I assume that house prices were in equilibrium in the first quarter of 2000, and calculate the implied fundamental trajectory of house prices in the ensuing period. Developments in fundamental prices are then compared to actual house prices. Further details on this econometric approach are provided in Appendix B of a previous version of this paper, see Anundsen (2020).

3 Results

I start this section by looking at aggregate results for the Nordic countries. First, I present results from testing for bubbles (explosiveness) before discussing the evolution of house prices relative to what is implied by economic fundamentals. In the second part, I test for bubbles in the capitals.

14. While I use the weighted nominal mortgage rate across all maturities as my measure of the relevant interest rate, one could argue that longer horizon interest rates are also important for housing demand. To explore how this affects results, I added the spread between the 10-year bond yields and the mortgage rates to the VAR-models. In all cases, a likelihood ratio test would not reject the restriction that this variable does not enter the cointegration space, with the following p-values: Denmark (0.15), Finland (0.08), Norway (0.42), and Sweden (0.05).
15. For all countries, I consider a VAR(2)-model, which is also supported by the Schwarz information criterion.
16. A similar restriction is used and tested in Anundsen (2019) for Norway, Finland, and the US. To test the validity of this restriction, I estimated a VARX-model for each of the countries, in which I conditioned on the housing stock per capita in the cointegration space. I estimated this model with no constraints on the income and the housing stock coefficients, and under the assumption that the two coefficients are the same, but with opposite signs. I find support for this restriction for Norway, Denmark, and Finland, but that the imposed restriction is more doubtful for Sweden. The p-values from likelihood ratio tests are: Denmark (0.11), Finland (0.06), Norway (0.04), and Sweden (0.01). For Sweden, the (unconstrained) coefficient on the housing stock is estimated very imprecisely, which is probably related to relatively less variation in the housing stock per capita measure in Sweden than in the other countries. I therefore also looked at a model for Sweden in which I excluded the housing stock from the specification. In that case, the coefficient on the user cost and income are quite similar to the baseline specification, and estimated fundamental prices are almost the same. Thus, my conclusions for Sweden are not affected by imposing this restriction.

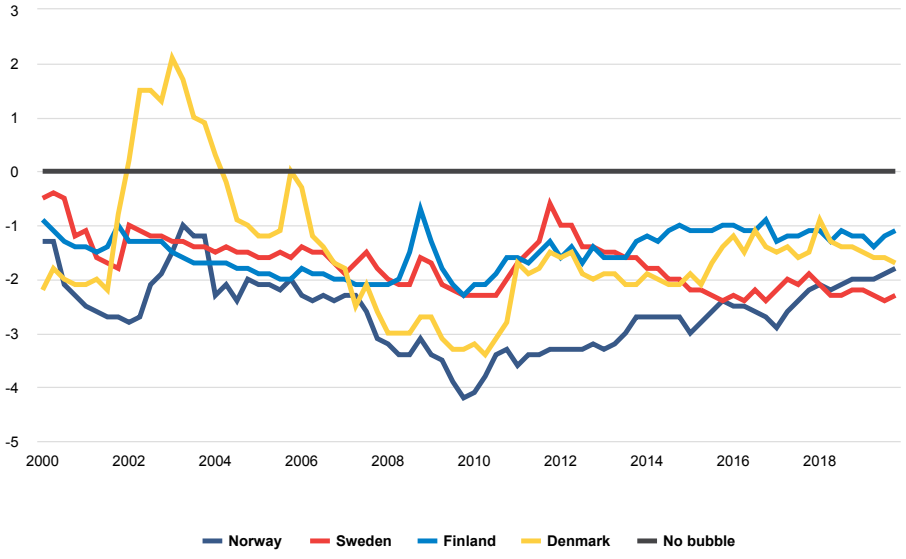
3.1 National results

Testing for bubbles

Figure 3 plots the difference between the test statistics and critical values consistent with a 10 percent significance level, while the 'No bubble'-line is illustrated in black. The interpretation is that whenever this difference is below the black line,[17] there are no signs of a bubble. If it is above the black line, there is evidence of a bubble.[18]

It is evident that there are no points in time in which the test indicates a bubble for Finland, Norway, or Sweden. For Denmark, the test signals a bubble in the period before the sharp price drop starting in the first quarter of 2007.[19] There are no signs of bubble-behaviour in Denmark subsequently.[20]

Figure 3 Test for bubbles



Note: The figure shows the difference between the test statistic and the critical value for a 10 percent significance level for Denmark, Finland, Norway, and Sweden based on the PSY-approach. The tests are performed on real house prices, which are obtained by deflating the national house price indices by the national CPI. The difference between the test statistics and the critical values consistent with a 10 percent significance level is plotted for all countries. The black line is the no-bubble line. The interpretation is that whenever this difference crosses the black line, there are signs of exuberance. If it remains below the black line, there are no signs of exuberance. The evaluation sample covers the period 2000–2019 for all countries. The estimation sample starts in the first quarter of 1990. I use a minimum window size of 41 quarters, and include 4 lags and a

17. Non-rejection of the null of no explosivity.
18. Rejection of the null of no explosivity in favour of the alternative hypothesis of an explosive root.
19. Results are not materially affected by using a 5 percent significance level.
20. While my analysis concentrates on the past 20 years, there have been previous episodes of strong house price growth in Nordic housing markets. Analysing this would require historical data series dating far back. While such an analysis is outside the scope of this paper, Anundsen and Eitrheim (2016) offers an analysis on historical data over the period 1890-2015 for Norway. They use house price indices and a CPI from the Norges Bank Historical Monetary Statistics (HMS) database. Their results indicate bubble-behaviour in Norwegian house prices in 1895-1899 and 1985-1988. For later periods, there are no signs of bubble-behaviour.

deterministic linear trend in the ADF-regressions. The critical values are simulated using 5 000 Monte Carlo replications. Details on the econometric approach are provided in Appendix B of a previous version of this paper, see Anundsen (2020).

Source: Own calculations.

House prices and fundamentals

I use the country-specific estimates from the cointegration analysis to construct implied fundamental prices (see Table A.2 in the Appendix for detailed estimation results). This series are plotted in Figure 4 a–d.[21]

Comparing actual and fundamental prices, it is evident that my results suggest that house prices were overvalued in all four countries in the years leading up to the 2008 global financial crisis. The overvaluation was particularly prominent in Denmark, which also saw the largest drop in actual house prices from peak to trough. This finding is consistent with the results from testing for explosiveness, which indicated a bubble in the Danish housing market in the years preceding the global financial crisis. The correction in house prices around 2008 brought house prices back to the value implied by fundamentals in all countries by 2010.

After 2010, Norwegian house prices remained undervalued until 2016, when the model suggests that Norwegian house prices became overvalued. They were overvalued by 9 percent at the end of 2019.[22] For Sweden, the estimates suggest that house prices have been overvalued – although relatively modestly – since 2014. At the end of 2019, the model suggests that Swedish house prices were overvalued by 7 percent.

In Finland, house prices have stayed flat since 2010, and they have more or less been at equilibrium. At the end of 2019, my results suggest that Finnish house prices were undervalued by a mere 3 percent. Following the drop in house prices in the aftermath of the global financial crisis, Danish house prices have remained mostly undervalued, and towards the end of the sample, I find that Danish house prices were undervalued by 9 percent.

Based on these results, I conclude that Danish and Finnish house prices were undervalued at the end of 2019, whereas Norwegian and Swedish house prices were overvalued. The only country where there are signs of systematic overvaluation is Sweden, where prices have been above equilibrium since 2014.

One should note that there is some volatility in my estimated fundamental prices. This is due to volatility in the fundamental drivers. Part of the volatility is related to movements in the real after-tax interest rate. The volatility of fundamental prices suggest that one should be careful in drawing conclusions about overvaluation based only on one or two quarters of data. Still, the trend over a few quarters gives useful information on whether house prices are systematically over- or undervalued.

21. Adopting a panel-approach, thereby abstracting from heterogeneity across countries in the response to changes in fundamentals, I get results that are more similar to Dermani et al. (2016), see Figure A.1 in the Appendix.
22. At Housing Lab - National center for housing market research, we update this indicator for Norway on a quarterly basis. The most recent estimates can be found on our website.

Figure 4a Actual versus fundamental house prices, Norway

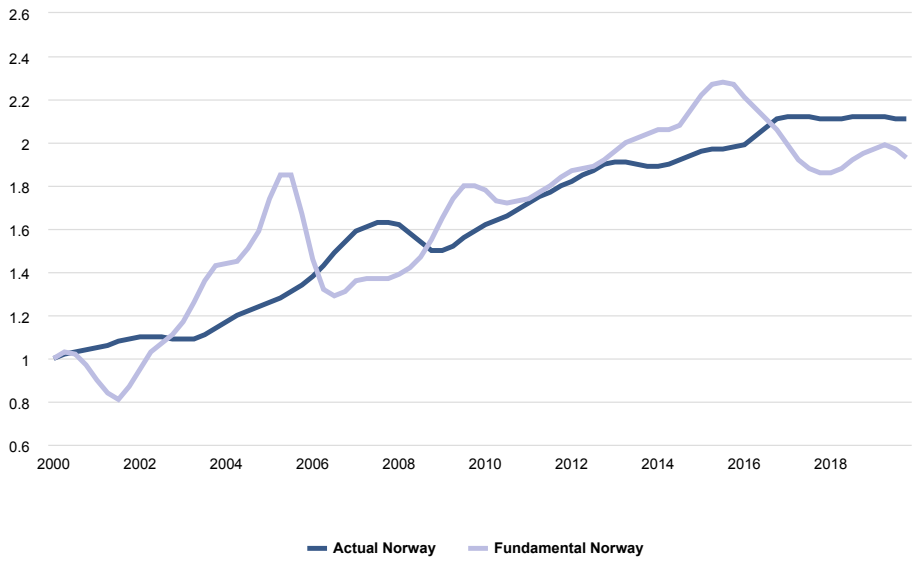


Figure 4b Actual versus fundamental house prices, Sweden

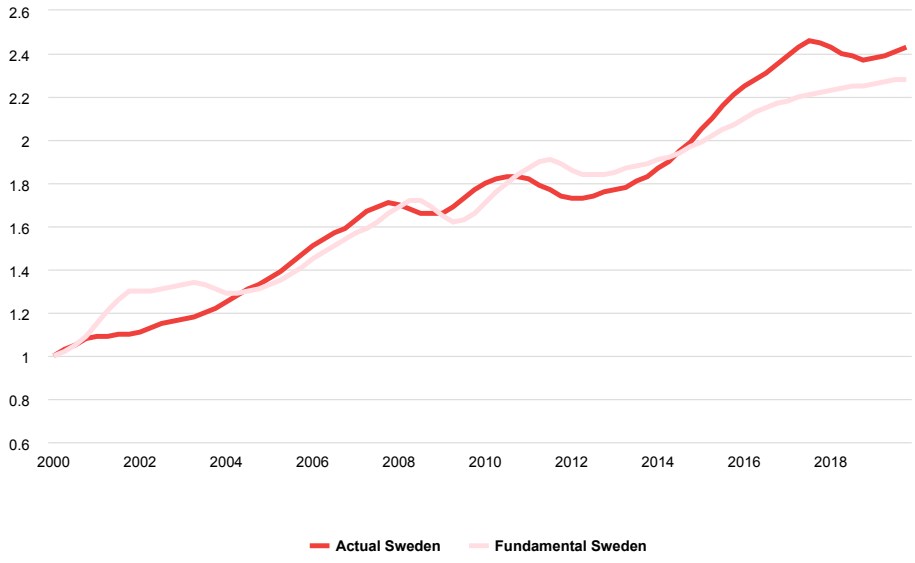


Figure 4c Actual versus fundamental house prices, Finland

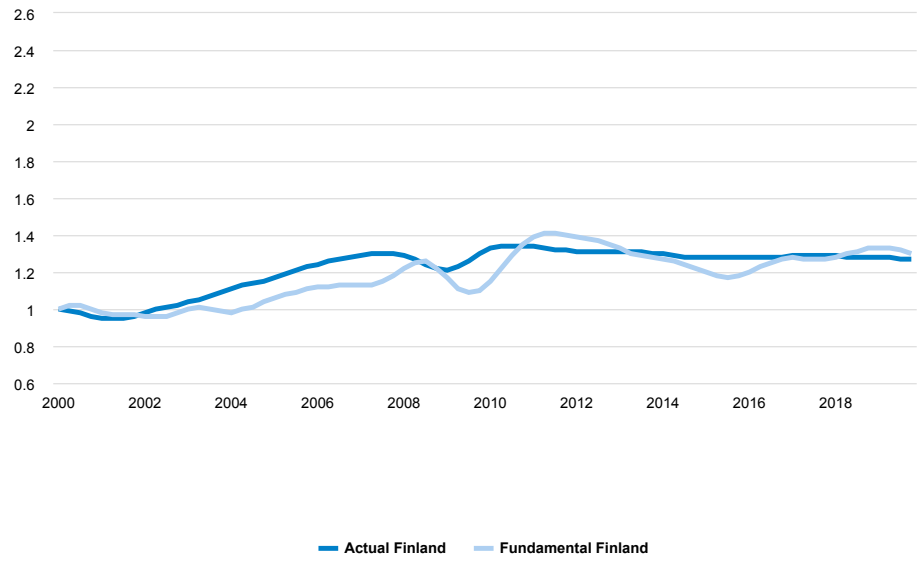
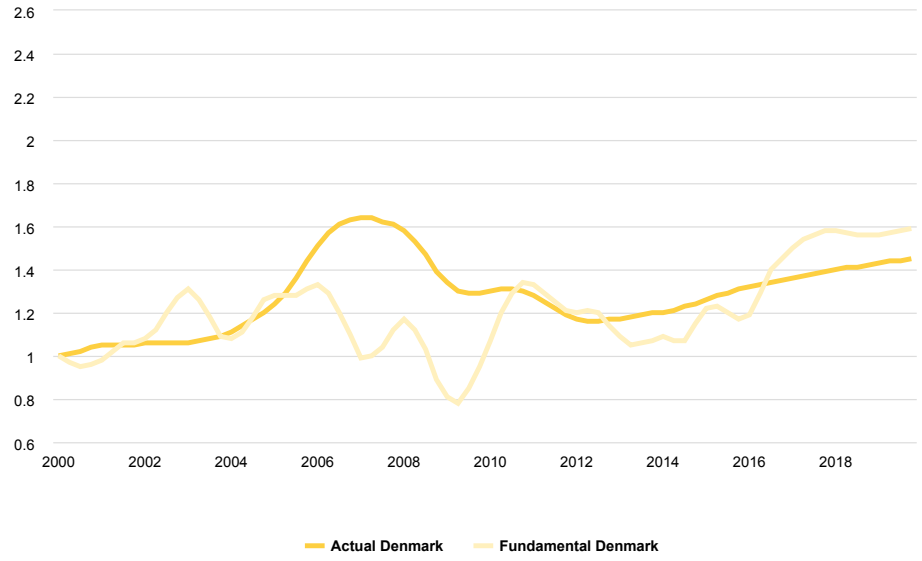


Figure 4d Actual versus fundamental house prices, Denmark



Note: The figures shows fundamental house prices and actual house prices over the period 2000–2019 for Denmark, Finland, Norway, and Sweden. Fundamental prices are determined by income per capita, the housing stock per capita, and real after-tax interest rates. Both fundamental and actual prices are normalized to one in the first quarter of 2000. Detailed results on estimated coefficients are given in Table A.2 in the Appendix.

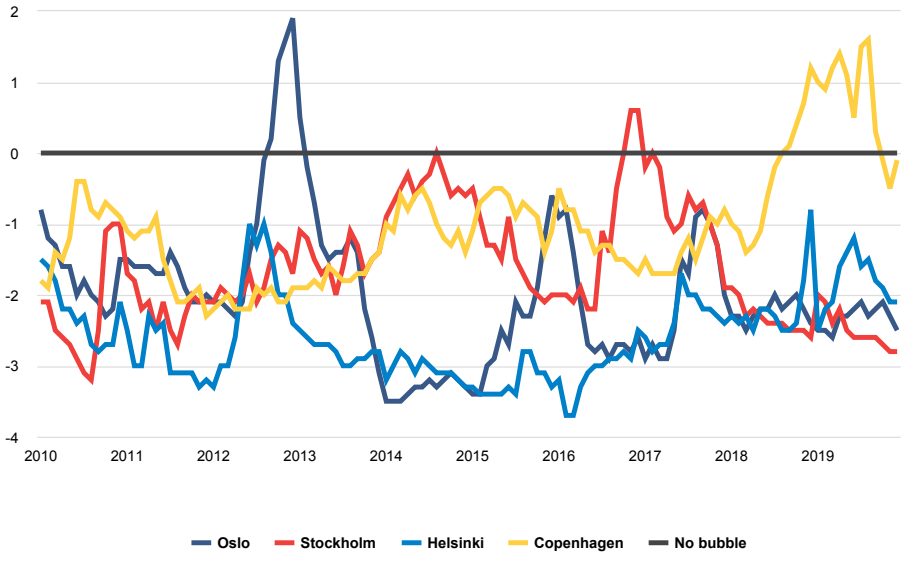
Source: Own calculations.

3.2 Results for the capitals

Figure 5 plots the difference between the test statistics and the critical values consistent with a 10 percent significance level from the PSY-approach for Copenhagen, Helsinki, Oslo, and Stockholm. The black line is the 'No bubble'-line. The interpretation is that whenever this difference crosses the black line, there are signs of a bubble. If it remains below the black line, there are no signs of a bubble.

My results suggest no signs of a bubble in Helsinki over the sample period. There are some signs of explosiveness in Stockholm and Oslo, but very short-lived, so it is hard to conclude that there have been bubble-like dynamics in these cities. For Copenhagen, I find some signs of explosiveness in 2018 and 2019, but this seems more related to a relatively sharp drop in prices and does therefore not suggest a bubble.[23]

Figure 5 Test for bubbles in the capitals



Note: The figure shows the difference between the test statistic and the critical value for a 10 percent significance level for Copenhagen, Helsinki, Oslo, and Stockholm based on the PSY-approach. The tests are done on real house prices, which are obtained by deflating the city-level house price indices by the national CPI. The difference between the test statistics and the critical values consistent with a 10 percent significance level is plotted for each of the countries. The black line is the no-bubble line. The interpretation is that whenever this difference crosses the black line, there are signs of exuberance. If it remains below the black line, there are no signs of exuberance. The evaluation sample covers the period 2010–2019 for all cities. The estimation sample starts in January 2006. I use a minimum window size of 49 months, and include 12 lags and a deterministic linear trend in the ADF-regressions. The critical values are simulated using 5 000 Monte Carlo replications. Details on the econometric approach are provided in Appendix B of a previous version of this paper, see Anundsen (2020).

Source: Own calculations.

23. Results are not materially affected by using a 5 percent significance level.

4 What factors drive fundamental prices?

An important finding from the cointegration analysis is that house prices are highly sensitive to interest rate changes in all countries (see Table A.2 in the Appendix for detailed estimation results). This is particularly so in Denmark and Norway. The estimates for Norway resemble those in Anundsen (2019), the estimates for Denmark are close to Dam et al. (2011), and the estimates for Sweden are similar to Claussen (2013), in which similar type of models are estimated. These estimates may be considered semi-elasticities of interest rates on (equilibrium) house prices, and may have additional usage elsewhere for policy makers. They are estimated to be -12.55 in Denmark, -7.90 in Finland, -11.00 in Norway, and -5.84 in Sweden. My results also suggest considerable cross-country variation in income and housing stock elasticities.[24]

Recent estimates suggest that the average housing supply elasticity for the countries I consider are: 1.41 for Denmark, 1.00 for Finland, 1.20 for Norway, and 2.01 for Sweden (Cavalleri et al. 2019). For comparison, they find that the housing supply elasticity for the US is 2.82.[25] Note that Cavalleri et al. (2019) estimate that the housing supply elasticity for Sweden is almost twice that of Norway and Denmark. My estimates suggest that Swedish house prices are also less sensitive to changes in income and interest rates than Danish and Norwegian house prices are. This is consistent with the idea that a more flexible supply in Sweden than in Denmark and Norway makes house prices less responsive to changes in fundamentals.

Heterogeneity in coefficients also makes a panel approach more challenging, since it would impose equal effects of changes in fundamentals on house prices in all countries. To shed some light on this, I estimated the long-run parameters using a panel approach. These estimates are also reported in Table A.2, and confirm that the panel approach masks underlying heterogeneities.

To look more into the drivers of fundamental prices in the four countries, I estimated quasi-counterfactual developments for fundamental prices, by holding a) real per capita disposable income fixed and b) the real after-tax interest rate fixed. This is not a fully-fledged counterfactual analysis, however, since that would require a model taking general equilibrium effects into account. The main motivation is simply to illustrate the importance of developments in income and the real after-tax interest rate for the evolution of fundamental house prices.

In Figure 6a–d, I plot actual house prices, fundamental house prices, fundamental house prices when holding real per capita disposable income constant, and fundamental house prices when holding the real after-tax interest rate constant. It is evident that the most important driver of house prices in all countries are income developments, as would be expected. It is also evident that the real after-tax interest rate matters a great deal for the evolution of fundamental prices.

24. The housing stock elasticities for Denmark and Norway are not directly comparable to those for Finland and Sweden, since they are measured somewhat differently due to data availability.
25. A previous study looking at housing supply elasticities in Europe is Caldera and Johansson (2013).

That interest rate developments are important for house price dynamics finds support in the literature, see e.g., Williams (2015) for an excellent summary of some international studies. For US metro areas, Aastveit and Anundsen (2017) show that monetary policy shocks exercise a great impact on house price developments. They also show that whether expansionary or contractionary shocks have the greatest impact on house prices depends on the elasticity of housing supply. In particular, they show that expansionary shocks have a greater impact on house prices in areas with low housing supply elasticities, whereas the opposite is true for areas with high housing supply elasticities. At the median, they find that expansionary shocks hit harder than contractionary shocks.

The estimated housing supply elasticities in Cavalleri et al. (2019) for the Nordic countries are lower than the corresponding estimate for the US. To the extent that the results in Aastveit and Anundsen (2017) are generalizable outside the US, contractionary monetary policy may have a relatively weaker impact in slowing down house price increases than expansionary shocks have in fuelling price increases. Low supply elasticities have also been shown to increase house price volatility in booms and busts (see e.g., Huang & Tang 2012, Glaeser et al. 2008, Anundsen & Heebøll 2016).

Figure 6a Fundamental house prices, actual house prices, and fundamental house prices without interest rate changes for Norway, 2000–2019

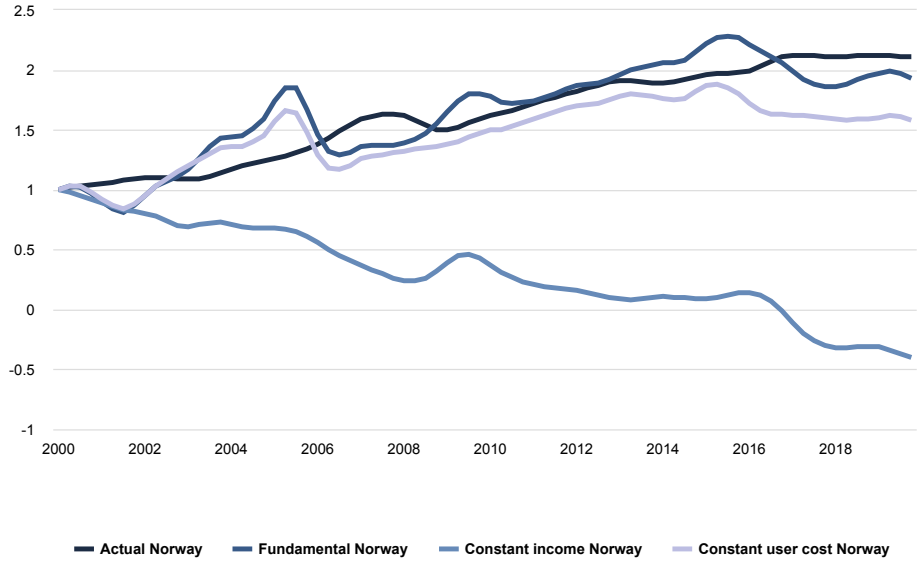


Figure 6b Fundamental house prices, actual house prices, and fundamental house prices without interest rate changes for Sweden, 2000–2019

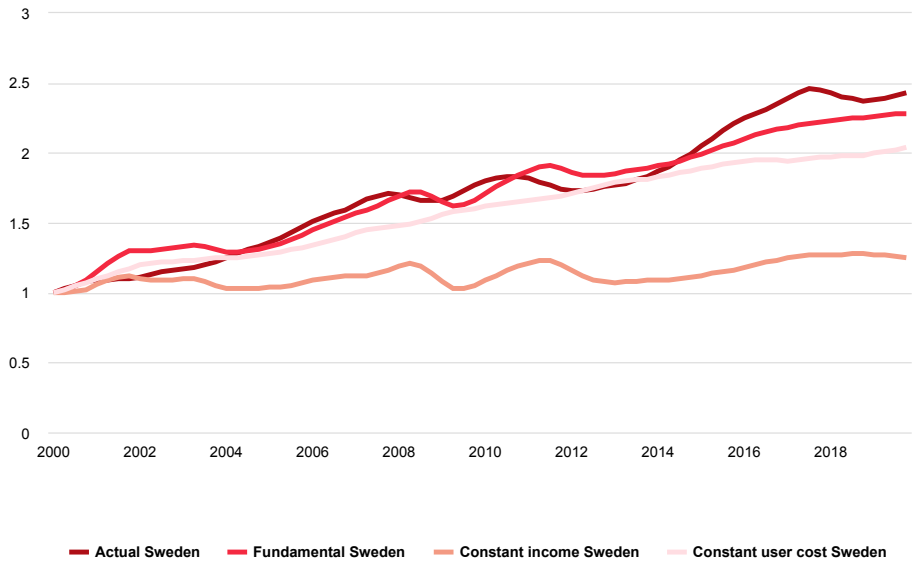


Figure 6c Fundamental house prices, actual house prices, and fundamental house prices without interest rate changes for Finland, 2000–2019

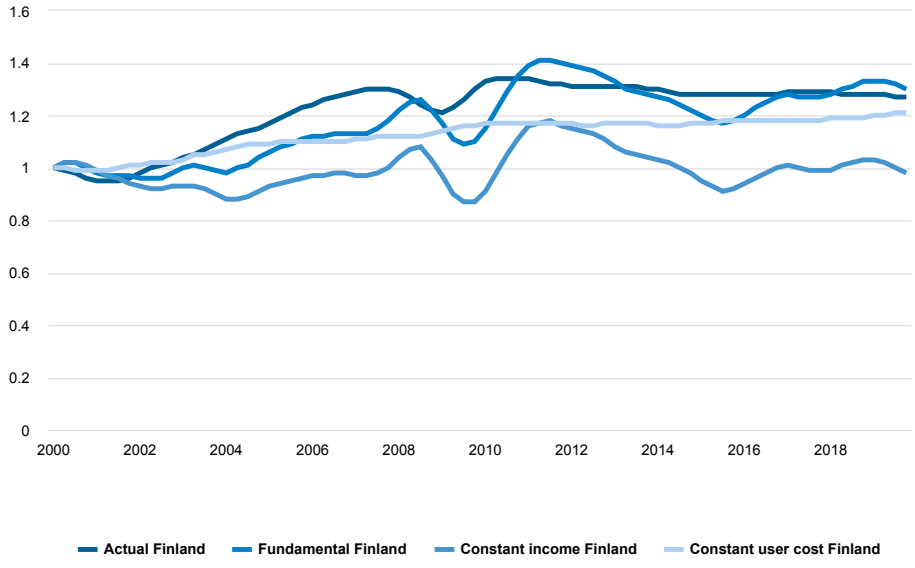
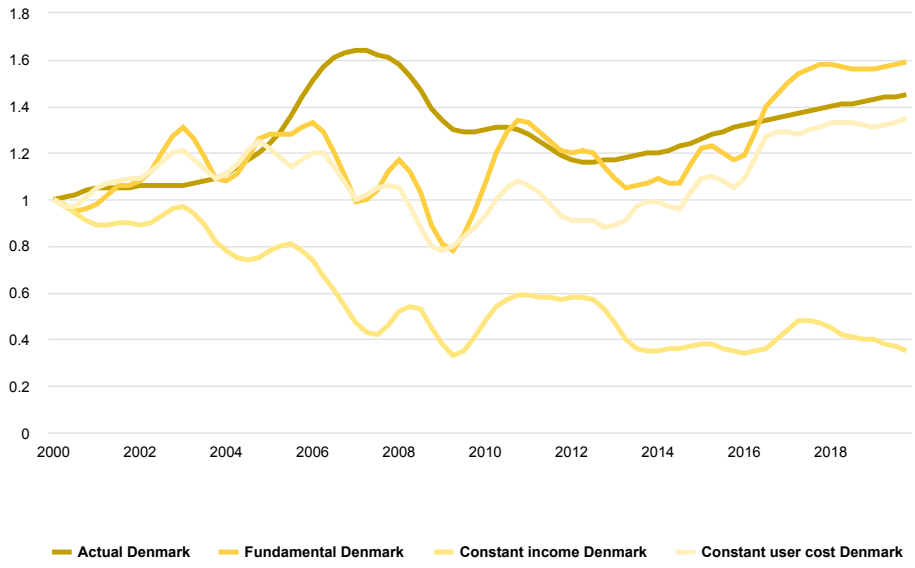


Figure 6d Fundamental house prices, actual house prices, and fundamental house prices without interest rate changes for Denmark, 2000–2019



Note: The figure shows fundamental house prices, actual house prices, fundamental house prices when holding real per capita disposable income constant from the first quarter of 2000, and fundamental prices when the real after-tax interest rate is kept unchanged from the first quarter of 2000 for Norway (6a), Sweden (6b), Finland (6c), and Denmark (6d). The sample covers the period 2000–2019. Fundamental prices are determined by real disposable income per capita, the housing stock per capita, and the real after-tax interest rate. All series are normalized to one in the first quarter of 2000. Detailed results on estimated coefficients are given in Table A.2 in the Appendix.

Source: Own calculations.

5 Conclusion

In this paper, I have investigated whether there are signs of bubbles or imbalances in the Danish, Finnish, Norwegian, and Swedish housing markets. First, I tested for explosive developments in real house prices. My results suggest that there was a bubble in the Danish housing market in the years preceding the global financial crisis. There is no evidence of bubbles for the other Nordic countries.

Using another methodological approach, I also estimated the trajectory of fundamental house prices for the period 2000–2019, as implied by developments in per capita income, the housing stock per capita, and the real after-tax interest rate. My results show that there were signs of overvaluation in all countries before the global financial crisis. I find that Norwegian and Swedish house prices were somewhat overvalued, while Danish and Finnish house prices were undervalued at the end of 2019.

My estimation results imply that the Nordic housing markets are highly sensitive to

interest rate changes, and that the secular decline in real after-tax interest rates over the past 20 years has been an important contributor to developments in fundamental house prices. I argue that the high sensitivity of house prices with respect to interest rate changes in Denmark, Finland, Norway, and Sweden must be seen in conjunction with the low housing supply elasticities that have been estimated for the Nordic countries. The low housing supply elasticities contribute to increased house price volatility over the course of a boom-bust cycle, and low supply elasticities implies a stronger effect of demand shocks on house prices.

From a policy point of view, fewer restrictions on construction activity would make builders more responsive to house price increases (increasing the housing supply elasticity), thereby dampening the effects of demand shocks and lowering house price volatility over the course of a boom-bust cycle. Policy actions that could reduce the bureaucratic hurdle in the building process could therefore lower house price volatility. If there is a supply side problem, it is easier to solve it on the supply side, not by manipulation of the demand side.

Several papers have also shown that relaxation of lending standards matters to regional house price developments in the US (e.g., Mian & Sufi 2009, Favara & Imbs 2015 and Anundsen & Heebøll 2016), and a strand of the literature attributes the bubble-like dynamics in the US housing market in the 2000s to the subprime explosion (see Duca et al. 2011a, 2011b, Pavlov & Wachter 2011 and Anundsen 2015). In this context, it may be tempting for authorities to impose limits to credit expansion through macroprudential policies. As a policy to cool down credit growth and to lower the risk of financial imbalances, this may be a sound tool, but it is not necessarily the best way to deal with housing market developments. If the reason why prices are increasing is that not enough houses are built in high-demand areas, it is a supply-side problem that requires supply-side policies. Tightening of credit standards can lower credit growth and thereby lower demand for housing. This pushes house prices down, but at the same time results in less construction activity – thus magnifying the initial structural deficiency. Given the low elasticities that are estimated for the Nordic countries, together with the high interest rate sensitivity of house prices, it seems to be of acute importance that one commissions a thorough investigation of political hurdles in the building process, which also studies housing needs in different part of the countries, and in particular whether new construction activity meets the actual needs in terms of type of housing, size, and not least location. Removing bureaucratic hurdles in the building process can lower house prices in the long run, make them less sensitive to demand shocks, and reduce house price volatility.

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Appendix

Data definitions

Table A.1 Variable definitions and data sources

Series	Description	Denmark	Finland	Norway	Sweden
PH	House price index	DS/DN	SF/BoF	SSB/NB/EV	SS/RB/VG
P	Consumer Price Index	DS	SF/BoF	SSB/NB	SS/RB
H	Housing stock	DS/DN	SF/BoF	SSB/NB	SS/RB
Y	Households' disposable income	DS/DN	SF/BoF	SSB/NB	SS/RB
i	Mortgage interest rate	RKR/DN/Dam et al. (2011)	BoF	NB	RB
τ_y	Capital gains tax rate	DS	BoF	SSB/NB	RB
POP	Population	DS/DN	SF/BoF	SSB/NB	SS/RB

Note: This table reports data descriptions and sources for the analyses of this paper. The data period runs from 1985 to 2019 for Denmark, Finland, and Norway. For Sweden, the sample covers the period 1909–2019. The abbreviations are the following: SD = Danmarks Statistikk, DN = Danmarks Nationalbank, RKR = Realkredittrådet, SF = Statistics Finland, BoF = Bank of Finland, SSB = Statistisk Sentralbyrå, NB = Norges Bank, EV = Eiendomsverdi, SCB = Statistiska Centralbyrån, RB = Riksbanken, and VG = Valueguard. For Denmark, I follow Dam et al. (2011) and construct the real after-tax interest rate using a combination of the interest rate on 30-year bonds and 1-year bonds, controlling for the minimum amortization rate and property taxes.

Detailed results from estimating fundamental house prices

Table A.2 summarizes the estimated long-run coefficients and adjustment parameters for each of the countries.

Table A.2 Results from cointegration analysis

Variable	Denmark	Finland	Norway	Sweden	Panel
Real interest rate	-12,55	-7,90	-11,00	-5,84	-6,88
	(6.39)	(0.99)	(5.11)	(1.50)	(0.84)
Disp. income	4,78	0,96	5,36	2,15	3,76
	(1.67)	(0.48)	(1.33)	(1.36)	(0.35)
Housing stock	-4,78	-0,96	-5,36	-2,15	-3,76
	(-)	(-)	(-)	(-)	(-)
Adjustment parameter	-0,05	-0,19	-0,03*	-0,15	
	(0.02)	(0.06)	(0.01)	(0.04)	

Note: This table reports a summary of the main results when the system-based approach of Johansen (1988) is implemented. The estimation period runs from 1985 to 1999 for Denmark, Finland, and Norway. For Sweden, it covers the period 1990–1999. The final column reports long-run coefficients when the countries are pooled into a panel. The dependent variable is real house prices, while the independent variables are real per capita disposable income, the housing stock per capita, and the real after-tax interest rate. The VAR models are of order two. * -0.029 before rounding.

Source: Own calculations.

It is evident that there is a substantial interest rate effect in all countries, and that the income effect is larger in Norway and Denmark than in Sweden and Finland. There is also evidence suggesting that equilibrium deviations are restored more slowly in Norway and Denmark than in the other two countries.

Having determined the parameters in the long-run relationship, I construct the fundamental house price path using the following specification:

$$ph_t^* = ph_{t-1}^* + \hat{\beta}_y^{1999q4} \Delta y_t + \hat{\beta}_h^{1999q4} \Delta h_t + \hat{\beta}_r^{1999q4} \Delta r_t, \quad t > 1999q4$$

Figure A.1a Actual versus fundamental house prices: country-by-country analysis versus panel approach, Norway

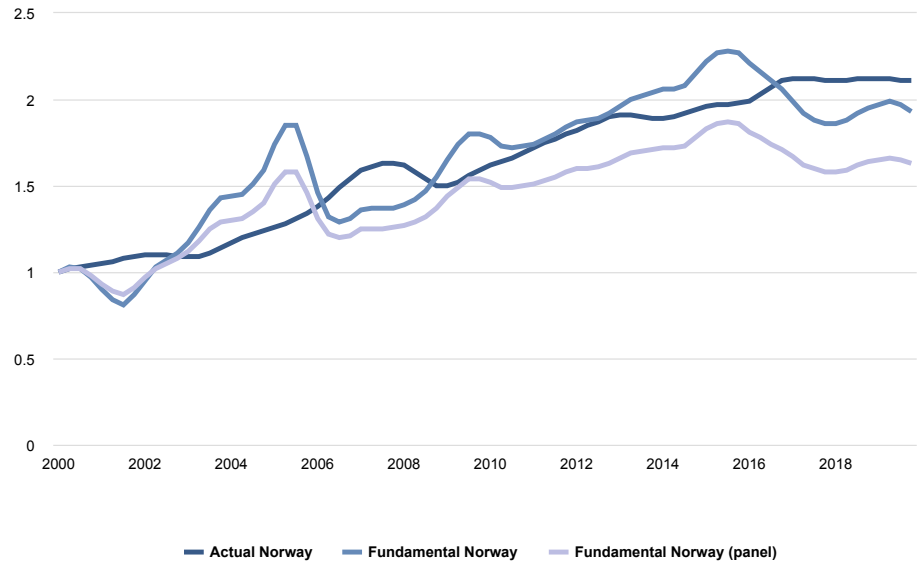


Figure A.1b Actual versus fundamental house prices: country-by-country analysis versus panel approach, Sweden

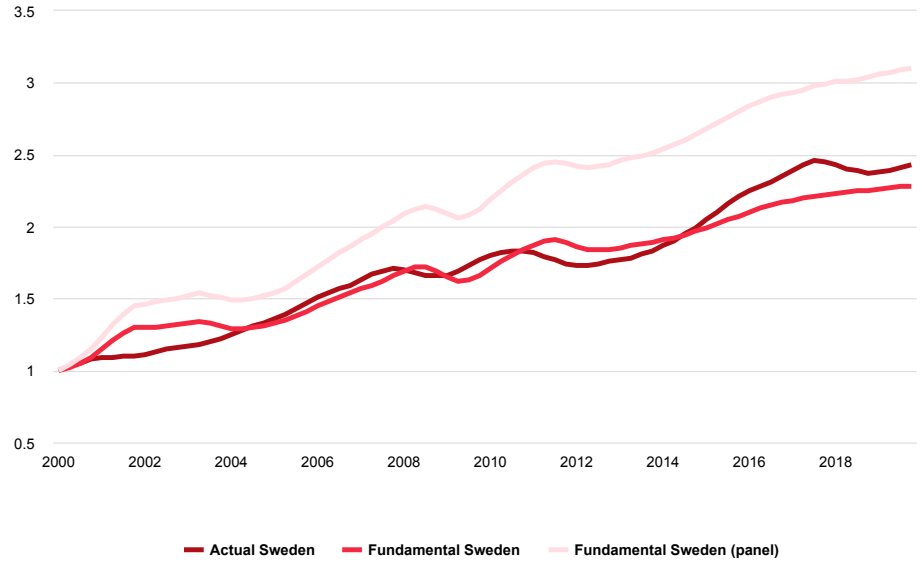


Figure A.1c Actual versus fundamental house prices: country-by-country analysis versus panel approach, Finland

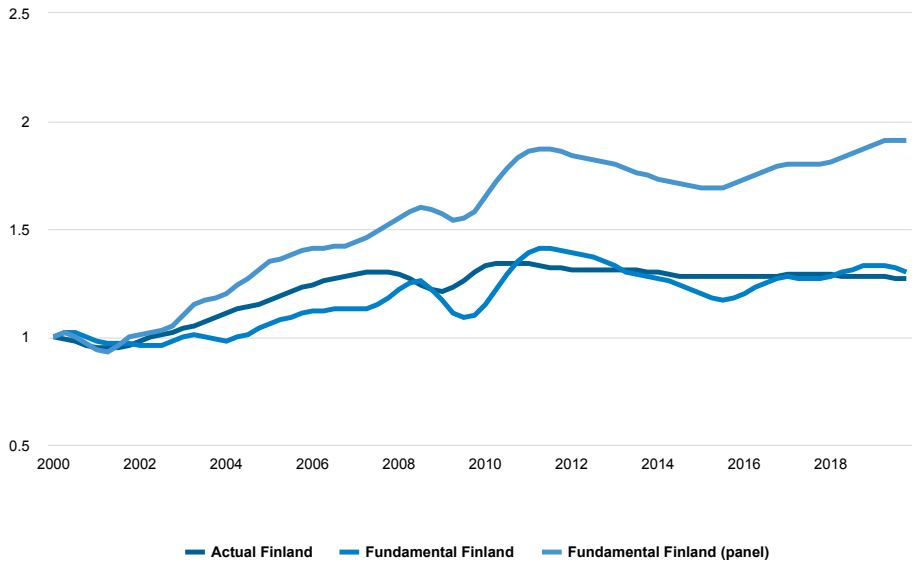
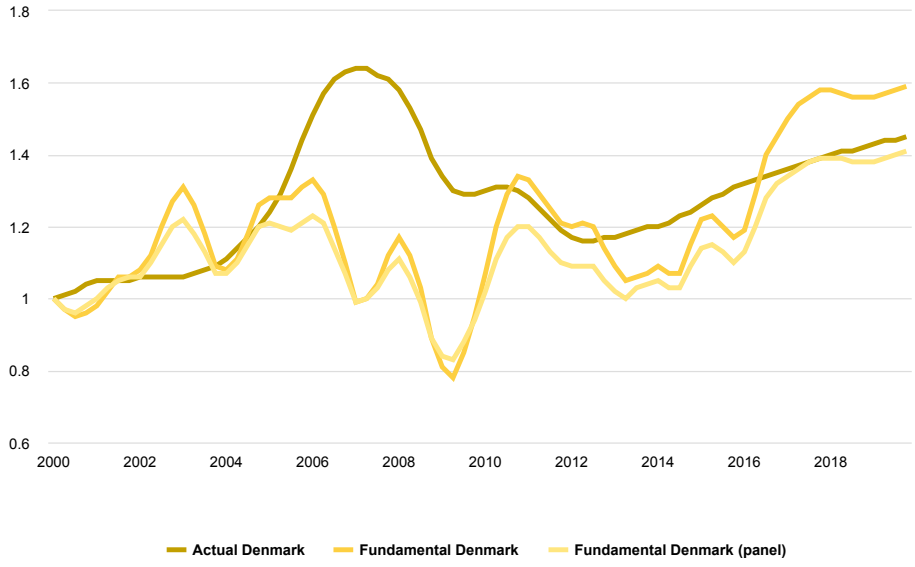


Figure A.1d Actual versus fundamental house prices: country-by-country analysis versus panel approach, Denmark



Note: The figures shows fundamental house prices when using country-specific estimates, fundamental house prices when using panel estimates, and actual house prices over the period 2000–2019. Fundamental prices are determined by income per capita, the housing stock per capita, and real after-tax interest rates. Both fundamental and actual prices are normalized to one in the first quarter of 2000. Detailed results on estimated coefficients are given in Table A.2.

Source: Own calculations.

Comment on A. K. Anundsen: House price bubbles in Nordic countries?

John V. Duca

The views expressed are those of the author and do not necessarily reflect those of the Federal Reserve Bank of Dallas or the Federal Reserve System.

This study nicely analyses Nordic house price trends in the 21st century. It finds that there was not a bubble in Nordic house prices before the Covid-19 recession, but rather slight house price overvaluations in Norway and Sweden and slight undervaluations in Denmark and Finland.

The author uses two complementary approaches that Anundsen (2019) has applied to U.S. data. The first is a more recent test for detecting bubbles and the second is a more conventional framework for estimating house prices. Both yield consistent results which shows how robust the findings are. The first approach applies Phillips et al. (2015a, 2015b) tests for exuberance and discusses the results that are well illustrated. Evidence of explosive dynamics is only found in Denmark and only in the lead up to the housing bust of the late 2000s, which accords with real house price swings that were sharper in Denmark than in the other Nordics in that earlier period.

The second approach is the inverted demand framework for house prices used by Meen (2001), which inverts a demand function for housing services, implying that house prices reflect supply and demand. Such models are feasible when good housing stock data are available as in the Nordics. The demand for housing is specified as mainly driven by interest rates and income, which is reasonable if credit standards are relatively stable (see Duca et al. 2011, forthcoming). This implicit assumption is likely true for the Nordics over the sample, which is after the house price boom and bust that was sparked by financial liberalization in the 1980s.

Because house prices adjust with a lag and are affected by nonstationary variables, the author uses cointegration and error-correction models to estimate house prices. In doing so, the author imposes a unitary income elasticity of housing demand and conducts tests that support the restriction in three of the four Nordic countries. Estimates indicate moderate overvaluation in Norway and Sweden and moderate undervaluation in Denmark and Finland, with the deviations of actual from

equilibrium house prices less than ten percent away from equilibrium. In cointegration models of asset prices that sluggishly adjust, such moderate-sized deviations are often found in other studies for non-bubble periods and are consistent with the finding of no explosivity using the tests of Phillips et al. (2015a, 2015b). As for what has driven Nordic house prices, the study finds a large role for interest rates in elevating house prices in recent years, which is illustrated by plots of estimated equilibrium house prices with a counterfactual equilibrium path in which the 2000 level of user cost was maintained throughout the sample.

This study nicely discusses how supply constraints contribute to low housing affordability and that reforming policy to address these constraints could both help stabilize housing cycles and make housing more affordable to young and lower income households. In contrast, while mandating tougher mortgage credit standards could stem high house prices and possibly bolster financial stability, it may reduce homeownership among the young and less affluent.

The paper's findings suggest three areas for future research. First, the Norwegian results suggest that conventional house price determinants might be supplemented by an energy price variable. The relatively slow estimated speed of adjustment (2.9 percent) for Norway (Table A.2) suggests that there may be an omitted variable and the deviations of actual from equilibrium house prices seem to slightly lag large swings in oil prices. Such swings could affect household perceptions of permanent income that are not fully reflected in current income – either because they alter expectations of pre-tax income or alter views of future tax rates that could be affected by oil-related swings in the size of Norway's sovereign wealth fund and its impact on public finance. For another energy-exporting nation, Canada, Killian and Zhou (forthcoming) find notable effects of real oil price shocks on house prices.

The second area for further research is improving the modelling of house prices in Finland, where the estimated equilibrium price of housing tends to exceed the actual over much of the sample and for long time periods. This is especially true for 2002-2011, when the Finnish economy may have still been integrating with European economies. Such a transition to a higher standard of living can plausibly induce expectations of increasing future income until the transition is perceived to end. In an inverted house price model that uses current income, it is plausible that the estimated equilibrium house price path could lag the actual during transitions when expected income exceeds current income. I wonder whether using measures of permanent and expected income for Finland could address this issue and result in improved models of Finnish house prices.

The third area of future research suggested by this study relates to Anundsen and Heebøll's (2016) finding that the effects of demand drivers – including credit standards – are larger on house prices in U.S. cities which have lower price elasticities of supply. The current study finds that Copenhagen is the only Nordic capital that displayed explosivity in the last two decades, which occurred during the runup of house prices in the early 2000s, but not in the late 2010s. One potential explanation is that homebuyers and lenders may have been chastened by the bust of house prices in the late 2000s and early 2010s. Regulation may have also played a role, as new macroprudential limits on lenders under Basel III may have prevented instability in Copenhagen's housing market (see Calmfors and Englund 2020, Duca

et al. 2019 and Rangvid 2020), where tight supply constraints make prices sensitive to shifts in demand.

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Comment on A. K. Anundsen: House price bubbles in Nordic countries?

Sverre Mæhlum

Views and conclusions expressed here do not necessarily represent the views of Norges Bank.

Detecting potential house price bubbles are important for many policy areas, in particular for financial stability. In the Nordic countries, the housing market is of particular interest for financial stability due to highly indebted households, with debt mainly consisting of mortgages and a large share of wealth consisting of housing. Large falls in house prices might give serious consequences for the real economy. Among others, the European Systemic Risk Board (ESRB 2019) have highlighted the vulnerabilities in the housing markets. In 2019, the ESRB issued a warning to Norway and recommendations to Denmark, Finland and Sweden about residential real estate sector vulnerabilities. In this context, detection of house price bubbles are useful for both assessment of vulnerabilities as well as informing policy decisions, such as macro-prudential policy.

The paper by Anundsen builds on his previous work in Anundsen (2019). The main contributions in this paper are: i) extending the analysis to Denmark and Sweden and update the analysis of Finland and Norway to the end of 2019, ii) testing for explosive developments in house prices in the Nordic capital cities, and iii) a closer look at effects on house prices of interest rate changes.

Testing for explosive developments in real house prices, he finds few signs of house price bubbles. The main exception is Denmark before the financial crisis, which seems reasonable. There are also signs of exuberance in Copenhagen in 2018 and 2019. This is not highlighted in the paper, probably because the house price growth in Copenhagen has been low in recent years.

Estimating fundamental house prices, he finds that there have been periods with signs of under- and overvaluation. The results suggest that house prices were overvalued in all countries in the years preceding the global financial crisis, but that prices quickly returned to equilibrium following the ensuing housing market bust. The rather slow growth in house prices in Denmark and Finland since the financial crisis are also consistent with the results, suggesting that house prices were undervalued in Denmark and Finland towards the end of 2019. However, strong house price

growth in Norway and Sweden seems to result in somewhat overvalued prices at end of 2019.

The estimated fundamental values are sensitive to some of the choices made. For example, the estimation period and coefficient restrictions are important. Ingholt and Mæhlum (2020) apply the same method on Norwegian data, but they allow the coefficients on income and house stock to be different. The house stock coefficient is not significant in this case. In addition, they estimate the interest rate effect before and after 1998 and find a quite large fall in the coefficient, from around 11 percent before 1998 (as Anundsen) to around 5 percent after 1998. The high coefficient before 1998 might be due to the banking crisis in Norway in early 1990s, with strong growth in house prices and credit before the crisis and large falls after. Different estimated coefficients also give a somewhat different development in fundamental values.

The developments in 2020 are not included in the analysis. Due to the Corona pandemic and the policy measures taken, this is a year of particular interest. House prices have increased in many countries, including the Nordic countries, from the end of 2019 to the third quarter of 2020, see Norges Bank (2020). Sharp increases in house prices since the spring of 2020 might lead to some signs of exuberance. At the same time, income growth has probably slowed in all countries during 2020, leading to slower growth in estimated fundamental house price values. On the other hand, interest rates have fallen in Norway, leading to an increase in fundamental values. The total effect for Norway seems to be that house prices are close to fundamental values in the third quarter of 2020.[26] However, it would have been interesting to see such updates for the other Nordic countries as well. Since interest rates were very low before the pandemic and their interest rate reductions have been smaller than in Norway, the estimated fundamental house prices may not have increased after 2019 in the other Nordic countries.

The paper ends with a useful discussion of effects of interest rate changes on house prices. The paper estimates effects of real interest rate changes on house prices for the other Nordic countries, applying the same methodology as for Norway. This is useful, since a comparison between studies done in each country usually do not apply the same methodology and, hence, results may not be directly comparable. The estimated effect of a change of one percentage point in the real interest rate differs, from less than 6 percent change in house prices in Sweden to more than 12 percent in Denmark. It should be added that the above-mentioned estimates for Norway before and after 1998 illustrates the uncertainty of such estimates. Interest rate effects on house prices is an important topic for further research. One would, for example, like to know to what extent very low interest rates have contributed to house price developments.

26. As mentioned in the paper, Housing Lab has updated the indicator quarterly suggesting that the gap between actual and fundamental prices has closed. The gap is also closed according to Norges Bank (2020), which is an updated version of Ingholt and Mæhlum (2020).

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Buy-to-let housing investors in the Nordic countries

Erlend E. Bø

Abstract

The last few decades have seen high population and housing price growth in the Nordic capital cities. The high prices have led to concerns about affordability of housing and unsustainable mortgage levels. Policy makers and media have argued that buy-to-let investors contribute to increasing prices. Simulations in a model with a buy-to-let sector suggest that this has been the case in some Nordic capital cities. However, high population growth creates price pressures independently of the presence of buy-to-let investors. Even the cities with rent regulations experience clear growth in both housing prices and rents.

Keywords: Housing prices, rents, rent regulations, housing search.

JEL codes: D83, R21, R31, R38.

1 Introduction

In the last few decades, housing demand in the Nordic capital cities has been high, and housing prices have seen large increases. This is likely connected with high population growth (Gyourko et al. 2013), due to inflow from less central regions, an international trend for urban living and EU enlargement. There are some differences between the cities. Reykjavík was harder hit by the 2008 recession, and its housing market is more impacted by tourism, while Helsinki has seen slower population growth than the other cities. But all Nordic capitals have had large population inflows and subsequent increases in housing prices.[27]

The high housing prices have led to worries that housing is becoming increasingly unaffordable for low and middle-income inhabitants, and that the high level of mortgage debt needed to finance housing purchases leads to risks in the financial system. Buy-to-let housing investors have been a special concern in policy circles in many countries, due to worries that they amplify price increases, and are vulnerable to negative interest rate and price shocks (Bank of England 2015, Reserve Bank of New Zealand 2016, Reserve Bank of Australia 2017, De Nederlandsche Bank 2018, Norges Bank 2020). Housing investors are also often pinpointed as price drivers by the media. Buy-to-let investors are defined here as investors who buy housing units for letting them out.[28]

In the housing literature, different mechanisms are proposed to explain the high volatility of housing prices. It is a common observation that housing prices are more volatile than can be explained by fundamentals such as income growth. In a previous paper (Bø 2020), I argue that observed shocks to population inflow can create substantial volatility in a search model with buy-to-let investors. The presence of buy-to-let investors and a rental market amplify the frictions in the search model and create larger price responses to increased housing demand. Central to the model are rental prices that react to demand and housing investors competing for the same houses as owner-occupiers. The model, calibrated with data from Oslo, can explain a large share of the increase in housing prices in Oslo in the housing boom period 2007–2014.

This paper expands on Bø (2020) to give an overview of the presence and impact of buy-to-let in the housing markets of the Nordic capital cities: Copenhagen, Helsinki, Oslo, Reykjavík and Stockholm. Here, I explore to which extent changes in housing prices in different cities can be explained by population growth and amplification by buy-to-let investors. There are significant differences in the structure of housing and rental markets between the Nordic countries. For example, condominiums are common in Norwegian cities and almost non-existing in Finland and Sweden. Finland, Iceland and Norway have mostly unregulated rent setting, Sweden has a system of collective rent bargaining, and Denmark has a large non-profit rental sector. These differences are likely to matter for prices, rents and ownership structure. I apply the buy-to-let model of Bø (2020) to data from Helsinki, in addition to Oslo, and a version of the model without a buy-to-let sector to data from Stockholm. The buy-to-let model is well suited to Helsinki and Oslo, which have few

27. See Torstensen and Roszbach (2019) for a coverage of Oslo and Stockholm.
28. The definition used in this paper is not dependent on financing the property with a specific buy-to-let mortgage. A discussion of the differences between small-scale private investors and larger commercial firms follows in Section 3.

rental regulations. The model without a buy-to-let sector can match some, but not all, of the high Swedish price growth. However, it is unable to explain observed rent increases. Comparing simulations from the models with and without a buy-to-let sector indicates that the combination of freely set rents and buy-to-let investors increases price growth by around 60 percent compared to a market with constant rents and without a buy-to-let sector during periods of relatively high population inflow.

Section 2 discusses data sources, and presents descriptive evidence on the population growth of the Nordic capital cities and on housing price and rent developments over the period 2000–2019. I present some institutional details, such as rent regulations, and the size and development of the commercial rental sectors in Section 3. In Section 4, I discuss previous research on buy-to-let. Section 5 presents the model from Bø (2020), and applies it to compare the impact of buy-to-let in two different systems, (Helsinki and Oslo versus Stockholm). Concluding remarks are presented in Section 6.

2 Descriptive statistics

2.1 Data

Unless otherwise noted, the data in this paper are collected from databases of the national statistical offices of the respective countries i.e., Statistics Denmark, Statistics Finland, Statistics Iceland, Statistics Norway and Statistics Sweden.[29]

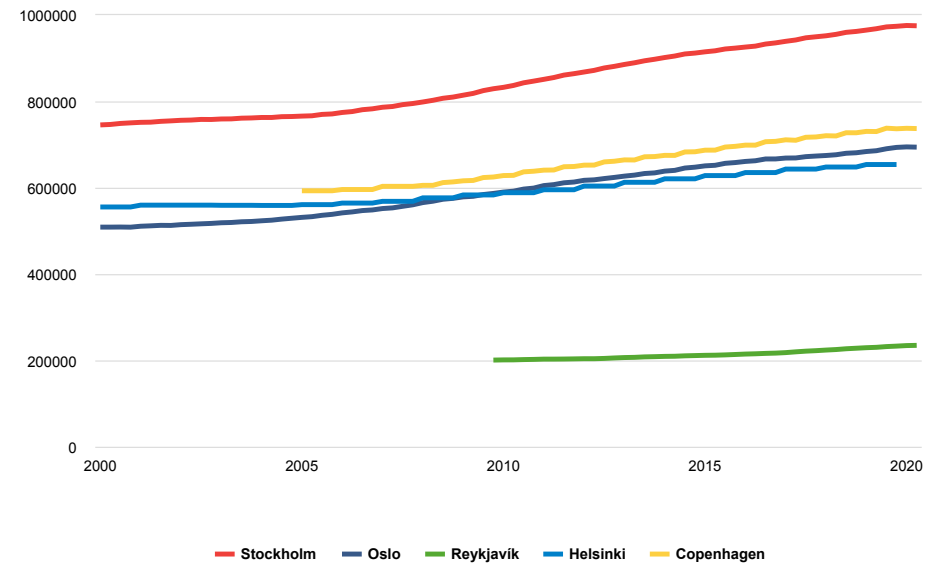
Although I mostly use the administrative (municipal) borders of the respective cities, some statistics are only available for other geographical areas. Where I have not been able to find the required data from the statistical offices (such as a price index for Swedish apartments), I have tried to find other sources, such as municipal governments or private companies.

2.2 Population, housing prices and rents

Here, I show the development of population, housing prices and rents from 2000 (or when available) to 2019.

29. Statistics Denmark StatBank: https://www.statbank.dk/statbank5a; Statistics Finland StatFin: http://pxnet2.stat.fi/PXWeb/pxweb/en/StatFin; Statistics Iceland Statistical database: http://px.hagstofa.is/pxen/pxweb/en; Statistics Norway StatBank: https://www.ssb.no/en/statbank; Statistics Sweden Statistical database: http://www.statistikdatabasen.scb.se/pxweb/en/ssd.

Figure 1 Population growth in Nordic capitals



Note: Quarterly population (yearly for Copenhagen before 2008 and for Helsinki) of Nordic capital cities. Population is measured at the municipality level, except for Copenhagen, which consists of the municipalities of Copenhagen and Fredriksberg, and Reykjavík, consisting of the capital region.

Source: Statistics Denmark, Statistics Finland, Statistics Iceland, Statistics Norway and Statistics Sweden.

Figure 2a Average yearly population growth in Nordic capitals, from 2000 (or start date)

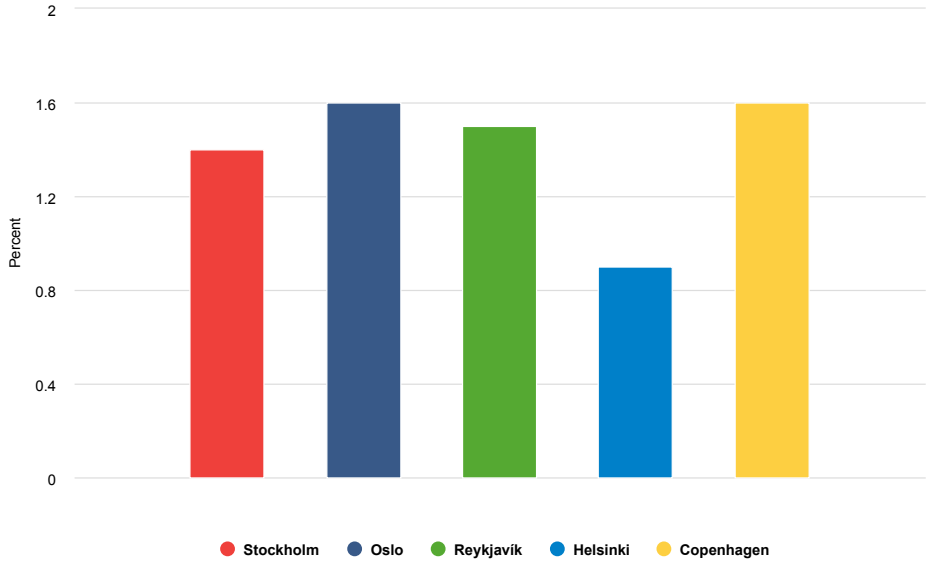
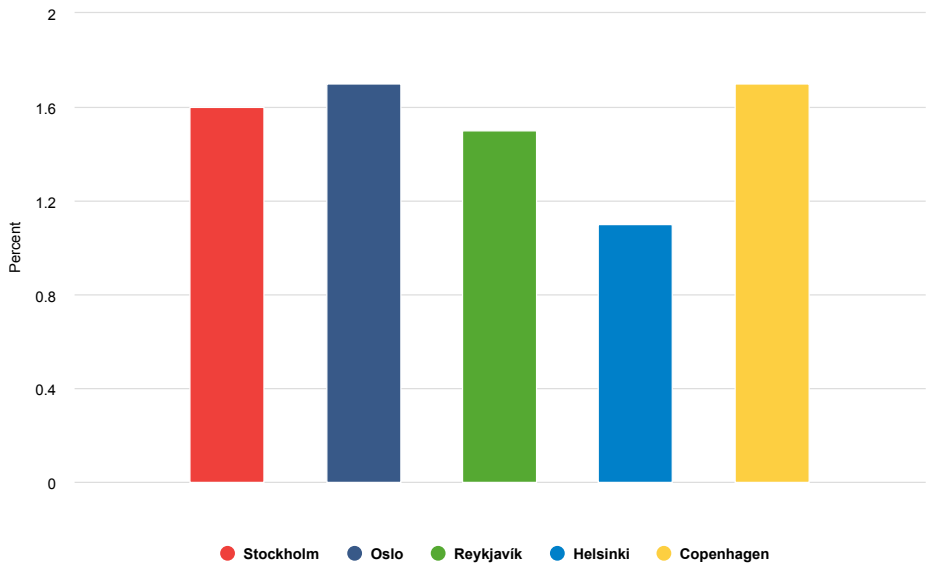


Figure 2b Average yearly population growth in Nordic capitals, from 2010

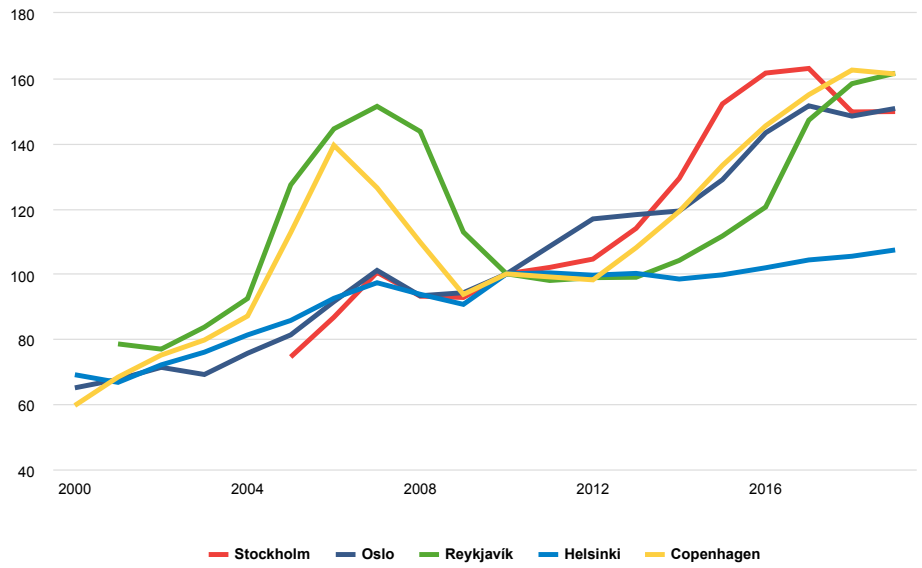


Note: These two graphs show average yearly percentage population growth. Figure 2a uses 2000, or first available year of data as starting point (2005 for Copenhagen, 2010 for Reykjavík), while Figure 2b shows growth from 2010 for all cities. Population is measured at the municipality level, except for Copenhagen, which consists of the municipalities of Copenhagen and Fredriksberg, and Reykjavík, consisting of the capital region.

Source: Statistics Denmark, Statistics Finland, Statistics Iceland, Statistics Norway and Statistics Sweden.

In the years since 2000, the populations of the Nordic capital cities have seen strong growth, see Figure 1. The average yearly percentage growth in population is shown in Figure 2a and 2b. Since 2010 (Figure 2b), all cities have had a yearly population growth of more than one percent, with Oslo and Copenhagen as the fastest growing cities. Helsinki has grown markedly slower and is the only city with an average growth less than one percent (Figure 2a).

Figure 3 Real housing price indices for Nordic capitals



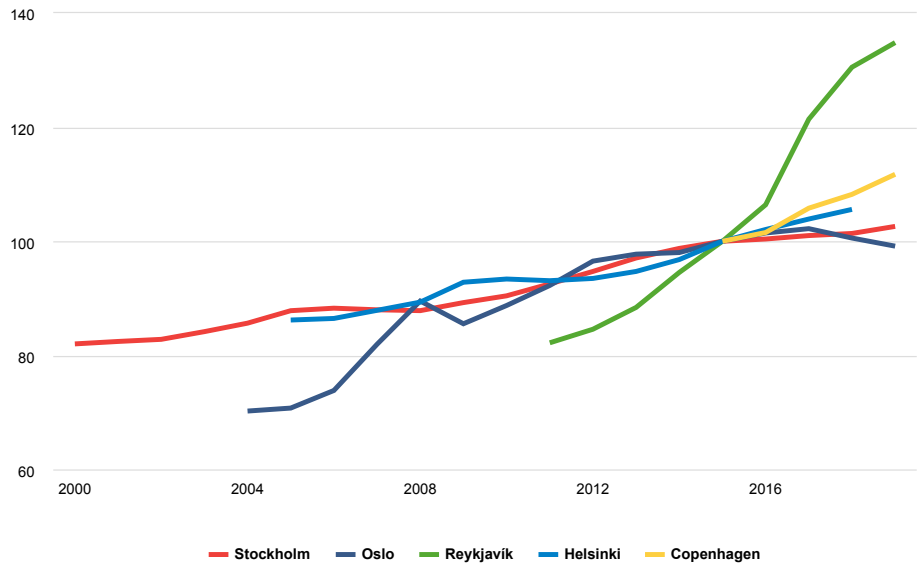
Note: The indices are adjusted for inflation using HICP, 2010=100. Due to methodological differences between indices, comparisons between cities may not be straightforward.

Source: Own calculations. See Appendix for discussion on data sources and aggregation of sub-indices.

Housing price indices for the different cities are shown in Figure 3. The figure shows inflation adjusted price indices for all housing, but for some of the cities I have had to aggregate several indices, as no aggregate price index is available. Details on how I construct these indices are found in the Appendix.

Housing prices grew fast before the financial crises in all cities. Copenhagen and Reykjavík had particularly high growth, but were also more affected by the crisis. From around 2010, prices have again been growing quite fast, except towards the end of the period. The exception is Helsinki, where there has been almost no real price growth since 2010.

Figure 4 Real rent indices for Nordic capitals



Note: The indices are adjusted for inflation using HICP, 2015=100. Due to methodological differences between indices, comparisons between cities may not be straightforward.

Source: Own calculations. See Appendix for discussion on data sources and aggregation of sub-indices.

Rent statistics are usually less methodologically advanced than housing price statistics. The indices used in this paper are mostly based on average yearly rent per square meter, which does not control for composition changes (smaller flats generally have a higher rent per square meter). With that caveat, inflation adjusted rental indices for the capital cities are presented in Figure 4 (details on the different rental indices can be found in the Appendix).

As can be seen from Figure 3 and 4, rents are clearly less volatile than prices.[30] They mostly grow slowly and steadily, though there are some episodes of very fast growth, as in Oslo 2006–2009 and Reykjavík 2014–2019. Stockholm and Copenhagen have different forms of rent control. Rents are set freely (for the most part) in Helsinki, Oslo and Reykjavík. No clear differences in rent developments are visible between capitals with and without rent control, but the number of observations is low.[31]

30. The comparison may overestimate differences in volatility as most rent indices measure the average rent over all rental contracts, not rents of new contracts. To the extent that rents are sticky over time, average rents are less volatile than new rents.
31. These indices only show growth. The rent level may well be more affected by rent control than the growth rate.

3 Institutional framework

In this section, I give a quick overview of housing regulations affecting housing ownership, transactions and rents in the Nordic countries, as well as available data on the distribution of ownership and rental housing in the respective capitals. There are differences in types of housing ownership, transaction rules, and rent regulations.[32] The most important features are summarized in Table 1. For an overview of housing policies in the OECD, including all Nordic countries, see Andrews et al. (2011).

Throughout the paper, I separate the rental market into commercial and non-commercial, where commercial is for-profit rental housing (owned either by private persons or corporations) and non-commercial is municipal, subsidized or non-profit rental housing. The term buy-to-let investor is often (including in Bø 2020) reserved for individual investors, but here I use the term buy-to-let investors to include individuals as well as corporations unless otherwise noted.[33]

3.1 Denmark

Denmark has two sorts of housing ownership, regular ownership and ownership through cooperatives.[34] Cooperative apartments are price controlled, with a maximum price usually set by estimating what the value would be as a rental apartment (Rasmussen & Sandager 2019). There can also be restrictions on subletting apartments in cooperatives. The rent is regulated when subletting is allowed. About 23 percent of housing units in Copenhagen[35] are owner-occupied and 33 percent are owned by cooperatives.

Non-profit rentals (*almene boliger*) are common in Denmark. Slightly more than 20 percent of the total number of housing units in Copenhagen are non-profit rentals. The construction of such units is subsidized, and rents are not market based. Another 20–22 percent of housing units are private rentals. Rents in private rental units in Copenhagen are restricted by law to be comparable to similar rental units, with some exceptions, i.e. recently built units (København kommune 2020). There is also a possibility to increase rents after renovations, a possibility that is said to be used (or misused) by investors (Transport- og Boligministeriet 2019).

The rental market in Copenhagen has increasingly been dominated by large corporations buying portfolios of rental buildings (Cushman & Wakefield RED 2019). Such corporations have been accused of strategical renovation to be able to increase rents. Their alleged proclivity for this practice has recently led to changes in Danish rent regulations (DR 2020). The share of housing units owned by corporations increased from 9.4 to 13.2 percent of the housing stock (30 000 to 46 000 housing units) between 2010 and 2019, while there was a small decline in the share owned by other investors, from 10.5 to 9.3 percent. In total, the share of the housing stock in

32. In this limited overview, I do not discuss tax systems, supply regulations or several other factors that might affect housing markets in the capitals.
33. This is discussed in more detail in Section 4.
34. Formally, ownership of a cooperative apartment gives the owner the right to occupy a given apartment owned by the cooperative.
35. The numbers on tenure status in this section are for the Copenhagen city province (the municipalities of Copenhagen, Fredriksberg, Dragør and Tårnby).

Copenhagen owned by for-profit landlords has increased from 19.9 to 22.5 percent.

3.2 Finland

Prices of houses and apartments are set freely. Finnish apartments are mostly organized as cooperatives. Rents are also freely set, with no regulations on price, price growth or term.

In Helsinki, the share of rental housing is 49 percent. Of these, 40 percent are subsidized, mainly municipally owned, while the remaining are commercial. The ownership structure of commercial rental units in Helsinki is unknown. Nationwide, about 55 percent are owned by small-scale private investors and the rest by corporate investors (KTI Finland 2019).

In the period from 2006 to 2017, the number of buy-to-let housing units in Helsinki increased from around 20 000 to 33 000 (Kannisto 2019).[36] This represents an increase from 6.9 to 10.1 percent of the housing stock. The corporate rental sector increased from 18.6 to 19.6 percent of the housing stock (54 000 to 64 000 housing units) in the same period. Total commercial rental housing thus increased from 25.5 to 29.7 percent of the housing stock in Helsinki.

3.3 Iceland

Iceland has a high home ownership share. Even in Reykjavík, 73 percent of households live in owner-occupied housing (down from over 80 percent before the financial crisis). Around 15 percent of households live in rental apartments owned by corporations and individual investors (up from 10 percent before the financial crisis).[37] The remaining share of households live in subsidized rental housing. There are no price restrictions on housing prices. Limits on short-term rentals (like Airbnb) have recently been introduced, but there are few other rental regulations.

From around 2010 on, there has been a boom in tourism to Iceland and Reykjavík. This has led to an increasing number of Airbnb rentals. At the end of 2017, roughly 1 200 housing units in Reykjavík (1.4 percent of the housing stock) were estimated to be full time Airbnb rentals (Elíasson & Ragnarsson 2018). The same authors estimate that around 15 percent of housing price growth over the period 2014–2017 can be connected to the growing Airbnb market. The study by Elíasson and Ragnarsson (2018) does not give any estimates on the Airbnb effect on rents. For Barcelona, Garcia-López et al. (2020) finds the effect on rents to be roughly half the effect on housing prices.

36. Where buy-to-let is defined as housing units that are not owner-occupied, but owned by private persons who also report rental income.
37. The share of commercial rental housing owned by small investors is unknown.

3.4 Norway

Housing units are sold freely on the market. Apartments are either condominiums or owned through cooperatives, which may have rules regulating subletting.

In Oslo, around 30 percent of households are renters. The non-commercial rental sector are small. Around 13 000 housing units (less than four percent of the housing stock) owned by the city, and there is some student housing. The remaining rental market is commercial. Rents are set freely. There are restrictions on rent increases within a rental term, but rental periods are generally short (the normal period is three years), and there are no restrictions on rents in new contracts.

Most rental housing is owned by private landlords. Nationally, only around 10–15 percent of rental housing is owned by corporations or organizations (Sandlie & Sørvoll 2017). During the period 2013–2019, the share of secondary housing in Oslo has been quite stable at around 17 percent of the housing stock, or 55 000–59 000 units (NEF 2020). Around 20 percent of housing buyers in Oslo over the period 2007–2014 were buy-to-let investors.

3.5 Sweden

Price setting is free for houses and apartments. Most Swedish apartments belong to housing cooperatives, which usually do not allow subletting except for specific reasons and for a limited period.[38] Swedish rents, both in private and municipally owned housing units, are regulated. Rents are determined by collective bargaining between the tenants' association and landlords and apply to all tenants (Hyresgästforeningen 2020). Rents are in principle based on the so-called use value of an apartment, which in practice also means that comparable apartments should have equal rent. The same rules apply to sublets. Thus, there is limited room for rents to respond to demand.

In Stockholm, around 60 percent of households own their housing (directly or through a cooperative), while the remaining 40 percent rent, almost all from either private or municipal housing corporations (with roughly equal shares). The limitations on subletting and rent setting mean that the market for private buy-to-let investors is very small.[39] The share of housing units owned by corporations in Stockholm was stable at around 20 percent over the period 2013–2019 (increasing in number from 83 000 to 92 000), but total commercially owned rental properties decreased from 24.7 to 23.5 percent of the housing stock due to fewer private investors.

38. Condominiums were allowed in 2009 but very few have been built.
39. Nationwide, 2 percent of households were subletting in 2013. Statistics for Stockholm are not available, but the share is likely significantly higher. Long-term buy-to-let is likely confined to single-household houses. A small fraction of cooperative and rental housing is sublet for specific reasons and a limited period, such as trial cohabitation and work elsewhere. A 2014 rule change loosened the restrictions on subletting somewhat, going from requiring notable reasons to allow subletting to requiring reasons to allow subletting. Still, buy-to-let investors cannot assume that they will be legally allowed to sublet a cooperative apartment long-term. Illegal subletting does occur at some scale (SOU 2017).

Table 1 Summary of institutional differences

	Copenhagen	Helsinki	Reykjavík	Oslo	Stockholm
Rent control	Partial	No	No	No	Yes
Ownership type suitable for BTL	Partially	Mostly	Yes	Mostly	No
Small private investors as landlords	< 0.5	< 0.5	Common	> 0.5	Rare
Owner-occupier share**	0.56	0.51	0.73	0.69	0.61
Private rental share*	0.23	0.3	0.13	0.27	0.23

Note: This table summarizes the most central information in Section 3.1–3.5. Data for the municipalities of Helsinki, Oslo and Stockholm, while Copenhagen covers the Copenhagen city province and Reykjavík the capital region. ** In the last year available in data, including cooperatives. * In the last year available in data.

4 Related literature

Buy-to-let investors are motivated by the return they can get on the rental market. They are thus a different sort of investors than so-called flippers (Bayer et al. 2020), who intend to quickly re-sell at higher prices. Only a few papers have previously analysed the role of buy-to-let investors, empirically or theoretically.

Scanlon et al. (2016) and Bracke (2019) describe the buy-to-let market in the UK, and England and Wales respectively. In the UK, buy-to-let investors are mostly individuals intending to hold the investment long-term for the purpose of having extra retirement income (Scanlon et al. 2016).[40] The importance of a well-functioning private rental sector is emphasized by Scanlon et al. (2016). Neither study offers any explicit modelling of the interaction between buy-to-let and housing prices.

Bracke (2019) reports that the share of the housing stock owned by buy-to-let landlords increased from 9 to 19 percent in the period 2000–2013.[41] The study finds that buy-to-let housing units are relatively small, are mostly found in large, well-performing housing markets, and buy-to-let investors are less likely to sell their property over the next six years than other buyers. In the Nordic countries, the Norwegian buy-to-let sector seems most similar to the English.

Only very few papers model the buy-to-let market. Sommer et al. (2013) explores

40. Scanlon et al. (2016) also describes the development of buy-to-let in the UK and gives a detailed description of the tax system for private renters in the UK, as well as short overviews of some other countries (of which Denmark is the only Nordic country).
41. Sprigings (2008) reports a share of buy-to-let transactions in the UK of around 20 percent in the years before the financial crisis.

the role of credit constraints, down payment requirements, and income growth when housing prices and rents interact. The model can explain high housing prices and a more modest rent increase consistent with data for the US, but only half of the increase in the price-to-rent ratio during the housing boom of 1995-2006. The paper does not quantify the size or development over time of the buy-to-let sector.

Bø (2020) investigates the size of the buy-to-let share of the housing market, and how the share is related to the housing cycle. Based on transactions microdata from Oslo, the share of buy-to-let investors fluctuates between 15 and 25 percent of total transactions in the period 2007–2014, and seems to be pro-cyclical.[42] These empirical observations serve as input for a housing search model (in the mould of Wheaton 1990 and a number of later papers) with buy-to-let investors and a rental market. The calibrated model can explain the high observed price volatility. It can also explain the high share of investment buyers found in the data, and fits qualitatively with a number of unmatched moments, such as the correlation of rents and housing prices, although it severely underestimates transaction volatility. The model matches the price growth, and much of the increased price-to-rent ratio in a housing boom, without any role for factors such as exogenous shocks to credit supply. The boom is driven by an exogenous increase in population inflow, which increases demand for both owned and rented housing, with housing price increases amplified by search frictions as more investors enter the market.

Bø (2020) also shows positive, but small welfare gains from taxing buy-to-let investment, which result from a redistribution of housing units from low utility renters to higher utility owners as the ownership share increases. The welfare analysis may underestimate welfare gains, since the tax reduces housing prices and price volatility. This does not matter in the model, but may be positive for financial stability and for agents if they are risk-averse. However, fewer non-owners will be able to rent, and if vulnerable renters lose their housing, they may be negatively affected.

The focus in Bø (2020) is on individual buy-to-let investors, i.e. individuals buying secondary housing units. This was a choice made partly because individual buy-to-let investors were the prevalent investor class in Oslo during the period of study. As we have seen, this does not hold for all Nordic capitals. Individual investors are mostly competing with non-investor buyers for housing units. Housing corporations, on the other hand, often buy or whole buildings or portfolios of buildings, and thus do not compete as directly with non-investor buyers. In a modelling framework with search frictions (as in next section), the addition of buy-to-let investors competing with owner-occupier buyers increases housing prices.

5 Model and results

In this section, I summarize the buy-to-let model in Bø (2020), before using it on data for Helsinki, Oslo and Stockholm. The basic idea is that owners of a housing unit can become landlords by investing in a second unit. Their incentives to do so are

42. Buy-to-let investors are defined as buyers who buy a second (or subsequent) house, and retain that house, as well as at least one previous house for a period of above 12 months.

determined by the expected rental return. Rents are determined by the demand and supply of rental housing. When there is high population inflow, this increases demand both in rental and buyer markets. The increase in rental demand will also increase the number of investors, which through competition with other buyers increases buyer demand and thereby housing prices even more.

The model is based on standard housing search and matching models (a recent survey of the literature is Han and Strange 2015). In search and matching models (which are common also in modelling labour markets), search frictions hinder the efficient matching of buyers and sellers found in Walrasian markets. Markets thus clear over time as well as through prices. It is reasonable to think that there is so much heterogeneity between housing units (much of it only observable on site) and so many housing units for sale at any point in time that buyers have difficulties finding the housing unit best suited for them.

This friction is modelled as a matching process, where the number of random matches between buyers and sellers in each period is determined jointly by the number of buyers and sellers. Each buyer visits the matched housing unit and finds out how well it matches the buyer's preferences (by drawing a random match quality). Housing heterogeneity is modelled through this match quality, which is specific to each buyer-housing unit match. Agents are in other respects homogeneous and risk-neutral, and housing units are homogeneous. The transaction price is determined by bargaining between buyer and seller.[43] If the buyer's match quality is too low there is no transaction, as the housing unit is worth more to the seller than to the buyer. With high housing demand (many buyers relative to sellers), the value of being a seller is higher, as sellers can expect high demand also in next period; the required match quality that gives a buyer higher valuation than the seller thus increases. A higher required match quality increases housing prices through the bargaining and leads to persistence of market conditions.[44] Because a lower share of matches leads to transactions in high demand markets, excess demand and high prices last over multiple periods.

In the model from Bø (2020), owners can buy a secondary housing unit to let out and rents are determined in the model in a frictionless rental market where non-owners meet landlords.[45] Rental prices then equal the willingness to pay for rental housing by the marginal renter. Non-owners have a heterogeneous willingness to pay for rental housing.[46] If there are more non-owners than rental units, the non-owners with a willingness to pay lower than the rent do not get any housing. They can be thought of as people sharing flats with others or living in their parents' household and do not pay any rent. The relative number of prospective renters to rental units determines rent in the model, and this number changes over time.

In the model, there is a distribution both over the per-period utility to owning (match quality) and renting (heterogeneity in the returns to rent). The utility of owning is higher on average than the utility of renting, which means that non-owners are interested in buying housing.[47]

43. Complete information Nash bargaining.
44. Thus, standard search models, which implicitly or explicitly feature constant rents, have a price-to-rent ratio that increases with housing demand.
45. For simplicity, they can only buy one additional housing unit. Kannisto (2019) finds that Finnish buy-to-let housing is mostly held by small investors, with 200 000 units (nationwide) owned by 172 000 persons.
46. If the willingness to pay were homogeneous, rents would only have two possible values, either the common willingness to pay or 0, depending on whether there were more renters or landlords. The willingness to pay is distributed through draws from a random distribution.
47. This is not an assumption in the model, but a result of the calibration. Outside the model, tax advantages,

Agents in the model do not choose when to sell, but are hit by random mismatch shocks, which make them unhappy with their current housing unit (this also holds for landlords, who are matched with their primary housing). Thus, investors in this model are motivated by rental income. Although their total return also depends on the expected capital gain, they are not able to time selling to when the price is high.

The population inflow to the city fluctuates over time, and inflow shocks drive the dynamics of the model.[48] The outflow is constant and equals average inflow, so the population is stable over time on average. The housing stock is fixed. Value functions, descriptions of the matching and transaction processes, and further details can be found in Bø (2020).

The buy-to-let model has two additional mechanisms that increase price volatility compared to a 'standard´ search model with constant rents and no landlords. First, the endogenous, demand driven correlation of rents and housing prices makes it more attractive for non-owners to buy in 'hot' markets than if rents were constant. If they remain on the rental market, they will face higher rents, and therefore their willingness to pay for housing increases. Second, it is more attractive to invest in buy-to-let in periods with high rents, as the rental return is higher. The additional buy-to-let investors increase the total number of buyers, amplifying the effect of high demand on housing prices. The increased competition for housing due to additional investors drives up the price-to-rent ratio as the required match quality for a transaction increases.

The model is solved for different combinations of parameters, and then simulated over a sequence of inflow shocks, which correspond to the real inflow over the 30 quarters 2007q1–2014q2.[49] A number of pre-determined moments from the simulations, such as the share of investment buyers, are calculated, and compared with the same moments from real data to find the parameter vector which gives the closest fit.

The model lacks a role for interest rates, mortgages and mortgage regulation, and housing supply, all of which have been shown in the literature to be important for housing price development. It is not meant to give a full explanation of all forces driving housing prices, but to illustrate to what extent population inflow is able to affect prices in a model with housing investors and search frictions.

5. 1 Helsinki, Stockholm and Oslo

The model is applied to Helsinki, Oslo and Stockholm. Copenhagen would be hard to fit to the model, with three different rental regimes and two types of price setting for owner-occupied housing. While Reykjavík housing market is regulated similarly to the markets in Helsinki and Oslo, it was hard hit by the financial crisis, which strongly affected the housing market through mortgage defaults. The present buy-to-let

tenure security and negative selection of neighborhoods with rental units may all be reasons for a preference to own.

48. A sequence of high inflow shocks will lead to high housing demand.
49. I use the method of simulated moments (MSM). A number of parameters are calibrated directly against suitable data, and some are given values commonly used in the literature. The remaining parameters are calibrated using MSM against six data moments: mean rent to housing price ratio; coefficient of variation of rents; coefficient of variation of housing prices; mean investor share of buyers; coefficient of variation of the investor share of buyers; mean housing turnover rate.

model is not suited to deal with such shocks. There are obviously many other differences between these cities, such as tax systems, supply regulations, geographical constraints and interest rates, which all may impact prices and rents.

In the simulations, I use the parameters calibrated for Oslo, assuming they hold for the three cities involved.[50] The inflow shocks are however specific to each city. For comparability, I use a similar length of simulation as in Bø (2020): 30 quarters, from 2007q1 to 2014q2.[51] I have gross inflow data (domestic plus foreign in-migration as a share of the total population) for Helsinki and Stockholm in addition to Oslo. For Helsinki, the available data is yearly. I split the yearly inflow into four equal quarters, possibly decreasing measured volatility. The monthly data available for Stockholm is aggregated into quarters and adjusted for seasonal effects. The pre-shock simulation periods use inflow with mean and variance based on the period 2000–2006 for the respective cities. Outflow is assumed constant over the period and equals mean inflow for the period 2000–2006 for each city.

In the model, prices are continuously increasing during periods of high gross inflow, as the only driver of prices is the inflow shock. In the real world, housing prices fluctuate for many other reasons, such as the business cycle, credit supply and seasons. The model is based on quarterly data, but the data on prices and rents is yearly. I approximate housing prices and rents from 2007q1 as the average of data from 2006 and 2007, and for 2014q2 as 2014. This may introduce measurement errors in the rates of increase as shown below.

The model is first applied to Helsinki. In many ways, the Helsinki housing market should be well suited for the model, as there are few rent regulations, and an institutional framework similar to that in Oslo. An important difference is that Helsinki had a lower population inflow than Oslo during the simulation period.

50. This is certainly a strong assumption, as e.g. the rate of mismatch shocks may depend on age structure, and bargaining weights may differ depending on bids being binding or not. However, several of the moments needed for recalibration of the model are lacking in the data available for Helsinki and Stockholm.
51. Bø (2020) does not model housing supply. As housing stock and (average) population in the model are constant, one can implicitly assume that housing supply grows with average population growth. The longer the period of a population boom being simulated, the more problematic is the choice not to model housing supply responses.

Figure 5a Results, housing prices

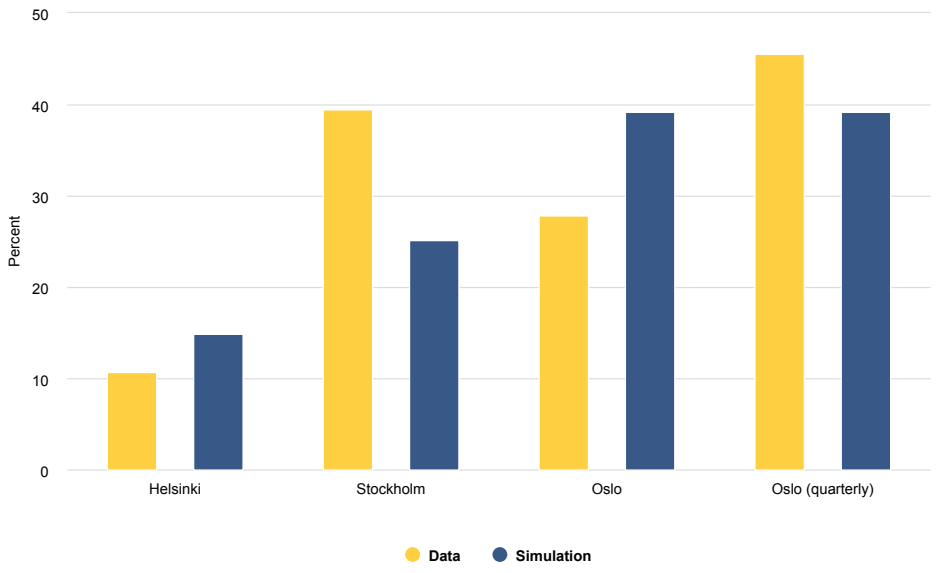
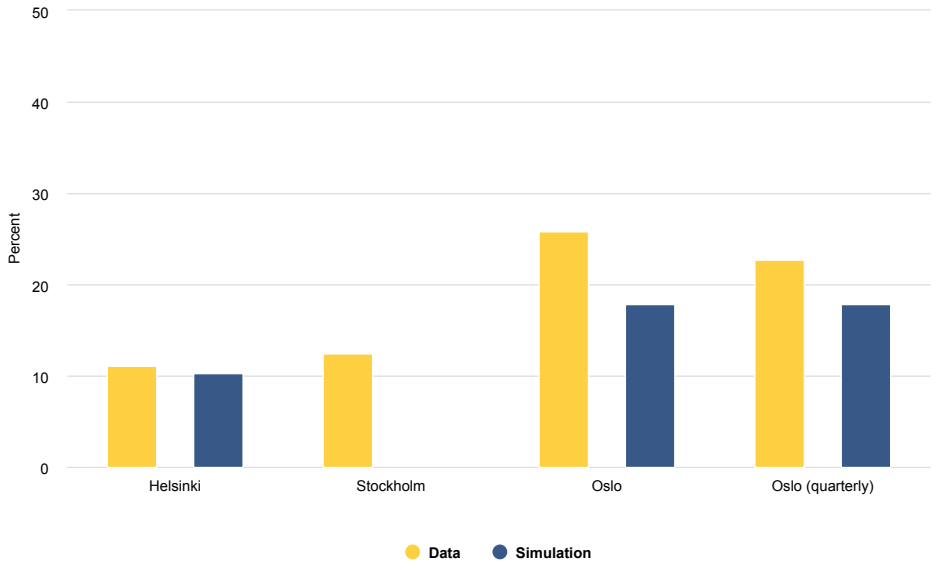


Figure 5b Results, rents



Note: These two graphs show the housing price and rent increases in data and simulations. The bars marked Oslo (quarterly) are the results from Bø (2020).

Source: Statistics Finland, Statistics Norway, Statistics Sweden, Bø (2020) and own calculations.

As shown in Figure 5a and 5b, prices and rents are simulated to increase by respectively 14.9 and 10.3 percent in Helsinki, compared to actual increases of 10.7 and 11 percent. The share of buy-to-let housing units increases from 16.4 to 17.3 percent, while the observed share (based on Kannisto 2019) increased from 8.9 to 11.6 percent over the same period, excluding government-subsidized rental housing from the housing stock.[52]

Stockholm has a very different rental market that necessitates some changes to the model. I assume that housing owners cannot invest in secondary housing to let out.[53] In the model there are only buyers, owners and sellers, as in a standard search model. Implicitly, this model includes a rental sector with constant rents, that does not interact with the owner-occupier housing sector. Rents are set at 85 percent of the simulated rent in the baseline (Oslo) model in 2007q1, based on a comparison of 2005 PPP adjusted rent levels between Norway and Sweden in Andrews et al. (2011). The model assumes that all non-owners have access to this implicit rental market. It may thus underestimate the effect of excess demand for rental housing on housing demand.

Running the model with these assumptions, and with the population inflow to Stockholm in 2007q1 to 2014q2, housing prices are found to increase by 21.9 percent, while rents are by assumption unchanged. Actual prices increased by 39.4 percent and rents by 12.4 percent. The results are shown in Figure 5a and 5b. The model thus underestimates the price increase, but even in a model with no rental growth, the inflow to Stockholm is high enough to increase housing prices substantially. More advanced modelling of rent-setting could improve the model fit, as data show that real rents are clearly increasing. With some room for rents increasing because of high demand, prices would likely increase more, as discussed earlier in Section 5.

The sizable commercial rental business in Stockholm is not modelled here, but it is interesting to think of their economic model. With constant rent, as assumed in the model, buy-to-let investors would lose out if competing directly for housing against owner-occupier buyers in high demand periods. Rental housing is here assumed completely separate from owner-occupied housing. However, there is certainly some substitutability between rental apartments and cooperative apartments. The large commercial firms owning most of the private rental housing in Stockholm may be able to buy housing cheaper through large scale purchases, exploit efficiencies in management and maintenance, or achieve higher rents through size leverage in rent bargaining.

The simulation results for Oslo are shown in the third group of bars in Figure 5a and 5b, together with actual housing price and rent data. Prices and rents are simulated to increase by 39.2 and 17.8 percent, compared to actual increases of 27.9 and 25.4 percent based on yearly data. The share of buy-to-let housing is simulated to increase from 16.2 to 18.2 percent. The actual share of secondary housing was 17.1 percent of the housing stock in Oslo in the final quarter of 2013 (NEF 2020).

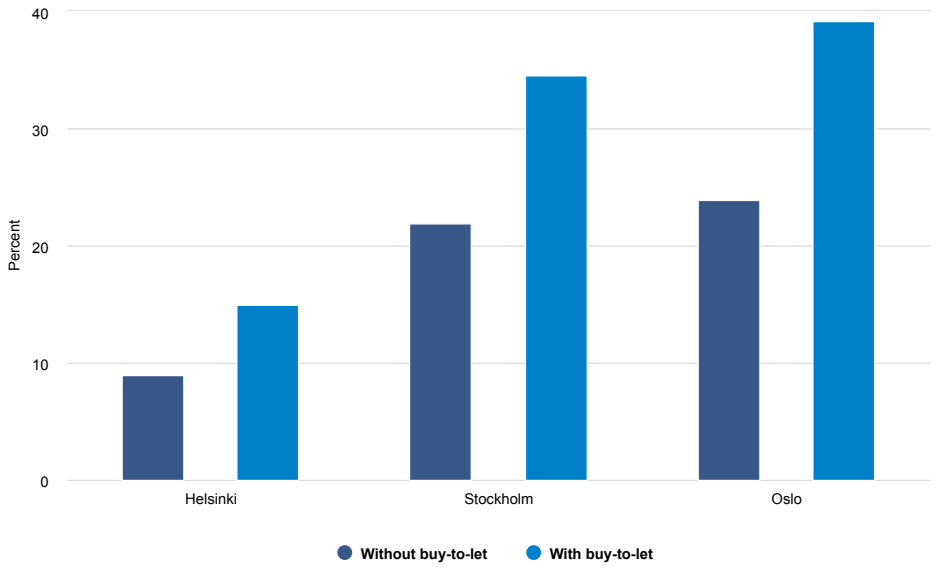
The last pair of bars in Figure 5a and 5b compares the simulation results for Oslo with quarterly data (from Bø 2020). The fit is clearly better. Housing prices increase a lot less using yearly data than quarterly data, while rents increase more using the yearly measure. This should be seen as a caveat; yearly data may not accurately measure the relevant outcomes.

52. From 7 to 9.1 percent of total housing mass including subsidized rental housing.
53. Owner-occupied, detached housing can easily be let out, but apartments, which are more attractive as rental units, are cooperatively owned. They can only be sublet for specific reasons and limited periods.

Next, I look at the effect on prices and rents of the *existence* of a buy-to-let sector compared to *not* having a buy-to-let sector within this modelling framework. Figure 6 shows the results of simulating the counterfactual of having no buy-to-let sector in Helsinki and Oslo, and of having a buy-to-let sector in Stockholm.[54]

As shown in Figure 6, the housing price effect in the model without a buy-to-let sector is only around 60 percent as large as in the model with buy-to-let in all three cities. In other words, the simulations show that buy-to-let serves to amplify price movements in the housing market. In addition, the counterfactual buy-to-let model for Stockholm features rents that increase by 16.4 percent, somewhat more than the observed 12.4 percent, while the counterfactual Helsinki and Oslo simulations have constant rents by assumption.

Figure 6 Simulated housing prices, with and without buy-to-let



Note: Simulation results for the models with and without a buy-to-let sector, using inflow shocks from the different cities. The bars show percentage growth in housing prices over the simulation period.

Source: Own calculations.

6 Concluding remarks

All Nordic capital cities have experienced large increases in housing prices, which worries policy makers as housing becomes increasingly unaffordable for low-income households. In policy and media discussions on house price growth, buy-to-let

54. It could be argued that having a buy-to-let sector may affect inflow; I assume it does not.

housing investors are often identified as price drivers. In this paper, I collect relevant data on the rental markets in the Nordic capital cities and use a previously developed model of buy-to-let investors to analyse the impact of buy-to-let investors. I modify the model to fit the regulated rental market in Stockholm.

All the cities have sizable private rental sectors. However, the institutional framework for owning rental housing and setting rents clearly differs, as does the structure and development of the rental sector.

The buy-to-let model appears to fit data well in cities where rents are set freely. The modified version without buy-to-let and with constant rents underestimates the increase in both housing prices and rents in Stockholm. To explain different rates of price increases, population growth is clearly important, as the comparison of Oslo and Helsinki shows.

The simulations suggest that price increases could be reduced substantially by regulating rents and restricting buy-to-let, as shown by the comparison of the simulations with and without buy-to-let. The presence of a buy-to-let sector amplifies the price increase by about 60 per cent in the simulations. It is worth noting that the constant rent in the model without buy-to-let is not consistent with the substantial rent increases in actual data from Stockholm in our data. During a period with high population pressure, the existing regulations in Stockholm did not keep rents constant. The existing regulations of rents and buy-to-let in Stockholm are therefore likely to result in both higher rent and housing price increases than simulated in the model.

The existence of buy-to-let investors thus drives prices to some extent in markets where regulations allow their existence, according to the model, which may be an argument for regulating buy-to-let. On the other hand, private landlords play an important role in those housing markets, housing people who do not wish, or cannot afford to buy housing (Scanlon et al. 2016). If buy-to-let is regulated out of existence, some other form of rental housing has to meet the demand.

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Appendix

Housing price indices

The methodology of housing price indices differs between the countries. While the indices are mostly based on hedonic methods (Hill 2013), there are several different ways of constructing hedonic indices. Going into methodological detail is outside the scope of this paper. Methodological differences may distort comparisons between the cities. For some of the countries, there is no single housing price index available for all housing. Rather, there are separate indices for e.g. single-family housing and flats. In those cases, I weight together the indices based on the respective share of the housing types in the total building mass. The geographical base of indices also does not always cover only the city municipalities. Below, I give details where this is relevant.

Denmark: There are separate indices for single-family housing and apartments for the Copenhagen city province (Copenhagen, Fredriksberg and the two neighbouring municipalities Dragør and Tårnby). Using available data for 2010–2020 on the composition of the housing stock, the share of single-family houses in the Copenhagen city province decreased slowly from 10.44 percent to 10.27 percent over the period. I thus use a weight of 10 percent on the single-family price index, and 90 percent on the multi-family index. A constant weight is used over the whole period 2000–2019.

Finland: There are separate indices for single-family housing and housing companies. The single-family index can only be obtained for the Greater Helsinki area, consisting of Helsinki and a dozen neighbouring municipalities. I use this index for the price development of single-family housing in Helsinki municipality. The share of houses (detached and attached) in the Helsinki housing stock fluctuates around 13.5 percent, which is the weight I use for the single-family index. I assume that the housing company index has the weight of the share of apartments (i.e. that all apartments, and only apartments are sold as housing companies).

Iceland: There are separate indices for single-family housing and apartments, produced by Registers Iceland. The indices are weighted by the share of single-family housing in the total housing stock, which decreased from around 28 to 25 percent over the period 2001–2019 (Register Iceland 2011).

Norway: An index for all housing types exists for the Oslo area. The housing price index covers Oslo and the neighbouring municipality of Bærum.

Sweden: Housing price indices for single-family housing and for apartments (cooperatives) in Stockholm can be obtained from the company Valueguard from 2005 on. Valueguard creates hedonic indices based on transaction data from real estate agents (Valueguard 2020). The single-family index is based on data for the Stockholm labour market region, the apartment index for Stockholm municipality (Valueguard 2011). I weight the indices by the share of single-family houses over apartments, based on dwellings data from Statistics Sweden. Thus, I assume that the cooperative index is a proxy for the price of all apartments, no matter the ownership structure. The Valueguard index is monthly. I average over months, with equal weight for each month (for simplicity) to get a yearly index.

Rent indices

Rent statistics are usually less developed than housing price statistics, covering shorter time periods, and are based on less available data and simpler methodologies. The available indices or statistics are mostly based on average prices per square meter, which do not control for composition changes.

Denmark: The Copenhagen rent index is based on average yearly rent per square meter for the municipality of Copenhagen published by the Danish Transport, Construction and Housing Authority (Bolig og planstyrelsen 2020). The series starts in 2015. Rents are published separately for non-profit rentals, cooperatives and condominiums for the municipality of Copenhagen. I weight the rents together based on the share of housing types in the statistics for dwellings from Statistics Denmark.

Finland: Statistics Finland produce a rental price index for Helsinki from 2010. Using an older statistic with a different methodology expands the time series to 2005, at the cost of getting a trend break in 2010.

Iceland: A monthly rental index for the capital region is produced by Registers Iceland from January 2011. I average prices over months within each year.

Norway: For Oslo, Boligbygg (the housing department of the municipality of Oslo), creates a statistic based on all housing units advertised for rent at the web page Finn.no, quarterly from 2004 q4 (Boligbygg 2020). The rent per square meter and quarter is calculated using advertised rental prices and characteristics in a hedonic regression. I average rents over quarters within each year. Notice that this is based on the rents of new rental contracts, in contrast to the indices from the other countries. Eiendom Norge, also produces a hedonic rental price index for the four largest cities in Norway, based on signed rental contracts (Eiendom Norge 2020). However, that index only covers apartments rented out by a few, large rental companies. It is available from 2012.

Sweden: The municipality of Stockholm has published a yearly rent index since 1998 (Stockholms stad 2020). The index is based on the units from Statistics Sweden's survey ´Rents for dwellings´ that are located in Stockholm. The rents are average rents for existing rental contracts.

Inflation adjustment

Both housing price and rent indices are inflation adjusted with harmonized indices of consumer prices (HICP) from the respective countries, sourced from Eurostat.

Comment on E. E. Bø: Buy-to-let housing investors in the Nordic countries

Marius Hagen

Views and conclusions expressed here should not be taken to represent the views of Norges Bank.

This paper focuses on the role of buy-to-let investors as driver of the development and volatility of house prices in the Nordic capital cities. In the last decades, we have seen rapid growth in house prices in the Nordic capital cities and buy-to-let investors have been mentioned as a potential contributor to the price increase. However, there are few empirical studies on the role of buy-to-let investors. In view of the limited coverage, this paper is an interesting contribution.

The paper starts with an informative overview of the ownership structures in the Nordic capitals. There are considerable differences in housing regulations between the Nordic capitals, which in turn affect the ownership structure. For example, Norway, Finland and Iceland have mainly unregulated rent setting, while in Sweden, there is collective rent bargaining, and Denmark has a large non-profit rental sector.

Bø employs a search model on data for Helsinki, Oslo and Stockholm to estimate to what extent population inflow and buy-to-let investors can explain changes in house prices. In Helsinki and Oslo, where there are few rental regulations, the model seems to fit the data well, while there are substantial deviations in Stockholm, although Bø applies a modified version of the model to account for the different institutional set-up. Finally, Bø tries to isolate the effect on prices and rents of the existence of a buy-to-let sector compared to not having a buy-to-let sector. The results indicate that the house price growth is considerably higher in markets where rents are set freely and there exist buy-to-let investors.

The results in this paper are interesting as they give an indication of the importance of buy-to-let investors. However, when interpreting the results, one must be aware that the models rely on some simplifying assumptions. The models are calibrated based on data for Oslo from 2000 to 2006. Population outflow is assumed to equal average inflow in this period and the housing stock is assumed to be fixed, i.e. it is implicitly assumed that the housing supply increases in tandem with population growth. However, population growth has far exceeded growth in the housing stock in Oslo during the simulation period 2007–2014, see for example Mæhlum et al.

(2018). The deviation in growth is to some extent captured by the model, as the population growth was higher between 2007 and 2014 than in the calibration period.

Further, the model does not include the interest rate. The development of the interest rate is of major importance for house prices, see e.g., Williams (2015) for a summary of some international studies. According to Ingholt and Mæhlum (2020), roughly one-third of the growth in house prices in Norway in the last 20 years was caused by lower mortgage rates.

A discussion of to what extent dynamics in the housing supply and changes in the interest may affect the results would be a valuable extension of the paper.

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Comment on E. E. Bø: Buy-to-let housing investors in the Nordic countries

Kasper Kragh-Sørensen

Over the last few decades, there has been a strong increase in the population inflow to the Nordic capital cities. At the same time, rental prices and in particular house prices have climbed to historically high levels. Growing cities, increasing rental prices, and even higher house prices are all part of a wider global trend (see, e.g., IMF 2020 and OECD 2020).

Rising rents and housing prices have caused concern among policymakers in many countries. First, higher prices may increase inequality by excluding poorer households from living in the cities. This is not only a concern from an equity perspective. If higher prices cause households to work in areas where they are less productive, this has the potential to hamper overall growth (Hsieh & Moretti 2019). Second, there is a risk that elevated house prices and mortgage levels have increased the risk of the financial system. As a result, policymakers in Norway, Sweden, and other countries have made it more difficult for households to borrow.

There are several popular explanations for the large increases in house prices. Scarcity of land is a prominent explanation. When more people want to live in cities, but land supply is restricted either by nature or by regulation, house prices increase. Lenient taxes on residential property may also inflate house prices. When housing taxation is low relative to other forms of capital taxation, households may end up investing a lot in housing. Finally, long-term interest rates have been falling considerably over time. This has made housing more affordable.

Erlend Eide Bø considers a complementary explanation by studying the role of buy-to-let investors in Nordic capital cities. The paper consists of two parts. First, Bø provides a comparison of the housing markets in the capital cities. A main finding is that these markets differ substantially. Second, Bø employs a model to analyze the extent to which developments in the housing markets between 2007 and 2014 are explained by buy-to-let investors. In this part of the paper, Bø argues that buy-to-let investors are likely to have amplified the house price increase in Oslo and Helsinki. However, the model has less to say about the house price growth in other Nordic capital cities. The model is best suited to study housing markets with unregulated rental prices and a significant share of buy-to-let investors. Copenhagen, Stockholm, and Reykjavík do not meet these two requirements.

Overall, Bø provides an interesting view on a highly relevant topic. The idea that buy-to-let investors may be important price drivers has been the subject of a lot of debate in Norway. I believe Bø's paper offers a valuable contribution to this debate.

First, it is clear that buy-to-let investors cannot be important in all Nordic capital cities. Buy-to-let investors appear to play a miniscule role in Copenhagen and Stockholm. Second, the paper takes an important first step towards a more structured debate about the role played by buy-to-let investors. However, there is still a considerable way to go before we can start to draw conclusions about the role played by buy-to-let investors in Oslo and Helsinki.

1 How can buy-to-let investors increase house prices?

Before I move on to discuss my concerns about the analysis of Oslo and Helsinki, it is helpful to describe key elements of the framework Bø uses in his analysis. To study the importance of buy-to-let investors, Bø uses a model that captures salient features of the housing market. In the model, there are households who *search* for a house to buy and there are households who sell. Buyers and sellers meet in the housing market and a transaction goes through if the buyer is willing to pay a price that the seller accepts. We usually call a successful transaction a *match* and we therefore refer to these types of models as search and matching models.

Market tightness is a key concept in the search and matching models. A market is 'tight' if there are many buyers relative to the number of sellers. In a 'tight' market, houses usually transact at a higher price. One reason for this is that a prospective buyer knows that it is difficult to find another house for sale in a 'tight' market. To ensure that the seller accepts the deal, the buyer is willing to pay a higher price. Moreover, a seller is more inclined to wait for a good match, as the seller knows that there are many potential buyers.

The presence of buy-to-let investors may lead to higher house prices as they increase the number of buyers and thus the 'tightness' of the housing market. The idea is simply that without the investors, it would be easier for other buyers to get a house at a lower price, as there would be less competition for each house on the market.

To test the usefulness of his model, Bø considers the effects in the Oslo housing market of an (unexpected) increase in the population. Assuming a population growth in line with the inflow to Oslo from 2007 to 2014, he finds that the model can account for a large portion of the increase in rents and house prices over that period. The inflow of households increases the demand for rental housing, which drives up rents. As rents increase, it becomes more favorable to own a home instead of renting. This drives up house prices. In addition, the buy-to-let investors amplify the price effect. As rents increase, the potential income from letting out a house also increases. Thus, investors react by searching more intensely for housing to let. Higher investor demand can potentially lead to considerable house price effects as it makes the housing market 'tighter'.

2 Assumptions that may overestimate the role of buy-to-let investors

While the story that Bø brings forward makes intuitive sense and appears to be in line with the criticism raised against buy-to-let investors in the public debate, he also makes a number of assumptions in the analysis that may overstate the role of buy-to-let investors.

First, it appears that all renters in the model are actively searching for a house to buy, and it is unclear, from the assumptions made by Bø, why they are doing so. This is potentially important as the housing market becomes crowded if all renters are active in the market. It also means that renters do not stop looking for houses when investors intensify their search efforts. The market tightness may be larger in the model than in a more realistic setting. Moreover, housing models typically incorporate some reasons for why owning is better than renting, such as untaxed imputed rent, mortgage interest deductions, or increased satisfaction of living in a home that is owned than living in one that is rented. Including incentives like these could make it easier to understand how the model works.

Second, Bø makes the important assumption that people moving to the city have to rent a house in the beginning. This creates strong movements in rental prices, as competition for rental housing increases. Moreover, it creates a large role for buy-to-let investors. In fact, the movers depend critically on investors if they are to find a house to live in. It would be more realistic to allow moving households to search for owner-occupied housing as well.

Third, homeowners and landlords do not choose the time to sell in the model. Instead, the timing of housing sales is random. This may reduce the number of sellers in periods of high inflow compared to a model where homeowners could time housing sales themselves. For example, it may be that homeowners who are relatively unhappy with their current home would be willing to sell when prices increase. Again, Bø's assumption may exaggerate the market tightness after an inflow of households.

3 Concluding remarks

There is a growing concern that expensive housing in the capital cities strengthen inequality trends in the Nordic countries. In order to offer appropriate policy advice for the Nordic housing markets, it is key to understand the drivers behind the rising housing costs. Bø explores one potentially important channel, namely the role of buy-to-let investors.

A main finding of Bø's analysis is that buy-to-let investors cannot play a major role in all Nordic capital cities. He shows that the importance of buy-to-let investors can be studied through the lens of a model as long as two requirements are satisfied: i) rents are unregulated, and ii) there is a significant share of buy-to-let investors in the housing market. By documenting a range of housing market characteristics of the

Nordic capital cities, Bø finds that Oslo and Helsinki satisfy the two requirements. On the other hand, buy-to-let investors are essentially absent in Copenhagen and Stockholm.

A second takeaway from Bø is that it is challenging to quantify the importance of buy-to-let investors. Although the model presented by Bø include many important features of a housing market, he makes a number of strong assumptions that may overestimate the investor channel.

Overall, I believe Bø's study delivers a valuable first step towards a deeper understanding of buy-to-let investors in the housing markets. Yet, I also believe the analysis shows that other drivers are likely to be more important in determining rising housing costs. After all, housing costs have been increasing in all Nordic capital cities, whereas only some of the housing markets have a significant share of buy-to-let investors. This suggests that common trends, such as increasing city population, scarcity of land, and falling interest rates are among the main price drivers.

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Housing prices, construction costs and competition in the construction sector – a Swedish perspective

Mats A. Bergman and Sten Nyberg

Abstract

The paper examines the development of increasing housing prices in Sweden in relation to the development of land and construction costs and potential causes for these patterns. In particular, we discuss how scarcity of land for development affect housing prices and construction costs. However, in comparison with similar countries Swedish constructions cost have increased more. We discuss potential reasons for this, including areas where the competitive pressure in the Swedish construction sector might be weaker.

Keywords: Housing prices, land prices, construction costs, Sweden, competition.

JEL codes: R31, R22, L74, L11.

1. Introduction

Housing prices have been on the rise in recent decades in the Nordic countries and elsewhere. Following a long period of stable real prices, at least since 1870 and up until around 1960, housing prices have risen sharply in most North-Western European countries, including the Nordic countries as well as in most Anglo-Saxon countries.

However, during the last 25 years or so Swedish house prices seem to have risen more than in neighbouring countries and the same can be said for construction costs. Not surprisingly, this has raised some concern among policy makers and prompted various inquiries into the problem. Housing construction has according to commentators suffered from high and increasing production costs, no or dismal productivity growth as well as weak and unfair competition in certain segments. These concerns have also manifested themselves in various sector studies by public authorities, government inquiries and academic studies over time.

In this paper, we discuss the development of housing prices and their relation to land and construction costs and what might explain their increase. We focus on Sweden but make some comparisons with other countries, in particular the Nordic countries. We first discuss the role of limited availability of land for development in explaining rising prices of housing and increasing construction costs in general. We then turn to cost differentials between Sweden and other countries that seem difficult to explain in this way and discuss areas where the competitive pressure in the Swedish construction sector might be weaker.

Before we look at the development of prices and costs, let us provide a little background on housing markets. Relative to EU as a whole, the Nordic population more often lives in detached houses, in particular in Denmark and Norway. By EU standards, a relatively large share of the population lives as tenants in Denmark and Sweden, as well as in Germany and Austria, while the share in the other Nordic countries is below the EU average of 30 percent. Denmark has the highest average residential floor space per capita of all EU countries, with Sweden in fourth and Austria, Germany and Finland in sixth, seventh and eleventh place respectively (Eurostat 2020).

According to the Swedish National Board of Housing, Building and Planning (Boverket 2017), Sweden has the least new housing per capita among the Nordic countries, the lowest ratio of new housing to population growth and the lowest investments in housing relative to GDP since 2000. By most measures and in most years, Finland has seen the highest rates of housing construction, at least among the four large economies in the Nordic region.

However, according to Caldera and Johansson (2013) and Cavalleri et al. (2019), Sweden's housing supply price elasticity is second only to that of the US. The other Nordic countries are also characterized by elastic supply. In contrast, housing supply is estimated to be inelastic in the UK and in continental Europe including, notably, Germany, Switzerland and Austria (Eurostat 2020).[55]

55. See Saiz (2010) and Baum-Snow and Han (2019) for detailed estimates of supply elasticities in US cities that largely confirms the findings of the cross-country OECD studies discussed above. Also, Mocetti et al. (2020), presents results in line with those reported in the above text for Italian cities. Lerbs (2014) presents results for German cities as well as a brief survey of previous empirical research based on US as well as non-US data.

Moreover, a de facto rent control remains in place in Sweden for rental housing, approximately a third of all housing, and this can influence cost incentives and distort quality choices. Few comparable countries have rent regulation for such a large share of all housing, although some form of rent-regulated affordable housing exists in virtually all countries.

In the following section, we look at the development of housing prices and the cost of land and construction in Sweden and how it compares to the development in other countries. We also briefly discuss the main explanations for rising housing prices in the research literature. Section 3 introduces a very simple model framework to illustrate how land prices and construction costs interact to raise housing prices when land available for development is constrained. Here, we also discuss how the Swedish rent control system may contribute to more capital-intensive construction. In Section 4 we proceed to discuss the relative rise in Swedish construction costs that appears difficult to explain, and the role played by concentrated wholesale markets for building materials and public procurement of rental housing. In Section 5, we discuss problems of weak competition in the public procurement of rental housing, and in Section 6 we offer some concluding comments.

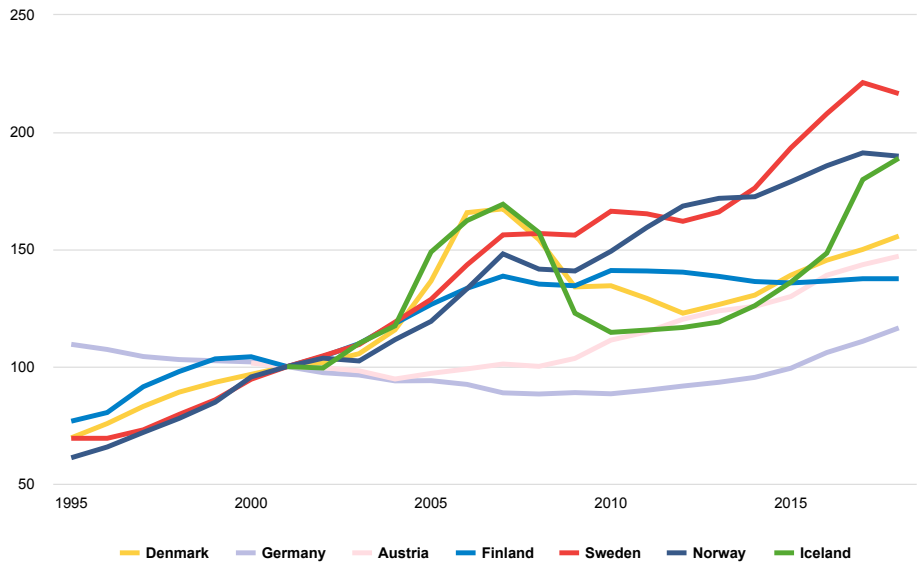
2. Housing prices, building costs and land prices

Over the long run, housing prices in the Nordic region have developed in a similar way to that of many comparable countries, although different from the German-speaking part of Europe. A study by Knoll et al. (2017) based on close to 150 years of data, finds considerable between-country variation, with relatively stable real prices in Germany, Switzerland and the United States but rising prices since the Second World War in the other eleven countries included in the study.

Over the most recent 25 years, however, marked differences can be seen among the Nordic countries. Finland has had stable housing prices since the financial crisis, which contrasts in particular to the continued price growth in Norway and Sweden.[56] Figure 1 shows the development of real house prices in the Nordic countries, Germany and Austria since 1995 or more recently.[57]

56. According to Boverket (2017), the average selling price for single-family homes has converged to a level corresponding to about ten years' disposable income in four out of five Nordic countries since the year 2000. The exception is Finland, with a price-to-income ratio of about seven in 2016.
57. According to Knoll et al. (2017), real housing prices in Sweden and Norway remained relatively stable between the late 19th century and the mid-1990s, although with brief periods of rapid price increases, such as the 1980s and sharp falls, such as the early 1990s.

Figure 1 Real house prices



Note: Real house price index, calculated as the ratio of nominal price to the consumers' expenditure deflator in each country, both seasonally adjusted. Re-indexed by the authors, 2001=100.

Source: OECD national accounts database.

As seen in Figure 1, and consistent with Knoll et al. (2017), prices have remained relatively stable in Germany, but have risen in the other countries. Over the period, prices have more than trebled in Norway and Sweden, more than doubled in Denmark and almost doubled in Finland. Over a shorter time-span, the price index for Iceland has closely tracked that of Denmark, with a marked boom-and-bust cycle just prior to and during the financial crisis, although with a stronger upturn in recent years than in Denmark.

Based on Knoll et al. (2017) and taking a long view, the Nordic countries do not stand out relative to most of Western Europe. It is rather Germany that stands out. In fact, the trend with rapidly rising housing prices appears to have started later in Norway and Sweden than in many other countries.

A key policy question is then of course what the causes of this pattern of increasing housing prices are. An often-voiced concern has been that these different price paths reflect underlying differences in the development of building costs over time, potentially attributable to weak competition in key segments of the construction sector. However, when considering the total cost of producing residential housing it is important to recognize that a sizable part of these costs is not directly related to construction.

As argued by Knoll et al. (2017), the dramatic increases in real housing prices seen in recent decades are mainly driven by land prices. Glaeser et al. (2005) argue that even on Manhattan, regulatory restrictions on land supply and building heights were

the main drivers of housing costs rather than scarcity of land.[58] The discrepancy between the average cost of forestland in the Stockholm region – a bit more than 100 000 SEK/ha – and the typical cost of land zoned for single-home buildings in peripheral suburbs – 10 – 50 million SEK/ha – suggests that this is even more so in the Nordic countries.[59]

While land costs have risen in most countries, real construction costs appear to have been relatively constant in the US and in many other countries (see e.g. Knoll et al. 2017 and Hilber & Vermeulen 2016). According to Statistics Sweden, the land cost per square meter of a new rental apartment more than trebled in real terms over the 1994–2018 period, while real construction costs doubled. However, since construction costs accounted for more than 90 percent of the total price of new rental apartments at the beginning of the period and close to 90 percent in 2019, the contribution of rising land prices to overall price increases has been modest for rental apartments.

Figure 2a and 2b show the nominal price changes for new rental apartments, cooperative apartments, and single-family homes for the three major metropolitan areas and the rest of the country in Sweden. Figure 2a shows land prices per square meter residential area and Figure 2b shows construction prices per square meter. There is no adjustment for quality change, apartment size or location within each region.

As can be seen, while land prices (per square meter residential area) were approximately equal for all types of housing in the 1990s, prices have followed dramatically different paths since then. Price increases have been largest for cooperative apartments, followed by single-family homes, and smallest for rental apartments. For all three categories, prices have increased more in the large cities than in the rest of the country. Note that land price per square meter residential area is calculated as land per square meter residential area times land prices. Hence, the price of land may have increased more than Figure 2a shows, for example if plots became smaller on average or if buildings became taller.[60]

Changes in construction costs have been less dramatic. Cost increases have been smallest for single-family homes, somewhat higher for rental apartments and largest for cooperative apartments. Still, increasing land prices explain only about one third of the total cost increase even for cooperative apartments.[61] Rental and cooperative apartments and single-family houses each have shares of about a third of new housing constructed since the year 2000.[62] Table 1 shows price increases for different tenancy and location.

58. However, this does not mean that abolishing land-use regulation would be advisable. In an analysis of housing prices in the San Francisco metropolitan area, Bunten (2017) concludes that while a pure market solution would drive prices down by a fifth and increase local GDP by 6 percent, such a policy would actually *reduce* welfare by 6 percent due to congestion effects. In the optimal solution, prices would fall only marginally. See also Been et al. (2019) for a survey of research on the link between housing supply and housing prices.
59. This simple comparison ignores the fact that a sizeable fraction of the land must be set aside for roads and other 'commons' and furthermore that costs associated with these will typically be allocated to the building lots. Along the same line of reasoning, Lind (2017) suggests that a reasonable 'production cost' for a singlehome lot could be 500 000 SEK, including infrastructure cost.
60. Less obviously, the same principle applies to construction costs. Unit construction prices, as measured by a construction price index, may for example remain constant, but the construction cost (or price) per unit of housing may increase if more luxurious houses are built, or if houses are built at sites where it is costly to build.
61. See also Kommunernas markpriser (SKR 2016, 2019).
62. See Konkurrensverket (2018) and Swedish National Board of Housing, Building and Planning (2017). Before the year 2000, the share of cooperative apartments was smaller.

Figure 2a Land costs

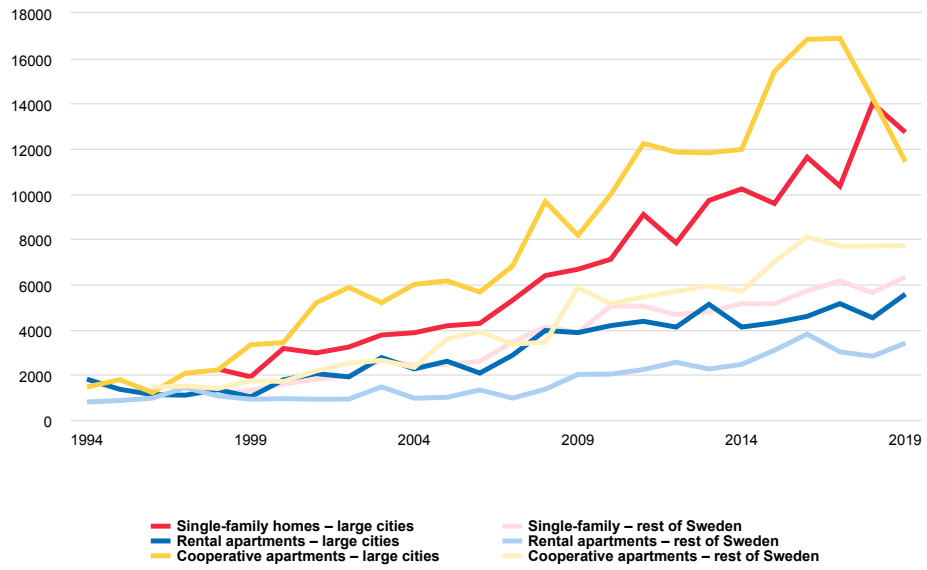
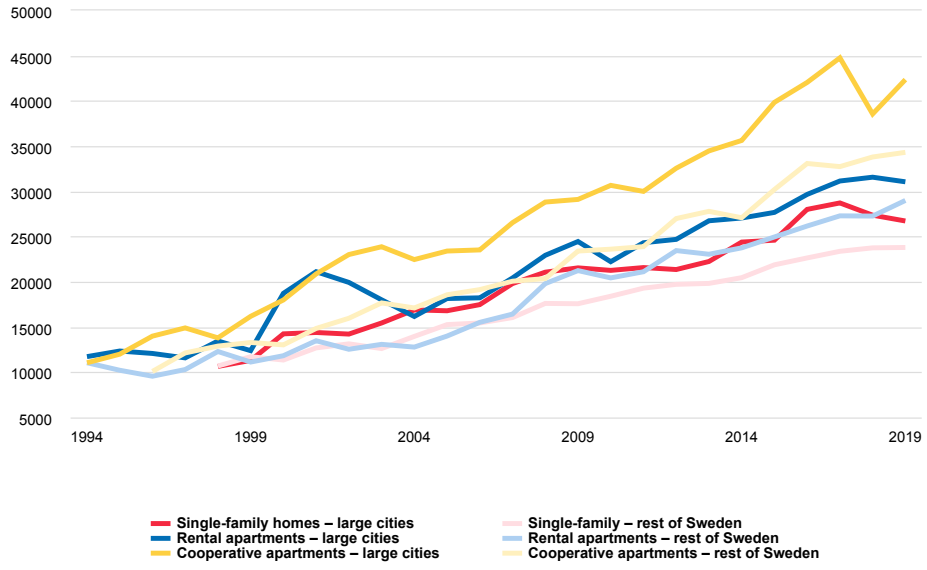


Figure 2b Construction costs



Note: Costs for land and for construction, new housing, excluding VAT, including construction companies' and developers' profits/losses, per square meter residential area for new housing in Sweden. Expressed in nominal prices.

Source: Statistics Sweden.

Table 1 Real price increases in Sweden, percent

	Single-family homes	Rental apartments	Cooperative apartments
Land prices			
Largest cities	333	129	479
Rest of Sweden	311	217	306
Construction prices			
Largest cities	93	97	185
Rest of Sweden	71	95	160

Note: Nominal prices deflated with the consumer price index. Rental apartments 1994–2019, cooperative apartments in large cities 1994–2019 and in the rest of Sweden 1996–2019, single-family homes 1998–2019. Prices per square meter residential area, paid by the final buyer. For all types of tenancy, land prices have risen more than construction prices.

Source: Statistics Sweden.

The weighted average real construction price has increased by approximately 110 percent and the real land price by almost 350 percent during the last twenty plus years. Still, since land prices constituted only a little more than 10 percent of total housing price in 1998, the increase in land prices accounts for less than 30 percent of the total price increase.

In the following section, we explore how limited availability of land for development affects not only land but also construction costs and prices. We also discuss how the Swedish de facto rent regulation might contribute to a higher capital intensity in construction and thereby to higher housing costs.

3. Availability of land, house prices and construction costs

As pointed out in the literature, and as indicated by the graphs above, increasing land prices is generally an important driver of rising housing prices. Land that can be developed for housing is a heterogeneous and scarce resource. Some locations are more valuable than other for many reasons, and the availability of attractive land for development is limited by physical constraints and land-use regulations.

The scarcity of land and the implications for its pricing and use have interested economists at least since David Ricardo's insight that differences in land productivity will be capitalized into the price of land, so called Ricardian rents. The Von Thünen neoclassical land-use model of 1828 posits that the optimal use of land is a function of the distance to the city centre. While the original model envisioned an agricultural setting, the spirit of Von Thünen's model is echoed in later models of urban land use,

such as Alonso-Muth-Mills type models. Models in this tradition can shed light on issues such as the pricing of land, and the location of housing and economic activities as a function of commuting cost or amenities. They can also include a production side, which is our focus here.

3.1 Location, land rents and housing supply

Some interesting insights can be gleaned even from a very a simple application of von Thünen's land-use model. Ignoring housing construction cost, let the long-run land rent r be a function of commuting distance to work d,

$$r(d) = p + t \times \left(\bar{d} - d \right)$$

for $0 \leq d \leq \bar{d}$, where p is the value of the marginal product per residential unit of land, say in farming, t is the travel cost per unit distance, and $\bar{d}$ is the radius of the city (the maximum commuting distance). Suppose everyone works at the city centre for the same income and faces identical linear travel costs. Then, housing prices will adjust so that the sum of commuting costs and land rental costs is the same in all locations: high land rental costs and low commuting costs in the centre and vice versa in the periphery. Adding a building cost b per unit of housing gives the long-run housing cost at distance d from the centre

$$c(d) = b + r(d) = b + p + t \times \left(\bar{d} - d \right)$$

for a given $\bar{d}$, which in turn is determined by city size. In principle, long-run housing supply can be derived, which will typically be upward sloping.

In a simple monocentric von Thünen model supply increases quadratically with the radius, which in turn is linearly related to the housing cost at a given distance, tending to make supply more elastic as the city increases in size.[63] Consequently, if demand increases, we would expect much of the supplied housing to be further out from the centre, and thus less valuable from a consumer perspective. When assessing the cost of providing a standardized unit of housing such quality differences, and others, need to be accounted for.

However, the prices reported in the Figure 1, 2a, 2b and Table 1 above are per square meter, without adjustment for quality change. Statistics Sweden also produces a quality-adjusted price index for new housing, illustrated in Figure 3a and 3b. Here, the index measures the quality-adjusted price per dwelling excluding the price of land but including quality factors such as size, location, building standard and amenities.

63. Baum-Snow and Han (2019) find in an empirical study that supply elasticity increases with distance from the city center.

Figure 3a Price indices for new single- and multi-family housing in Sweden excluding land costs, nominal prices

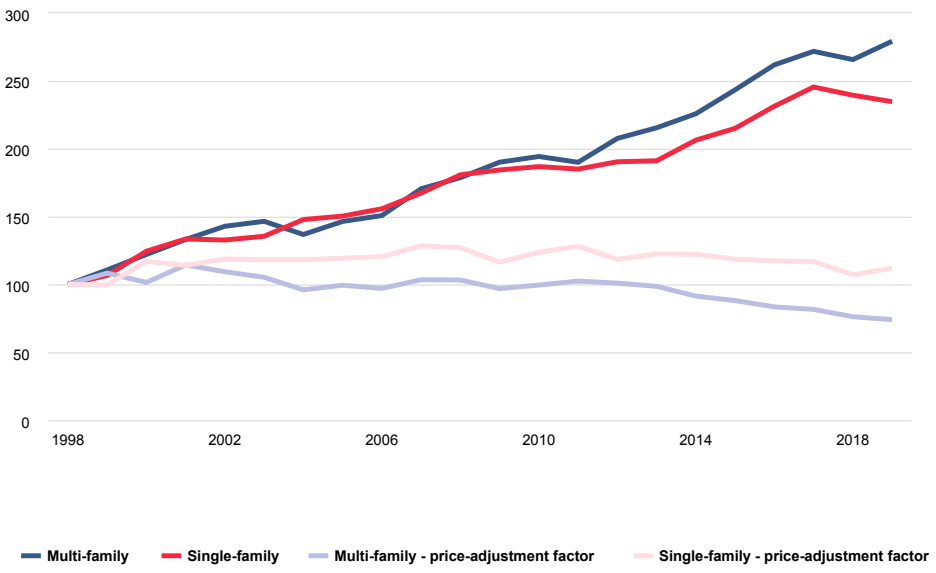
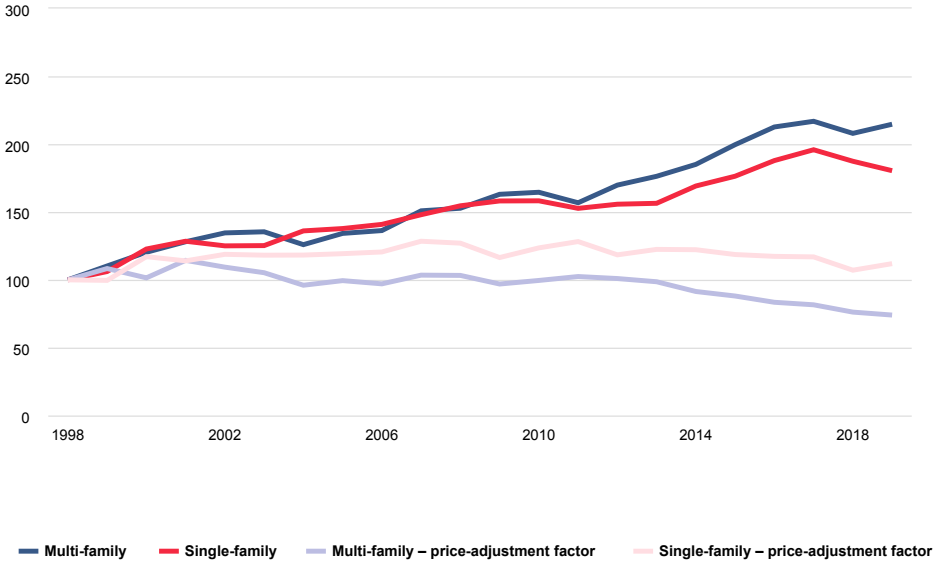


Figure 3b Price indices for new single- and multi-family housing in Sweden excluding land costs, real prices



Note: Price of land and VAT is not included. The price-adjustment factor controls for size, location, building standards and amenities. Increased average size of single-family homes and decreased average size of apartments have been the main drivers of the adjustment factor. Real prices equal to nominal price index deflated with consumer-price index.

Source: Statistics Sweden, Building-price index.

Statistics Sweden also produces an index that reflects average price (excluding land) per housing unit without control for quality. Comparing the four indices over the 1998 to 2019 period suggests that the average size of single-family housing increased by 10 percent but that the combined effect of other quality characteristics was virtually zero. For multi-family housing, a similar comparison suggests that average apartment size fell by about a quarter while the combined effect of other quality characteristics corresponds to a quality increase of 3 percent. Except for this modest quality effect, the numbers in Table 1 and Figure 2a and 3 are consistent.

3.2 Housing prices, land scarcity, land prices and construction costs

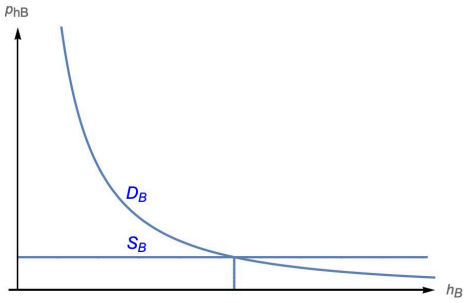
We seek to illustrate the interdependence of land prices, housing prices and construction costs per unit of land when land is scarce. We assume that the availability of land is a binding constraint in a location for some reason, such as geographical constraints or land regulation. For simplicity, we abstract from the spatial structure of urban-economics models and propose a simplified model, where the spatial dimension is reduced to just two locations. We could think of this as metropolitan areas and non-metropolitan areas.

As discussed above, housing prices depend in general on both land prices and on labour and other construction costs. The construction costs per square meter of housing could increase because factor prices rise or because more inputs are used per square meter of housing or a combination thereof. The former is what price or cost indices seek to capture. We start our analysis by considering how the scarcity of land affects land and housing prices as well as factor use.

To simplify matters, we abstract from labour and discuss how housing prices, land prices and construction costs (here equal to capital costs) interact when land is constrained. The model features two locations, A and B, prospective homeowners with identical preferences, and absentee landowners, who are not part of the model. Land is constrained in A, but not in B, and the wage is higher in A than in B. Housing is produced using land and capital. Consumers consume housing and other goods, and housing and the aggregate of other goods are substitutes to a certain degree. Markets are competitive and the marginal construction (capital) cost is assumed constant. The formal model is specified in the Appendix. We discuss the key mechanisms intuitively here with the help of figures.

In location B, land is available at constant cost and so is capital. This means that the supply curve of housing is horizontal and that the market clears when the demand curve intersects the supply curve, as illustrated in Figure 4 below. The equilibrium volume of housing depends on the number of households that prefer to live in B and their income. The price is determined by the costs for capital and land in B.

Figure 4 Supply and demand for housing in market B, where land is unconstrained

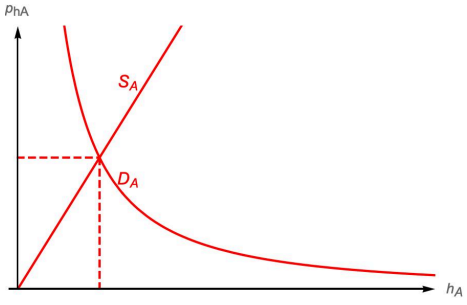


Note: Housing is produced with a Cobb-Douglas technology where land and capital both have constant marginal cost. Consumers have CES-preferences where the elasticity of substitution is 0.5. This determines the shape of the graph. The parameter values for the illustration above are given in the Appendix.

In location A, land is constrained and individuals earn more than in location B. A locational equilibrium arises when housing prices in location A are sufficiently high to offset the higher income so that the utility of living in A is equal to that of living in B. In equilibrium, no one wants to move. The demand for housing in A and B, the price of land in A and the optimal use of land and capital then all follow from this.

Not surprisingly, an increase in income in location A serves to increase the price of housing in location A. The price of land in A simply equals the marginal value of the last piece of available land. The price of land in turn affects the optimal factor mix used in housing production. If the land price is high it makes sense to use more capital per unit of land, which then raises the construction cost per unit of land in A. Thus, land scarcity results in an upward-sloping supply curve for housing, as in Figure 5, and the less land that is available for development, the steeper the supply curve. Production of more housing at higher prices will also make housing more capital intensive, for example by making it better equipped or by building taller buildings.

Figure 5 Supply and demand for housing in market A, where land is in fixed supply



Note: Housing is produced with a Cobb-Douglas technology where capital has constant marginal cost but land is in fixed supply. Consumers have CES-preferences where the elasticity of substitution is 0.5. This determines the general shape of the graph. That supply is linear reflects the parameterization. See the Appendix.

Figure 5 illustrates the market equilibrium in location A for a parameterized example where income in A is twice that in B.[64] The model illustrates that the differences in land prices and the use of capital can increase much faster than income differences when the availability of land is constrained. Therefore, the production cost (construction + land cost) per square meter can increase quickly because of more intense use of capital. This is a pure quantity adjustment effect – recall that the unit cost of construction (the unit cost of capital) is assumed to remain constant throughout, while average production cost per unit of land as well as production cost per unit of housing rises.

In sum, a positive demand shock, say due to increasing income in region A or lower interest rates, results in a higher cost of building residential housing both because land prices go up and because it becomes optimal to upgrade the quality of the housing being built when land availability is constrained. Therefore, we should expect a positive correlation between income levels in metropolitan areas, or lower interest rates, and the cost of producing residential housing even when the construction sector is perfectly competitive.

Let us also consider the implications of a higher unit cost of construction in this framework. In Ricardo's analysis of the price of farmland and in Von Thünen's analysis of the price of urban land, the land's productivity in farming and its distance from the city-centre and the consequent commuting cost, respectively, are capitalized into land prices. It might seem straightforward to conclude that higher building costs for housing would similarly be capitalized into the price of land for housing. However, this conclusion will not necessarily hold, when there is scope for factor substitution and relocation.

In our model, a higher unit cost of construction (due to more expensive building materials, say) implies that builders use less capital and more land (assuming a Cobb-Douglas production technology). In A, however, land is fixed. The equilibrium price of land is therefore higher and at a level that off-sets the incentive to substitute capital for land. In comparison with the original equilibrium, land prices rise less than capital costs and less capital will be used per unit of land. In both A and B the equilibrium amount of housing is lower, but more so in A than in B.

To see the importance of mobility for the impact of a cost change, it is helpful to consider the special case where land and capital must be used in fixed proportions (a Leontief production technology). If A and B were not linked by the equilibrium assumption of equal utility, then higher capital costs would be capitalized one for one into lower land costs in A, as long as land remains scarce. In B, where the price of land is determined by its value in an alternative use, such as farming, there will be no capitalization. However, if the two locations are linked through the equilibrium condition that all individuals' utilities should be equal, then higher capital costs will cause some individuals to relocate from B to A. This modifies the capitalization effect on land prices in A. Rising capital costs will *not* be completely capitalized in a region with scarce land, even if housing is produced with a fixed-proportions technology.

The discussion above is cast in terms of land and construction costs but the

64. In the model example, this results in housing prices being four times higher in A than in B. The ratio of capital to land used in housing production in A is sixteen, whereas land and capital are used in equal proportions in B. An individual in A spends almost three times more than an agent in B (who has half the income) on housing but consumes less than one fifth as much land and gets less than three quarter as much housing.

implications would be the same if we framed it in terms of labour costs instead – as land grows more expensive other factors such as labour will be used more intensively. The development of labour costs may also reflect local labour market conditions, especially in segments where the market is closed, say by virtue of professional license requirements.[65]

Below, we discuss one additional mechanism that can contribute to raising the capital intensity and therefore to raising the construction cost per square meter of land in Sweden.

3.3 Reforms of the Swedish rent control regime has introduced a bias toward capital

Sweden differs from most other countries in having de facto rent controls for a large fraction of all housing, almost 30 percent. The rent control regime in Sweden is not a formal regulation but rather a framework for negotiating rents between landlords and the tenants' association, underpinned by established principles of what constitutes a fair rent that makes it relatively easy for tenants to challenge 'unfair' rents in a regional rent tribunal. Decisions by a tribunal can be appealed to a higher court. The benchmark for fair rents is the 'user value' (which is distinct from the market value) of a specific unit of housing from a tenant's point of view, which before 2011 was defined as the rent for housing of comparable quality offered by a public rental housing company. After 2011 this was replaced by a norm based on all collectively bargained rents.[66]

In 2006, a reform was implemented to stimulate construction of new rental housing, which had been rather limited after the dismantling of construction subsidies in 1990. The reform consisted of introducing an option to negotiate the rent for new housing (*presumtionshyra*) that was exempt for fifteen years from the rent-setting principles governing rents in the existing housing stock. The intention was to remove the risk that rents set within the existing framework would not allow an investor to earn a reasonable return and consequently to increase the supply of new rental housing. The *presumtionshyra* should be set to ensure a fair rate of return on investment.[67]

While the rent-setting principles for the existing housing stock effectively serve as a benchmark price-cap regulation for rents, the new option available for newly built rental housing instead functions as a rate of return (RoR) regulation. In a reply to the government inquiry into the new system (SOU 2017), the confederation of property owners was very critical (Fastighetsägarna 2017), and argued for a system anchored in the building's quality and the tenants' preferences and not in construction costs. The tenants' association states the following:

65. For example, in a country with highly productive labour in the traded-goods sectors, these high wages may spill over to wages in the non-tradable sectors, which is known as the Balassa-Samuelson effect. Cross-country differences in costs may also reflect market power in certain segments of the construction sector.
66. See SOU (2017) Section 3.2 for an in depth account of the rent setting system.
67. *Presumtionshyra* was introduced as an option, and landlords may instead negotiate rents with the tenant's association, effectively adhering to the pre-existing regulatory system, or set rents unilaterally, which may be challenged in court. A *presumptionshyra* rent may significantly exceed the regulated level, and is considered to be fair if it covers the landlord's cost and provides a reasonable rate of return on investment. For a discussion of the presumptionshyra-system in Swedish se e.g., SOU (2017), Section 3.3.

> In the *presumtionshyra*-model there are no incentives for a builder to actively work to lower costs and optimize the construction processes. Rather, there is a built-in risk that the model drives costs since a production estimate with high costs provides preconditions for reaching an agreement about a higher rent level with Hyresgästföreningen. (The tenants' association).

This reasoning is in line with an early well-known result in the regulation literature, the so called Averch-Johnsson effect (Averch & Johnsson 1962), which essentially says that if a regulation posits a certain return on capital, then the regulated industry will over-invest in capital. Increased capital investments translate into higher revenues. The owner's true cost of capital must necessarily be at least slightly below the allowed rate of return – or else there would be no investment; hence expanding the capital base will typically be profitable. Analogously, a RoR regulation in the rental market stimulates construction of more expensive and exclusive rental housing.[68] The effect is even stronger if investments can reduce future operating and maintenance costs; a larger capital cost will raise the permissible rent while at the same time reduce future costs.[69]

This mechanism is not present in the other Nordic countries, which have adopted other approaches to affordable housing. In Sweden, the main policy tools are the de facto rent regulation of all rental housing and housing subsidies to poor households. In Denmark, rental-housing associations channel subsidies from old and established housing to newly built ones. In Finland, property developers are required to provide rent-controlled social housings in proportion to their provision of new non-regulated housing. In Norway, general rent controls were abolished in the late 1960s but remain in place for subsidized housing, while the state continues to provide subsidies that encourage home ownership.[70]

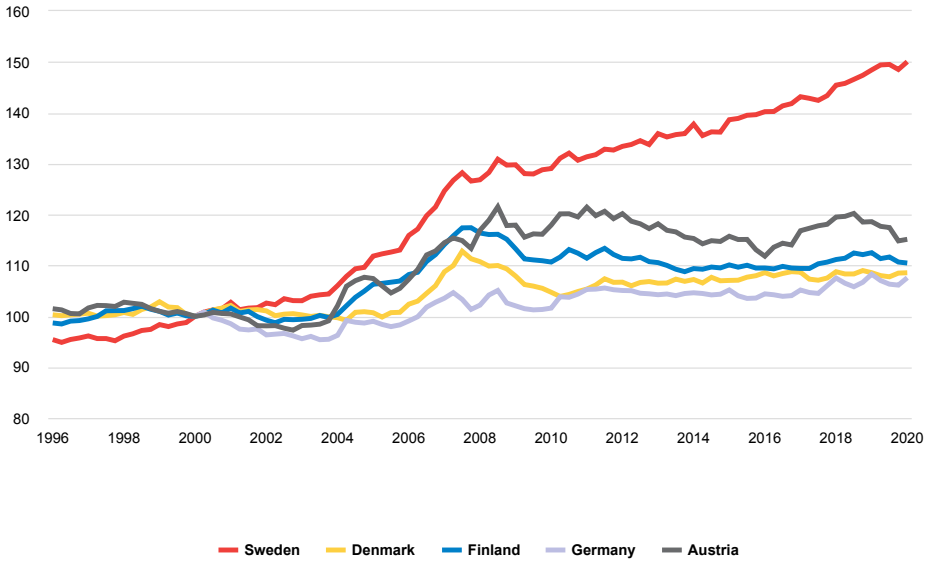
4. Increasing factor prices in an international comparison

Above, we saw that positive demand shocks are likely to result in more inputs per unit of land when land is constrained. It does not follow, however, that the *unit* cost of construction should increase because land is scarce or because the optimal input mix changes. Consequently, it is not clear that properly weighted construction or material cost indices should rise, although the price of housing increases due to more intensive use of such factors per unit of housing and because of a higher price of land.

68. Lind (2015, 2016) argue that even the old regulation, still applicable for housing older than 15 years, gives the owner incentives to raise the standard too much when apartments are refurbished. Also, he argues that more low-cost basic-quality housing should be built in Sweden.
69. In the market for owner-occupied housing, these effects are not present. Rather, the incentives will be to exploit the bounded rationality of the prospective buyers, for example through a luxurious surface in combination with cheaper choices beneath the surface and perhaps financial arrangements that shift payments from the tenants forward in time. In many respects, the incentives are the opposite: the building company will have incentives to shift costs *away* from capital costs to future maintenance and repair costs – at least if the buyers are boundedly rational.
70. Jensen (2013), and Eerola (2021), discusses social-housing policy in the Nordics

Yet, there is evidence that factor prices have risen considerably more in Sweden than in other comparable countries during the last 25 years. Figure 6 a–c show construction costs, labour costs and materials input costs for the residential construction sector, relative to the respective country's CPI, for Sweden and four comparable countries, as measured by Eurostat. (Norway and Iceland are not included in the statistics.) As seen in Figure 6a, materials prices have increased by about 10 percent more than average consumer prices in Austria, Denmark, Finland, and Germany – but by almost 60 percent more in Sweden. Relative to consumer prices, labour costs have increased by more than 50 percent in Denmark, by almost 50 percent in Sweden, but only by 10–20 percent in the other countries. Construction prices have increased by almost 50 percent in Sweden, but only by 10–20 percent elsewhere. Variations in the Swedish krona's exchange rate with the euro can possibly explain some – but only some – of the extreme development of materials prices in Sweden.[71]

Figure 6a Building materials price index



71. The euro appreciated roughly 10 percent relative to the Swedish krona between the first quarter of 1998 and the second quarter of 2020, of which about 6 percent points occurred between the third quarter of 2003 and the third quarter of 2007, corresponding to the period when materials prices increased the fastest in Sweden.

Figure 6b Labour cost index

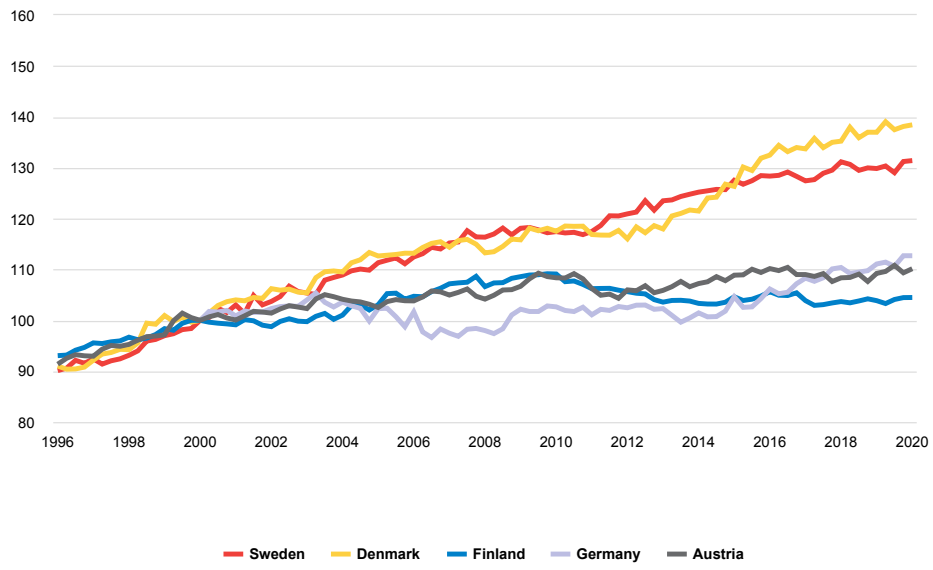
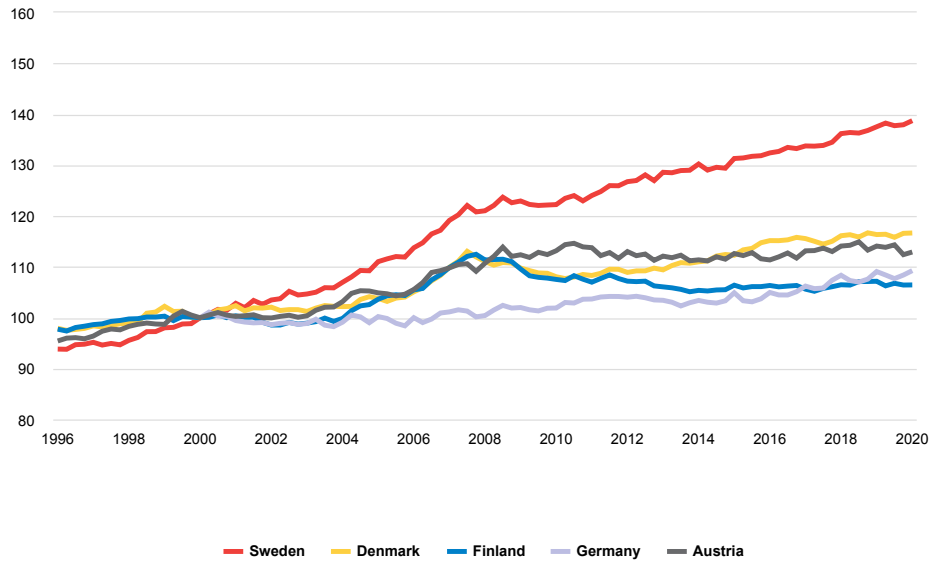


Figure 6c Construction cost index



Note: Cost indices for the residential construction sector, quarterly data from 1996 (first quarter) to 2020 (first quarter), real prices (since first quarter of 2000 for Germany). Indices are deflated with CPI for the respective country and re-indexed to 100 in the first quarter of 2000.

Source: Eurostat, Construction costs for new residential buildings.

While the increase in the construction cost for housing, as shown in Figure 6c, is much larger in Sweden than in the other countries, the cost increase reported by Eurostat is still much smaller than the one reported by Statistics Sweden. As discussed above, the real increase of the construction cost for housing is at least 100 percent over the same period according to Statistics Sweden. We have not been able to find the reason for this discrepancy, but the reported statistics appear to support the notion that building costs have increased more in Sweden than in several comparable countries.

A common criticism against cross-country comparisons of construction costs is that they are only meaningful if they measure the same things – and this is likely not the case for construction costs. Climate conditions vary considerably and this is reflected in different demands for insulation or air-conditioning for example. Income differences translate into differences in demand for amenities and differences in wage levels feed into labour costs. Similarly, differences in national or local building codes will also account for some of the variations in the level of construction costs. Consequently, direct comparisons of cost *levels* across countries may not be so instructive. However, the development of construction costs over time, as in Figure 6a, can be more informative.

For traded goods, such as building materials, it could even be argued that the levels should be comparable. In that perspective, the secular trend for the Swedish materials cost index stands out in a cross-country comparison. Figure 6a shows that this index has increased by around 10 percent in the comparison countries over the period, while the Swedish index has increased by almost 60 percent. Increasing labour cost could of course also influence the production costs of materials, in particular for those that are not much traded internationally, but the Danish experience contradicts this explanation. Labour costs have increased even more in Denmark than in Sweden, but the materials cost index has remained comparatively flat, which suggests that labour cost is not a key driver of the difference.

4.1 Why do construction and materials cost rise more in Sweden than elsewhere?

What could account for Swedish exceptionalism in this regard? We will discuss some potential reasons, but admit that we cannot give a fully satisfactory explanation.

One potential reason is that increasing costs may simply be due to capacity constraints. However, several inputs are traded, and even for those that are not, it is not a priori clear why this should afflict Swedish inputs to a greater extent than, say, Finnish or Danish inputs. Another potential reason is that idiosyncratic regulatory constraints or building codes could deprive Swedish builders of economies of scale. Similarly, municipal restrictions that raise construction costs have been seen as an important factor in the Swedish debate. Still, the relatively large differences between the cost indices suggest that the Swedish cost development cannot be attributed to poorly functioning input markets or regulation. Moreover, Figure 6 suggests that this is not just a level effect.

Yet another possibility could be that Sweden suffers more from imperfectly competitive markets than neighbouring countries, or that published prices do not

reflect actual prices because of large rebates, which would serve to inflate indices.

4.2 Imperfect competition in the construction sector

While a steeper cost development in Sweden than in comparison countries could be indicative of weaker competition in some segments of the construction sector, and perhaps especially in the case of building materials, we should point out that this cannot be inferred from differences in cost trends alone but depends on underlying causes.

The construction sector includes a very heterogeneous group of actors supplying a wide array of products and services. Market structure varies considerably, from a segment with an abundance of small builders and firms, providing various services such as carpentry, plumbing or electric installations, to industrialized segments such as the production of building materials, where there are significant economies of scale and where consolidation has been strong. Accordingly, market concentration is very low for the former types of services while it is very high for building materials such as dry wall or cement.[72]

Market concentration is one determinant of competitive conditions, but other factors such as openness to trade, barriers to entry, and contractual and commercial practices, also matter and affect market performance. Market structure can affect firms' ability to extract supra-normal prices either because the market structure affects firms' unilateral price setting in a way that softens competition, or because it facilitates coordinated behaviour, such as tacit or explicit collusion. In the former case, market concentration essentially makes the demand a firm faces less sensitive to the price it sets. This is captured by the Lerner condition, which says that the optimal markup for a firm is the inverse of the price elasticity of demand. Specifically, the Lerner condition is

$$L = \frac{P - c}{P} = \frac{1}{e}$$

where the left-hand side is the Lerner index, P is price, c marginal cost and e is elasticity of demand. The relationship between market structure and market power, as measured by the Lerner-condition, is mediated by a number of factors and is not a simple function of the number of firms in the market. A highly concentrated industry could be quite competitive if products are homogeneous and barriers to entry are low. Conversely, competition could be weak in a market with many firms if customers face high switching costs *ex post*. However, for given market conditions, increased concentration tends to weaken competition.

If we examine competition through the lens of the Lerner condition, we could look for clues on either side of the equality sign. For instance, we could focus on the left-hand side and look for segments in the construction sector where firms seem to have exceptionally high margins, in comparison to similar firms in other markets or firms facing similar market circumstances and risks. This can be indicative of weak competition and low firm-level demand elasticities. Alternatively, evidence on price elasticities for different inputs could be informative about the competitive conditions on different input markets. Unfortunately, there is not very much direct

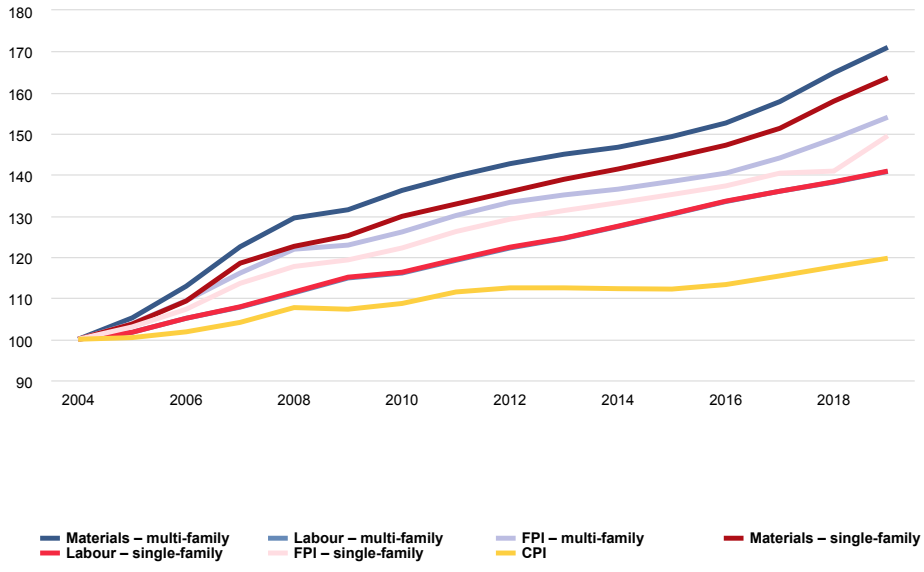
72. See e.g., SOU (2015) for a more in detail discussion of the construction sector.

information available on margins or elasticities.

There are, however, price indices for different inputs. Rising prices may of course have various causes, such as rising world market prices or reduced competition. While we lack cost information, which could be helpful in discriminating between various explanatory factors, the price developments at least show to what extent different product categories contribute to the increase in the index for building materials. Market concentration can also be an indicator, depending on the mode of competition. For example, if firms were competing in a Cournot fashion there would under some assumptions exist a link between the market concentration as measured by the Herfindal-Hirshman index[73] (HHI) and the average markup: $L = HHI / e$. Taken together these observations suggest that concentrated markets where prices have increased substantially might be worth a closer look. Since we are looking at the development of prices over time, markets where the concentration has also increased could be particularly interesting.

As discussed above (see Figure 6a), there are indications that the cost of building materials has increased more in Sweden than in comparable countries. Factor price indices for the housing sector, as reported by Statistics Sweden, offer more details. Building materials is the factor with the highest price growth within the sector, as illustrated in Figure 7.[74]

Figure 7 Factor price indices for new residential building in Sweden



Note: Annual prices for 2016–2019 calculated by the authors as average of monthly prices. Labour – multi-family and Labour – single-family follow closely, consequently the curves coincide.

Source: SCB, Factor price indices for new dwellings, excluding VAT.

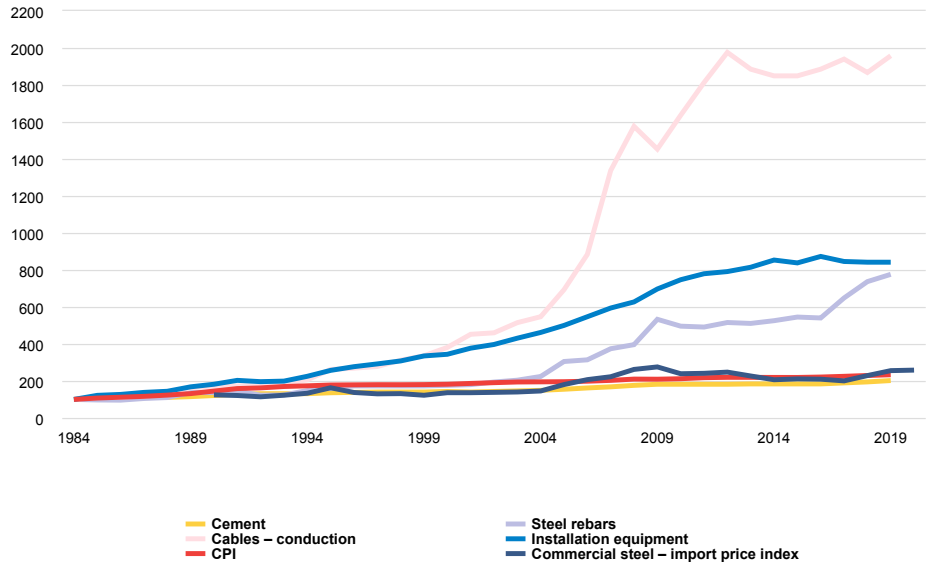
73. Defined as the sum of the squared market shares, typically measured in percent.
74. Statistics Sweden currently reports price indices for 17 factors for multi-family dwellings. The highest price growth over the five most recent years is for white-collar salaries, followed by three indices for different types of materials.

Back-of-the-envelope calculations show that if materials account for two thirds of the cost of new single-family homes, as reported in a government inquiry (SOU 2015), then increasing materials costs can explain all of the real price increase for such dwellings. Statistics Sweden (2020) estimates that materials account for only one third for *all* types of housing. This suggests that increasing materials costs can explain only about a quarter of the real price increase of all new dwellings in Sweden.

However, cost increases for materials do not necessarily contribute to the construction cost difference between countries. They may instead reflect rising commodity prices, for example for metals. In Figure 8 we present price developments for some building materials, indexed to 100 in 1984, together with the CPI and an index series for imported commercial steel. The figure shows that while the domestic price index for steel rebars closely tracked the import prices for commercial steel between 1984 and 1995, domestic prices have increased by more than 400 percent since 1995, while import prices increased by less than 50 percent.

Figure 8 also shows that price increases will not necessarily be large in a highly concentrated industry such as the cement industry. Over the period, cement prices have actually increased less than the CPI. One should also note that the price of installation equipment has increased by more than a factor eight and cables and conductions have increased by a factor of twenty, while the CPI only increased by a little more than 130 percent.

Figure 8 Nominal price increases for some building materials in Sweden, 1984–2019



Note: Import price index for commercial steel 1984–1995. For the 1990–2019 period, a price index was generated by the authors as the average of the index values for four steel products. Old and new price series for building materials were linked by assuming that the price increase in 2011 is equal to the average of the price increases in 2010 and 2012.

Sources: CPI and import prices from Statistics Sweden. Materials prices from Swedish Construction Federation.

4.3 The wholesale market for building materials

Even if increasing materials costs can explain only part of the housing cost increases, several government reports as well as reports from the Swedish Competition Authority have suggested that the building materials sector suffers from poor competition. There is a wide range of building materials and market conditions vary; some materials are traded across borders while other are traded mainly in the domestic market. For some, markets are competitive, while for others competition is likely to be imperfect. We can only make a partial investigation and choose to focus on the wholesale market for professional builders. This is an interesting segment of the market for building materials that has experienced dramatic price increases, undergone substantial consolidation and is characterized by interesting pricing practices.

There are a number of wholesalers of building materials in Sweden. Some are national firms catering to builders and home renovation enthusiasts alike, some cater only to the professional segment of the market and provide a one-stop-shop service, while others are regional or active in a limited number of products. The size distribution of firms is very skewed in the professional segment.

Wholesalers tend to be strong in some product segments and weaker in others, but the two firms Ahlsell and Dahl have a strong presence in multiple segments.[75] For example, in the plumbing, heating, water and sanitation segment the companies commanded market shares of 40 and 35–40 percent respectively in 2017, and overall market concentration as measured by HHI was estimated to range between 2 875 to 3 400, according to a merger decision by the Swedish Competition Authority (Konkurrensverket 2017). For reference, a market with an HHI in excess of 2 500 is considered to be highly concentrated by the antitrust division of the US Department of Justice.

In particular, the pricing practices are characterized by inflated gross list prices combined with steep, often volume related rebates. This has been suggested to reduce price transparency and to create lock-in effects.[76] The rebates accrue to the builder and may be paid directly by the manufacturer or by the wholesaler. From a competition point of view, straight (or linear) rebates are just like price cuts. Incremental rebates can introduce an element of second-degree price discrimination but is not really a competition concern.

A dominant firm can achieve leverage by offering rebates conditional on the customer buying a specified fraction of its purchases, or specified absolute amounts, or exclusively from the wholesaler. Such rebates are known as fidelity rebates and are often retroactive, i.e., apply to all purchases made by the customer during a specific period (typically the same year). See example.

75. Ahlsell is primarily active in Sweden, Norway and Finland, has an explicit growth through acquisition strategy and has acquired almost a hundred companies from 1997 to 2019. Dahl is a subsidiary of Saint-Gobain, a leading global construction company.
76. See e.g., SOU (2000). Konkurrensverket (2018) provides further references to reports that discuss rebates. In the competition authority's report, however, rebates are not singled out as a major concern.

Example: Suppose firm A is an unavoidable trading partner for a fraction $1-\theta$ of a buyer's demand, leaving other wholesalers to compete for the fraction θ of its demand. If A sets the price P and offers a rebate δ on total purchases conditional on the customer buying exclusively from it, then a new firm must offer an effective price (EP) such that $\theta EP+(1-\theta)P=(1-\delta)P$. Thus, $EP=((1-\delta)P-(1-\theta)P)/\theta=(1-\delta/\theta)P$.

For example, if A offers a 10 percent conditional rebate and 25 percent of the market is contestable ($\delta=0.1$ and $\theta=0.25$), then $EP=0.6$. Thus, a new firm must offer a 40 percent discount to match A's offer. Such a rebate scheme could then be anticompetitive under EU competition rules (article 102 TFEU) if it would exclude an equally efficient competitor (as the incumbent). This kind of theory of harm is at the core of the never-ending rebate case against Intel. See European Commission (2005, 2009).

Rebates also allow wholesalers to price discriminate between customers, which may reflect differences in the cost of serving different customers but can also reflect differences in bargaining power. Rebates lead to less price transparency. Home buyers contracting with small builders have limited insight into the builder's rebates, and the degree of pass through of rebates is generally thought to be low.

The internet has afforded final buyers more price transparency and pricing practices have attracted media attention. However, for services where regulations require installations to be done by a licensed professional or where this is required by insurance contracts, more building materials will be sourced from wholesalers that target professional buyers and who have an interest in maintaining the rebate system.

There is also a potential risk that low price transparency due to rebates distort project cost estimates that constitute the basis for setting negotiated rents under the *presumtionshyra*-system. High apparent construction costs serve to push up rents. The builder may at the same time profit from hidden rebates.

The rebate system presumably serves to diminish pressure on costs. From the point of view of the manufacturer of materials, the benefit is that the system makes customers more loyal. From the point of view of the developer of rental housing, the system is attractive if rebates are not observable by the tenants' association since rents would then be based on list prices. The rebate system may also serve as an entry barrier for small wholesalers. The conclusion is that annual aggregated rebates may be in the interest of *both* the dominant buyers and the dominant sellers in the wholesale market for building materials, but for different reasons. Dominant sellers seek to limit entry into the market while buyers could profit from high apparent prices that justify high rents – and receive hidden rebates.

This scenario is consistent with the steep rise in building materials prices in Sweden, as shown in Figure 6 a–c, 7 and 8. Construction companies have an interest in inflating the list prices of building materials in tandem with equally inflated annual rebates, at least collectively. Competition in list prices is expected to be weak under these circumstances. Manufacturers or wholesalers will instead compete with rebates. List prices will tend to inflate, as sellers have small incentives to undercut

rivals and as buyers that benefit from discounts have little interest in list prices per se. Small buyers will be disadvantaged as they receive smaller rebates. This in turn strengthens entry barriers.

There are two main threats to a rebate system. First, as in all collusive schemes, there is a market opportunity for a maverick firm that stops colluding. Also, at some point, when the discrepancy between list prices and competitive prices becomes sufficiently large, entry by rival providers of building material becomes profitable. A deviant seller may want to target small customers that have not benefited from discounts. Second, large buyers, such as municipalities, might eventually react against the inflated prices and sponsor entry, for example by inducing imports of building materials.

5. Limited competition in construction and other competition problems

So far, we have focused the discussion about the high cost of new housing in Sweden on the role of land prices and the cost of building materials. While both of these factors clearly matter, we have also argued that they cannot explain all of the cost increases for housing. Here, we explore to what extent limited competition in the housing construction sector can also play a role. Since casual observation suggests that competition is strong among small firms building single-family houses, we focus on larger projects. The strict freedom-of-information legislation in Sweden in combination with the procurement rules in the public sector allow us to study the competitive situation in the market for construction of multi-family housing. In this section, we will also briefly discuss the possible existence of cartels in markets relevant for the construction of new housing.

5.1 Public procurement of rental housing

As a consequence of the affordable housing policy in Sweden, municipal rental housing corporations own a large fraction of rental housing and construct about half of new rental housing. This means that the rules for public procurement apply for a sizeable share of new rental housing and that tenders are public.

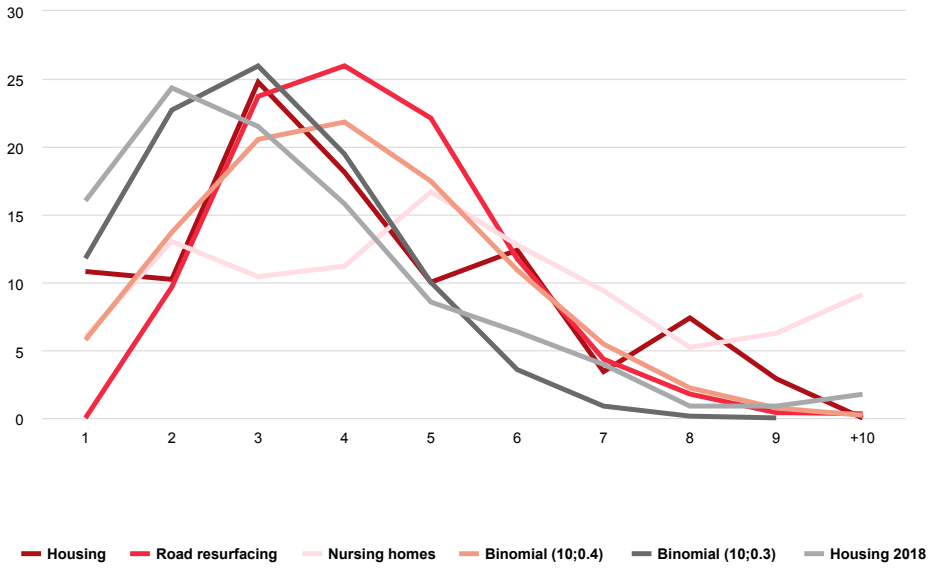
An important consideration in procurement is the (expected) number of bidders. A firm submitting a bid needs to consider the cost of preparing the bid, the chances of winning the contract and the profit it can make if it wins. The two latter depend on the price quoted in the bid. If the firm expects many competing bids by efficient firms it will have to offer a low price to stand a reasonable chance of winning. Conversely, if few or no other firm are likely to submit bids, the firm can submit a much higher bid. Therefore, the expected number of bidders is likely to affect the price level. We cannot observe the firms' expectations, but we can observe the realized outcomes, which should be a fair approximation of expectations, assuming that firms learn from observation.

The Swedish Competition Authority (Konkurrensverket 2015) studied public procurement of apartment buildings during the years 2009–2012 and found that the

average number of bids was about four. Bergman and Stake (2015) argue that having four bidders is likely sufficient for a competitive procurement process, given that there are relatively significant costs associated with submitting a bid.

In a follow-up study (Konkurrensverket 2018), covering 2015–2018, the average number of bids had fallen to just under 3.5. In about 40 percent of the procurements there were one or two bids, twice as common as in the previous study. Similarly, Public Housing Sweden (Sveriges Allmännytta, formerly known as SABO), an organization for municipal and private rental housing corporations in Sweden, found that the average number of bids fell from 3.2 in 2015 to 2.6 in 2017. During the period 2015 to 2018 the price per apartment in the winning bid increased by 48 percent (SABO 2019).

Figure 9 Relative frequency of number of bids per procurement in four empirical samples and binomial probability mass function for two sets of parameters



Source: Number of bids in multi-family rental-housing tenders 2009–2012; see Konkurrensverket (2015) for details. Ditto, 2015–2017, kindly provided by the Swedish Competition Authority; see their 2018 report for details. For road re-surfacing procurements, see Bergman and Stake (2015). Nursing-home management contracts 2001–2019, collected by Mats Bergman. Binomial distributions calculated by the authors.

Figure 9 shows the share of all public procurement tenders that received a certain number of bids, for four empirical samples covering 456 new multi-family housing tenders in 2015–2019 and 164 in 2009–2012 respectively; 1 244 road resurfacing tenders; and 384 nursing-home management contracts. The average number of bids was 3.5, 4, 4.2 and 4.4. All of the empirical distributions resemble a theoretical distribution with ten potential bidders that each independently submit a bid with 40 percent probability, although all of them deviate in some respect. The road-resurfacing sample has fewer instances of a single bidder than expected, the

nursing-home sample has fewer instances of three or four bids than expected, while the housing sample has *more* instances of only one or two bids than the hypothesized theoretical distribution.

We can generate a distribution that resembles the empirical distribution for housing tenders by assuming that for half of all tenders there are ten potential bidders and for half of all tenders there are only five potential bidders, and where each potential bidder participates with probability 40 percent. If we are willing to see this as a likely explanation and if we assume that the potential bidders have rational expectations about the *expected* number of bidders, this means that in half of all public procurements of multi-family housing, the actual bidders expect to compete with only one other firm. This would likely result in elevated prices.[77]

Still, while poor competition for half of all municipal rental housing, (about 10 percent of all new housing) would be a serious problem, it can perhaps not explain why construction costs have evolved differently in Sweden than in other countries. This said, it is worrying that there is a single bidder in between 10 and 30 percent of the public tenders for apartment buildings.

5.2 Cartels

Explicit collusion in the building and construction market would be even more detrimental to competition than just a low number of expected bidders. Competition in all markets can be hampered by collusive behaviour such as price cartels or agreements to divide up the market or, in procurement markets, by bid-rigging schemes. In Sweden, no anti-competitive agreements case has been brought against firms in the construction sector in a long time. The final decision in the case of the Asphalt cartel was handed down in 2009, but the cartel was uncovered already in 2001. The Plastic pipe cartel was decided in 2003. This indicates that compliance to competition legislation is high.[78]

However, anti-competitive behaviour in the building materials market seems to be more common elsewhere in Europe. Connor and Helmers (2007) report that cartels in the construction sector account for 16 percent of all cartels uncovered in Europe, suggesting that the industry has been tainted by collusion at least historically. Indeed, European competition authorities reveal collusive agreements in the sector from time to time.

In Denmark, the High Court recently fined two construction companies for bid rigging (Danish Competition and Consumer Authority 2020) and in Germany the Bundeskartellamt, the German competition authority, fined eleven building-service providers for bid rigging (in the amount of 110 million euro) and fined three

77. The figure plots the empirical probability mass function for the four empirical samples. These are compared with theoretical probability mass functions for binomial distributions with 10 independent bidders, each submitting a tender with probability 0.4 or 0.3. We cannot use a binomial distribution to generate the observed high incidence of single bids while still having four bids on average. A possible explanation is that for a subset of these tenders the expected number of bidders is small, either because the number of potential bidders is quite small or because the potential bidders submit bids with a low probability. As a suggestive exercise, we have calculated the probability mass function that results when adding one binomial distribution with five potential bidders and one with ten, where each potential bidder bids with a probability of 40 percent. This distribution closely tracks the empirical distribution for housing bids 2015–2017.
78. Well known Swedish construction companies have however been involved in collusive arrangements in other jurisdictions. Hence another interpretation is that the detection rate is low, e.g., due to ineffective supervision.

producers of steel plates used in construction for price-fixing (646 million euro, Bundeskartellamt 2020.) The Competition and Markets Authority (CMA) in the UK recently launched a campaign targeting anti-competitive behaviour in the construction sector in the wake of a number of cases. The CMA fined three drainage-product manufacturers for coordinating prices and for engaging in market sharing, and five office-outfitting firms for bid-rigging in 2019. It is currently pursuing cases against groundworks suppliers and suppliers in the roofing-materials sector. Interestingly, a study commissioned by the CMA found that the awareness of the competition rules was mixed in the construction industry and that only 57 percent identified the statement 'It's okay for competitors to agree prices in order to avoid losing money' as false (ICM 2018).

6. Conclusions and recommendations

We have seen steeply and steadily rising market prices for owner-occupied homes in Sweden and Norway in recent decades. In contrast, Finnish housing prices have been stable since the financial crisis. Denmark and Iceland experienced what in hindsight looks like a house price bubble in the 2000s, which burst after the financial crisis. Prices have only quite recently reached the levels from 15 years ago.

In an international comparison and taking the long view, the rise in housing prices in Sweden is not unique. The trend began later than in many other countries, but it has been comparatively steep in recent years. Taking a closer look, what does stand out is that rising land prices have played a limited role. Although real land prices have more than quadrupled since the late 1990, this can only explain about 30 percent of the rise in cost of new housing. Elsewhere, land prices have played a much greater roll. Knoll et al. (2017) estimated that rising land prices typically account for 80 percent or more of the cost increase for new housing (see also, Hilber & Vermeulen 2016).

Real construction costs in Sweden have more than doubled since the late 1990s. This is true irrespective of whether we use the average construction cost per square meter or the cost index for the construction of new housing. Cost increases have been steeper for multi-family housing, in particular for cooperative apartment buildings. This development can be contrasted with the situation in the US and Germany, where real construction costs have been stable.

The effect of rising construction costs depends on the supply of land and on the substitutability between land and other factors of production, such as labour and building material. We present a simple model analysis that shows that rising construction costs can actually result in higher land prices in regions where land for new housing is scarce, but under other assumptions concerning factor substitution we could expect higher construction costs to be capitalized into lower land prices. Empirically, we observe relatively modest land-price increases in Sweden compared to many other countries, with rising construction costs contributing relatively more to the rising price of housing.

In the international literature, land-use regulation is often suggested as the main cause behind rising land prices and such restrictions are also thought to make housing supply less elastic (Gyourko & Molloy 2015). We believe similar mechanisms are at play in Sweden, even though there is some empirical evidence suggesting that the supply of housing is relatively elastic in Sweden (and in the other Nordic countries). While land-use regulations are useful tools in the presence of external effects they are, given the long duration of the legal processes and the sometimes overly strict regulatory standards, in combination with the ongoing urbanization likely to be a main reason for the high land prices.

When it comes to rent regulation, Sweden does differ from comparable countries, in that it has rent regulations for a large share of all housing. In particular, the new version of the regulation, *presumtionshyra*, can be expected to raise average construction costs per square meter, as this is one way for landlords to increase profit. According to the Averch-Johnson effect, a firm with rate-of-return regulation has incentives to add more units of capital, i.e., to make housing more luxurious. In addition, this type of regulation can easily dampen cost incentives, making each unit more expensive.

We observe that the cost of building materials has increased more in Sweden than in comparable countries. This is possibly due to a system of rebates that may not be captured by Statistics Sweden's price measurements and that possibly is more pervasive in Sweden than elsewhere. Such rebates can easily raise entry barriers for new firms seeking to challenge the incumbents. We present calculations suggesting that rising costs of building material can explain at least a quarter of the increase in housing prices seen in Sweden in recent decades.

Looking at competition for construction contracts we noted that while the average number of bids for municipal multi-family housing may not be remarkably low compared to other sectors, the share with only one or two bids is high. This could indicate that the expected number of bidders is quite low for a large share of all tenders. Under such a scenario and if the construction companies can make good estimates of the expected number of bids, this is enough to cause concern. The few bidders would then have incentives to submit high bids.

None of the above explanations may be sufficient to explain the high cost of housing in Sweden, but in combination they paint a picture that is consistent with the view that has been expressed in numerous government reports: that competition in Swedish housing construction is weak.

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Appendix: A simple model illustration

The model illustrates how land availability and construction costs influence the price of housing, the optimal input mix and the income shares spent on housing by the households.

Supply

Housing is provided in two locations, A and B, where income is higher in A than in B. We can think of A as a metropolitan area where land is constrained, whereas it is not in B. Housing is produced with a Cobb-Douglas technology using land, l, and capital, k, as inputs. Capital serves as a catch-all for non-locational qualities such as amenities, and the price of capital, p_k can be interpreted as construction costs. Competitive builders choose inputs to minimize cost, given a quantity of housing, h:

$$\min_{l,\,k} \quad p_l l + p_k k - \lambda\left(l^{0.5}k^{0.5} - h\right)$$

This yields the factor demand functions $l\left(p_l,\, p_k,\, h\right) = h\sqrt{p_k / p_l}$ and $k\left(p_l,\, p_k,\, h\right) = h\sqrt{p_l / p_k}$. The marginal cost of capital, c_k , is assumed to be constant, but the price, $p_k\left(k\right)$, could potentially increase in k, e.g., due to imperfect competition. However, we treat the price of capital as constant.

In B land is freely available at a constant marginal cost c_{lB}, so $p_{lB} = c_{lB}$. The optimal input mix in B is thus constant and independent of the level of housing services. The lowest cost of providing housing in B (the cost function for h in B) is thus $c_B\left(p_l,\, p_k,\, h\right) = 2h\sqrt{p_{lB}p_k}$.

In A, land is in fixed supply, $\bar{l}_A$, and p_{lA} equals the inverse demand for land when all land is used: $p_{lA} = h_A^2 p_k \,/\, \bar{l}^2{}_A$. Since p_{lA}increases in h_A the optimal input mix is not constant. If p_{lA} is high, builders use less land and more capital, i.e., provide smaller and better-appointed housing or build taller buildings. The cost function, $c_A\left(p_k,\, p_k,\, h\right) = 2h^2 p_k \,/\, \bar{l}_A$, increases more steeply in h_A.

Under perfect competition, supply is given by the average cost. In B, this is constant, which corresponds to a horizontal supply curve. In A, it is proportional to h, which results in a linear supply curve.

Demand

Suppose consumers have identical CES-preferences over housing, h, and other goods, x.

$$u\left(h_l,\, x\right) = \left(h_l^{\theta} + x^{\theta}\right)^{\frac{1}{\theta}}$$

For convenience, suppose that $\theta = -1$. Individuals choose h and x to maximize utility given their budget constraint $y_l = x + p_{hl}h_l$, where y_l is the income and p_{hl} is the price of

housing in l. The price of other goods is normalized to 1. The demand for housing by an individual in l is then,

$$h_{li} = \frac{p_{hl}^{-0.5}}{p_{hl}^{0.5}+1} y_l$$

This can be shown to imply that a rising share of the budget is spent on housing as the price increases.

The aggregate demand for housing is the sum of the individual demands for agents living in a location. The number of individuals living in A is n_A, and in B, $N–n_A$, where N is the population size.

Market equilibrium

Market clears when supply equals demand. Since supply is horizontal in B, the price of housing equals average cost, $p_{hB} = 2\sqrt{p_{lB}p_k}$. The quantity of housing is then the aggregate demand evaluated at this price,

$$h_B = \frac{p_{hB}^{-0.5}}{p_{hB}^{0.5}+1}\left(N - n_A\right) y_B$$

So, h_B responds to population size and income, while p_{hB} remains constant, as does the input mix. In A, the supply, $h_A = p_{hA}\,\overline{l}_A \,/\, (2p_k)$, must equal aggregate demand for housing, i.e.,

$$h_A = \frac{p_{hA}^{-0.5}}{p_{hA}^{0.5}+1} n_A y_A$$

Since supply strictly increases in price while demand strictly decreases, there is a unique equilibrium. Not surprisingly, increased income or increased population in A shifts demand and results in higher housing prices. By contrast, an increased availability of land reduces prices.

We have yet to determine the individual choice of location and n_A. To do so we compare the utilities of individuals living in the two locations which, given the equilibrium prices and quantities:

$$u_A\left(h_A, x; y_A\right) = y_A\left(p_{hA}^{0.5}+1\right)^{-2}$$

and

$$u_B\left(h_B, x; y_B\right) = y_B\left(p_{hB}{}^{0.5}+1\right)^{-2}$$

Both utilities increase in income, but in A the benefit of higher income is partly offset by rising house prices. In equilibrium, $u_A\left(h_A, x; y_A\right)$ must equal $u_B\left(h_B, x; y_B\right)$. Now, suppose $y_A > y_B$. This makes it attractive to move to A, but relocation itself drives up the cost of housing in A until indifference is restored. This mechanism ensures an equilibrium, as long as enough people live in B to allow for full adjustment via relocation.

Interest rates and capitalization

The model concerns a one-period choice. However, we can stretch the interpretation a little and think of individuals as making a long-term housing decision which determine consumption of housing services and other goods in each period for a long time to come. The price of real estate then reflects the discounted value of this consumption stream and would depend on the interest rate. Specifically, a lower interest rate makes housing services cheaper insofar that it allows households to make a larger capital outlay for a given amortization.[79] (It may be introduced in the model as a coefficient on the housing prices). The main effect is to increase consumption of housing relative to other goods.

Parameterization for the graphs

The following parameter values have been used for the supply and demand graphs in Figure 4 and 5: $c_k = c_{lB} = 0.25$, $l_A = 1$, $y_A = 4$, $y_B = 2$, $N = 13$. The graphs were produced in Mathematica.

79. This argument could also partly apply to consumption of other goods, which we abstract from here.

Comment on M. A. Bergman and S. Nyberg: Housing prices, construction costs and competition in the construction sector – a Swedish perspective

Michael Cocozza

The article by Bergman and Nyberg centers on causes of the relatively high Swedish housing prices. The authors discuss some connected issues causing the high price level: low competition in the markets for building materials and housing construction, the Swedish rent-setting system, the zoning rules and the high rise of land prices since 1990. Altogether, these factors affect housing prices. My comments below are based on my experience as an entrepreneur in the industry. I have been active as a builder and housing developer since 1984 in the Swedish market and I will give my personal view on the analysis in the article. I hope I may be able to contribute with some suggestions to new approaches and new perspectives when it comes to housing and construction prices.

1 Interest rates

Let us start with land prices. The major factor, according to my view, causing the steep rise in housing prices since the 1980s, namely falling interest rates, is not dealt with in the article. When I started working in the 1980s, we borrowed money at an interest rate of 16 percent for investments. Today there is financing at 1–1.5 percent. In the 1980s, we had to make an investment calculation with a required yield of 15 percent. Today, the corresponding yield is 3 percent. This strong falling trend in interest rates has resulted in higher prices of residential buildings and especially of land. As is well known, the same also applies to other kinds of assets. We have had substantially higher stock and bond prices since 1990. I think this underlying trend of falling interest rates should be part of the analysis of the development of housing prices. It might even explain the main part of the rising prices.

2 Rent-setting and investment subsidies

As regards the Swedish rent-setting system, *bruksvärdeshyra*, and rent-setting for new production since 2006, the more market based form of *presumtionshyra*, I do not agree fully with the analysis in the article. My experience is that *bruksvärdeshyra* has not been an obstacle to new investments in housing projects. The intention of the system is that rents should reflect the market value of housing units. For the housing stock, the system works for the most part as intended with the main exception of central Stockholm and, to a lesser extent, some of the main regional city centers. The main problem, however, has been central Stockholm, where rents have been substantially below the market level. This state of affairs dominates the debate and gives the impression that the same is the case for the country as a whole. However, the rent-setting system is and has definitively not been an obstacle to private investment in new production.

Rents have been set by the cost of new production of the municipal housing companies. These companies are controlled by boards consisting of politicians, most of them with little knowledge or personal experience from professional building or housing markets. The municipal companies have overall had poorer governance and lower efficiency and consequently relatively high rents for new houses. It has not been difficult for experienced private companies to get acceptable yields with rents based on costs in a production process ultimately governed by an amateur board appointed on political merits. The proposition by some economists that there has been a system of absolute 'rent control' and that private investors were driven away from the housing market does not hold. That proposition is more based on assumptions underpinning microeconomic theory than on empirical studies. This overly theoretic approach has to some extent also influenced the analysis of *presumtionshyra* in the article. The *presumtionshyra* system gives more scope for market forces in new production. With this possibility, there is no rent control of any importance left. It is possible to set rents that give investors an acceptable yield. The factor setting rent levels in the *presumtionshyra* system is not the construction costs but the market. The companies, municipal as well as private, can in rent negotiations with the tenants´ association show a production cost adjusted to rents that markets accept. The introduction of *presumtionshyra* has not per se affected construction costs.

It would have been interesting to see an analysis of how the Swedish investment subsidy program affects the housing market. The investment subsidy program was introduced in 2015 and aims to stimulate affordable housing. If the housing company keeps a rental level of approximately 1 500 SEK per square meter during the first 15 years, i.e. 15–25 percent below *presumtionshyra* or the market level, the state will subsidize the investment at approximately 5 000 SEK per square meter at a total production cost of 30–45 000 SEK per square meter, depending on type of project. Why do some companies work with the investment subsidy program and keep a lower rent than the market rent? What is this telling us about the housing market?

3 The planning process

The Swedish zoning system is clearly a cost-driving factor. It is a cumbersome process which takes a long time. As a result, the supply of land zoned for housing is limited. We could compare the Swedish system with the more flexible German system, where under certain conditions you may apply for a building permit based directly on the general plan (*översiktsplan*). The developer can in this case skip the time consuming process of obtaining a detailed plan. My experience is that the Swedish system has become increasingly bureaucratic during the last 20 years. It might be that the more flexible German system creates a higher supply of housing and accordingly keeps housing prices lower.

4 Construction costs

The costs of construction and building materials have definitively increased disproportionately in Sweden. Initially, we should ask if higher costs in Sweden compared to elsewhere in Europe applies to other markets as well, such as food and clothing. We are in a peripheral location in Europe with greater distance to the main markets where volumes are significantly larger. We constitute a small language area and have our own currency. It would be interesting to see a study of how the relative cost situation compares between Sweden and the rest of Europe for several product groups. Furthermore, comparisons of construction costs over time are difficult if the housing unit decreases in average size by about 25 percent. Smaller apartments will automatically result in a higher cost since expensive installations in kitchens and bathrooms have a greater relative cost impact for small apartments. This might constitute a source of error of about 10 percent in cost comparisons over time.

The relatively higher wages over time in the building industry in Sweden are probably caused by strong trade unions. It would be interesting to see a comparative study of the influence trade unions have on the building industry in different countries.

In my opinion, low competitive pressure and high prices of building materials have historical reasons that still affect the market. What ultimately governs housing price formation is access to land, or more specifically, the access to building rights on land zoned for residential use. The authors argue that competition in the Swedish market is weak. This is a consequence of a regime that evolved during the second half of the previous century.

5 A historical perspective

If we go back to the time before the financial crises in 1991, housing construction was concentrated to municipal housing companies and two cooperative organizations, HSB and Riksbyggen. In addition, the bank Sparbanken owned companies that

managed the building of one-family houses. For a long time we also had a construction company owned by trade unions, BPA. Thus, we had strong and detailed control of the construction process as a whole by companies and organizations with ties to the Social Democratic Party (SAP). This was a time when SAP had a strong position in society, with 40–45 percent of the votes in general elections. We had an arrangement where the supply of land for construction was handed out selectively to housing companies in a closed and politically controlled process with no competition at all. This lack of competition for land caused weak competitive pressure further down the chain of production, among contractors and subcontractors and for building materials. In some cases, the selected housing companies even created long-lasting cooperation with building companies, which were given contracts in negotiated procurements without competition. This policy was indeed motivated by very good social housing ambitions, but it resulted in weak competitive pressure at every level of the chain of production, and several times also in outright corruption.

This regime in the housing industry has to some extent successively been altered. The introduction of LOU, the law on public procurement, is one factor. The successive abolishment of the interest rate subsidy system starting in 1992 is another factor. Lower state subsidies meant that more efficient processes and methods had to be developed. The financial crisis in 1991–92 also had repercussions on the structure of the housing companies. We have seen increased integration between housing and construction companies during the last 10–15 years. Many companies are integrated today and thus have a competitive advantage compared to municipal housing companies. Some of the integrated companies have gone further to eliminate intermediaries for the supply of building materials. In a regime of competition for municipal land, the question of construction costs for municipal companies becomes less important.

6 Building costs for municipal housing companies

Historically, there has been a focus on housing costs of municipal companies and their procurement of construction. This tradition is also followed in the article with a section about municipal companies and their procurement. The section discusses the number of bids in public tenders and the finding is that there are relatively few bids and that 10–30 percent of procurements have just one bidder. This might be seen as resulting from bad procurement, too much risk-taking passed on to the bidder, or that projects may be too big for smaller companies. If the project is for 400 apartments, there will be fewer bids than if the project is divided in two procurements of 200 apartments each. The competition in the housing market may be very good indeed at the same time as it is weak for municipal companies, due to obstacles these companies create on their own. Against this background, it might be better to move the attention from the problems of the municipal companies to the market as a whole, and to focus research on housing prices and housing supply, not on the cost structure of certain companies. We do not discuss Volvo's cost structure

in building cars. Nor is the discussion of the housing companies' cost structure really of any interest to the public. What is interesting for the public are prices and rents in the market for new housing.

7 The competition for land

What is left of the old regime is a lack of competition for the central production factor, namely land with building rights. It is still the case that the allocation of land owned by municipalities – municipalities own most of the land – may take place without competition. The legislation governing the sale of municipal land is soft. There is no compulsory law stipulating that the process has to be competitive, as with public procurement. EU state aid rules are not applied in practice. The municipalities have a high degree of freedom when it comes to selling assets. We can see that, when allocation of land takes place in a competitive process and the lowest rent is the criterion for selection, there are big differences between the bids and municipal companies are seldom competitive. This is demonstrated by Table 1, which shows the results of one competitive bidding process in Stockholm in 2019. The municipal companies, Svenska Bostäder and Familjebostäder, were ranked 6th and 15th respectively. So what should we infer from this table regarding building costs? Nothing else than that the cost structure of different companies is of little interest, what matters is price (rent).

Table 1 Land allocation competition at Årstafältet, Stockholm 2019

Bidder	Bid rent per square meter living area per year, SEK
Bergsundet	1.440
Botrygg	1.495
Järntorget	1.525
Sveafastigheter	1.539
Sveaviken bostad	1.540
Svenska bostäder	1.625
Wallfast	1.693
SSM	1.750
Resona	1.785
Magnolia	1.790
Olov Lindgren	1.825
Gimle Bostad	1.847
Besqab	1.890
JM	1.950
Familjebostäder	2.400

Source: Stockholms Stad (2019).

The point of exposing housing companies to competition for land is that the developer's part of the total cost is also exposed to competition, not just the construction part. When municipal companies buy construction contracts, the developer's part is not exposed to competition. The developer´s part may amount to 30–40 percent of total costs, due to the fact that developers determine floor planning, area effectiveness, parking solutions, choice of material, technical solutions, and so on.

There were extremely few competitive land allocations in Stockholm, the main market, in the years 2006–2014. It is remarkable that a major part of land allocations by the city of Stockholm was allocated without competition to the leading private developer, which already had the most building rights on its own land. Since a center-right majority assumed power in 2018 there has been a trend towards increased competition.

The low supply of land zoned for residential use and the lack of competition in the allocation of building rights are in my opinion the main causes behind weak competition at different levels of the Swedish housing market. The analysis of the housing market should focus more on the regional level. We will come closer to reality if the analysis is separated in three categories: the three large city regions, regional cities with universities, and the rest of the country. The development of the market in the north and away from the coast has been entirely different from that in Stockholm.

When a Swedish citizen sells her land or her home, she hires a broker to sell it in a kind of auction procedure. When a municipality is selling property belonging to the citizens, land is often sold in a non-transparent, negotiated process. This plays an important role for how the housing market works.

The municipalities have a zoning monopoly. Zoning determines the value of the land. Zoning together with the way municipal land is sold affect both the volume of building rights and final housing prices. A regime with a planning process of ten years plus mainly municipal housing companies with negotiated construction contracts without any competition will result in a certain housing supply and land prices. Another kind of regime with building permits given directly on the basis of the general plan, skipping ten years of detailed planning, and municipal land sold at auctions will result in another type of market. That market would probably have strong competitive pressure affecting the entire industry down the line, with a greater supply of building rights and higher land prices, which in turn would result in lower rents, provided the municipality wants affordable housing as part of the supply.

8 Some thoughts on future research

It would be interesting to compare the supply of building rights in different countries, how the supply is affected by the planning regime and how competitive the allocation of building rights are, i.e. to compare the planning and the selling regime. Further, it would be interesting to see if there is a connection between supply and intensity of competition on one hand, and final prices and rents for new housing on the other in different markets.

The analysis by Bergman and Nyberg in this article is persuasive and a good basis for further research. It might be fruitful to have more of interdisciplinary research of the housing market, combining economics, economic history and political science. I have in my comments pointed to some areas where comparative interdisciplinary research could be rewarding.

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Comment on M. A. Bergman and S. Nyberg: Housing prices, construction costs and competition in the construction sector – a Swedish perspective

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House prices have risen substantially in many countries and international studies indicate that rising land prices are the prime cause (Knoll et al. 2017). Bergman and Nyberg argue that even if land prices have risen in Sweden, they only account for a relatively small part of the increase in house prices. Instead, increases in construction costs seem to be a more important cause. The authors look at the rise in construction cost from a number of different perspectives.

1 High land prices can lead to higher construction costs

One mechanism that the authors investigate, using a formal model, is that increasing land prices can lead to increasing construction costs in two ways. The first is that higher land prices make it rational to build more per unit of land, and this means that construction cost per unit of land rises. The second way is that when land prices are high, it becomes rational for developers to focus on higher income groups and build with higher quality. This implies that construction cost per square meter of housing increases.

There are some problems with this argument. The construction cost index produced by Statistics Sweden claims to be a constant-quality cost index. Increasing the quality should not lead to an increase in the construction cost index. The authors may, however, be correct in their argument, since it can be questioned whether the method that Statistics Sweden uses really controls for all kinds of quality changes (Lind & Song 2012). Borg and Song (2015) present an attempt to correct for remaining quality changes. They collect data on quality changes that have not been controlled for, such as stricter building regulations (e.g. to increase energy efficiency) and increased quality (e.g. in terms of materials), and estimate how much these have added to the construction cost. They conclude that about half of the increase in cost reported in the index is caused by quality changes not controlled for. This means that a considerable part of the reported constant quality cost increase

actually is caused by increased quality.

The data reported in Table 1 indicates that constructions costs have increased more for condominiums than for rental housing. This could strengthen the case that quality increases have caused increases in construction cost, as condominiums typically target higher income groups. There are, however, also problems with these statistics. As shown in Lind (2016), developers of condominiums in Sweden have incentives to overreport construction cost and underreport land cost. Informal information reported in that paper indicates that quality differences between new rental apartments and new condominiums are small. This indicates that the reported higher cost increase for condominiums is not caused by quality changes.

A general comment is that the authors perhaps are too uncritical of the underlying statistics and should look more closely on how the statistics are collected and processed. It should not be taken for granted that the reported statistics give a correct picture of reality.[80]

2 The role of the presumption-rent system

The Swedish rent regulation system is a collective bargaining system where the tenants´ association and landlord organizations bargain yearly about rent changes, in a similar way as on the labour market. If tenants suspect that the rent for their apartment is too high, they can go to court. The court evaluates the rent by looking at the collectively agreed rent for similar apartments. This procedure creates a risk for companies that develop new rental housing during periods of increasing costs, as tenants may argue that their rent is too high compared to similar apartments in the existing stock. The presumption-rent system was created to reduce the risk to investors. The rent is set in bargaining between the developer and the tenants´ association and is then 'presumed to be reasonable'. Tenants cannot question the rent in court for a 15-year period.

Earlier research referred to by the authors shows that a cost-plus-regulation can create incentives to increase cost, as higher cost makes higher rent possible. Some documents state that the presumption rent should be set to cover cost and give a reasonable rate of return to the investor. The authors therefore see the presumption-rent system as a cost-plus regulation.

This can however be questioned. The law does not say that the presumption-rent should reflect cost and does not stipulate any specific rate of return to be reasonable. The government report that proposed the system argues explicitly against seeing the presumption-rent as a cost-based rent, since such a rent can be calculated in many different ways (SOU 2004). The presumption-rent is simply the rent that the landlord and the tenants´ association agree to call the presumption-rent. It is common to say that presumption-rents are based on cost, especially by the tenants´ association, and this may have misled the authors. A housing company that

80. An example is the rather strange development of certain costs 2019–2020, e.g. the reported dramatic fall in labor costs at the end of 2019 and beginning of 2020. I am far from sure that this really is true. The payment system in the construction sector is complex and negotiated at rather short intervals, which makes collecting data difficult.

wants to follow this line of reasoning can however get higher rents without actually increasing the cost, e.g. by arguing that a higher rate of return is reasonable or that depreciation rates should be increased. The calculated cost can also be increased by changing the principle for allocating overhead costs. If the goal of the tenants´ association primarily is to protect sitting tenants and make sure that new rental housing is constructed they can be rather easy to convince that a certain (high) rent is reasonable in new construction, especially as these more expensive apartments typically target higher income groups. The arguments for saying that the presumption rent system has contributed to higher construction cost is therefore rather weak.

3 The role of limited competition: few bidders

The authors discuss several competition problems in the construction sector. In this and the following sections, I will comment on some of these.

As shown in the paper there is a low and falling number of bidders when public housing companies procure new construction.

Measuring the level of competition by looking at the number of bidders can however be questioned. If it is costly so submit a bid, which it is in this context, the optimal number of bidders can be rather small. It might also be the case that there is informal long run cooperation between the client and some of the construction companies. If it is known that the client is satisfied with these companies, then entering a bid would not be rational for other companies. Some companies in other industries work with long-term contracts with suppliers, instead of competitive tendering and short-term contracts. IKEA is a good example of this.[81] In these contracts, the client demands productivity increases from the supplier and constant or falling prices; otherwise, it will switch to other suppliers.

A broader view on competition and procurement methods might be necessary in order to understand how the market works. There are of course problems in establishing long-term cooperation in a situation where future production levels are uncertain, not the least because of unpredictable municipal planning. In any case, I think the authors have a too narrow perspective on competition and procurement when they focus on the number of bidders.

4 The role of limited competition: organizational structures

In addition to pointing out the relatively small number of firms in certain parts of the construction sector, the authors point to certain institutional structures, e.g. the

81. See e.g. Jonsson et al. (2013) for an overview of IKEAs supply chain model.

wholesale market for many construction materials. This market is far from transparent, with high prices but also large discounts for insiders.

As the authors discuss, it should be possible for larger actors to buy directly from the producers if the wholesale companies have high prices. An interesting question that the authors touch upon is how these seemingly irrational and cost-increasing structures can remain in place over long periods. I will return to this the final section.

5 The role of limited competition: international comparisons

Even if there are problems with the construction cost statistics, the general view seems to be that construction costs have increased more in Sweden than in other comparable countries. One hypothesis is that the level of competition is lower in Sweden, but in order to substantiate such a claim, an international comparison of the levels of competition would be necessary. The authors refer to Connor and Helmers (2005), who report competition problems in the construction sector in many countries.

There are at least two other hypotheses for why construction costs have increased faster in Sweden than in other countries. The first is that the unpredictability of the planning system in Sweden and the protracted appeal processes increase costs more in Sweden. The second hypothesis is that the municipalities in Sweden often have specific requirements on the design of new buildings, which reduces the possibility to standardize the production process.

Also on this point, I would have welcomed a somewhat broader perspective.

6 Concluding comments

The authors present a number of interesting observations concerning imperfect competition problems on the Swedish construction market, but it might also be interesting to try to formulate a more comprehensive stylized model to integrate these observations. Here is an attempt to formulate such an informal model.

The first component is that restrictions on land (building rights) together with falling interest rates and increases in disposable income lead to rapid increases in house prices. It follows that the surplus from housing construction increases. If all markets are imperfectly competitive, the result can be a 'surplus-sharing' system, where land prices, contractor prices, building materials prices and wages in the construction sector increase in tandem.

The problems in the Swedish construction sector have been discussed for more than 60 years and it is therefore important to explain why such a surplus-sharing system can persist decade after decade. I propose the following hypotheses.

1. In a situation where the general level of construction is high, a surplus-sharing system should be easier to sustain. It is not so risky to demand a rather high price in a specific bidding contest when there will be other projects available if you lose. If the central government stimulates construction in an economic downturn – which has been a classical policy in recessions – then a high construction price or cost level can continue in the downturn.
2. If housing companies are 'satisficers' and have a rather short-term perspective, it will not be rational for them to challenge the existing system. Since each cost element is a rather small part of the total cost, the possible gain from challenging each specific problem area will be rather low in the short term. Lower interest rates also means that rents may not have to increase in line with the construction cost, which also weakens the incentive to reduce construction costs for housing companies.
3. In theory, we should expect foreign companies to try to enter a market with a large surplus and there are some examples of this. There are, however, a number of risks in entering a new market and also risks for the clients when hiring a new builder. If future demand is uncertain, then the incentive to enter is reduced. Once a firm has entered the market, it will probably be rational to adjust to the policies of existing firms in the market and act in the same way as them, i.e. to set rather high prices (see e.g. the discussion in Anjou 2019).

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Housing taxation in the Nordics – efficiency and equity

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Abstract

In many countries, owner-occupied housing enjoys a tax-favoured status relative to rental housing and many other forms of wealth. I first use simple examples to illustrate why the tax status of owner-occupied housing relates crucially to the tax treatment of the so-called imputed rent and mortgage interest expenses. I then discuss other issues related to capital income taxation as well as property taxation and housing market transaction taxes against basic principles of good taxation, referring to tax policies in the Nordic countries. I also discuss the connection between certain macroprudential policies and housing taxation.

Keywords: Housing taxation, tenure choice, capital accumulation, Nordic countries.

JEL codes: H21, H31.

1 Introduction

Housing expenditures make up a large share of total household consumption and many households have most of their wealth in the form of housing. Housing choices also influence labour market outcomes because of their link with labour mobility. These features make the taxation of housing important for public finances and welfare. This is especially true for the Nordic countries because they have relatively large public sectors. The higher the overall tax burden, the more important it is to design the tax system so as to minimize its welfare-reducing effects.

I discuss the taxation of housing in the Nordic countries against what I see as basic principles of good taxation. These principles relate to efficiency and equity goals. The idea is to seek to minimize the so-called efficiency cost of taxation given the revenue requirement and the desired degree of redistribution.

An example of an efficiency cost of taxation is the negative effect of income taxation on labour supply, compared to lump-sum taxes that are independent of how much individuals choose to work. However, because lump-sum taxes (say, 30 000 euros a year for every working age individual) would violate the usual equity goals, we need to accept some efficiency costs. This makes the fully optimal tax system potentially very complicated. However, one principle that is usually helpful in achieving a good tax system is to avoid treating very similar activities differently, unless a differential tax treatment can be justified by a specific efficiency argument or equity consideration. Another useful principle is to avoid imposing a high tax burden on activities or tax bases that are quickly reduced by taxation. My discussion is largely based on these two principles. The idea is to avoid creating distortions that are unnecessary to achieve the distributional goals of taxation.[82]

I first describe how capital taxation typically treats similar housing-related activities. I use simple examples to illustrate the importance of the tax treatment of the so-called imputed rent and mortgage interest payments and link them to the actual tax systems in the Nordic countries. The examples involve a household that may own or rent its home and invest in rental housing or financial assets. I then discuss the taxation of housing more generally against the above-mentioned principles of good taxation. I discuss property taxation and housing market transaction taxes separately from capital income taxation. Finally, I consider the current low interest rate environment and discuss the links between housing taxation and policies that aim at limiting household indebtedness.

I do not attempt to describe the actual tax systems in place in the Nordic countries in detail, but rather to highlight some of the most important elements and choices related to the tax treatment of housing. The examples are nevertheless consistent with a so-called dual income tax system that has inspired the actual tax systems in all Nordic countries. A dual income tax system combines a progressive taxation of labour income with a flat or nearly flat tax on capital income at the personal level.[83] I also leave subsidies, such as housing allowances, and social housing out of the discussion, although they may also be very relevant for many of the household choices that I am considering here.

82. See Adam (2011) for an in-depth discussion of the principles of good taxation.
83. Sørensen (2010) provides an in-depth discussion of the Nordic dual income tax systems. He refers to the Danish system as a hybrid between a dual income tax system and comprehensive income tax system.

In the next section, I consider how capital income taxation treats similar housing-related activities. I discuss separately the taxation of owner-occupied housing vs. rental housing, the taxation of owner-occupied housing vs. financial savings, and the taxation of housing vs. business capital investment. In Sections 3 and 4, I address property taxation and housing market transaction taxes. In Section 5, I discuss the links between housing taxation and so-called macro-prudential policies that aim at limiting household indebtedness. In Section 6, I briefly consider how some tax reform options would affect households that have already made major housing-related decisions within the current tax system. I conclude in Section 7. The Appendix complements the examples given in the main text by providing a somewhat more general illustration of how capital income taxation affects the cost of owner-occupied housing.

2 Housing and capital income taxation

2.1 Owner-occupied housing vs. rental housing

2.1.1 Tax treatment of imputed rent

In order to illustrate the importance of the tax treatment of the imputed rent, I consider an example where households can either own or rent their house and invest in financial assets or rental housing. Let us assume there are identical houses that are worth 100 000 euros and that incur 1 000 euros of direct maintenance costs annually. Let us also assume that the return on financial assets (e.g., stocks or bonds) is 5 percent annually and that there is a 30 percent capital income tax. In this example, housing is financed with savings rather than debt.

It is useful to first determine the market rent of these houses. A reasonable first assumption is that landlords receive the same after-tax return on their investment in rental housing as they would receive on financial assets. If, for instance, the return on rental housing was substantially lower than the return on financial assets, landlords would presumably like to sell houses and invest in financial assets instead. This would reduce the supply of rental housing and put upward pressure on rents. If, on the other hand, the return on rental housing was higher than the return on financial assets, some wealthy households or other investors would presumably increase the supply of rental housing putting downward pressure on rents. Throughout this paper, I am thinking of profit-oriented landlords. Landlords with a non-profit character may of course set rents differently and are often not even tax liable.

Of course, investors should also consider risk. For simplicity, we may assume that the 5 percent (expected) return relates to assets with similar risk characteristics as rental housing.

Assuming that both rental income (net of maintenance costs) and the return on financial assets are subject to the capital income tax, the before-tax return on rental housing should be the same as that on financial assets, i.e., 5 percent per year. If we

further assume that it is the landlord rather than the tenant who pays the maintenance costs, this implies an annual rent of 6 000 euros. To see this, notice that the after-tax return on a rental house worth 100 000 euros is then: *6 000 euros - 30 % × (6 000 - 1 000) euros - 1 000 euros = 3 500 euros* which is equal to the after-tax return *(100 % - 30 %) × 5 000 euros = 3 500 euros* on financial assets worth 100 000 euros.

We can now consider a household that lives in its own house and contemplates moving to a rental house. If the household moves to a rental house, it can sell its house, invest 100 000 euros (the value of the house) in financial assets, and receive an after-tax return of 3 500 euros per year. On top of that, it would also save 1 000 euros in maintenance costs. So in total it would have 4 500 euros of additional disposable income. On the other hand, it would then have to pay 6 000 euros in rent per year. Moving to a rental house would thus require the household to reduce its non-housing consumption or savings by 1 500 euros per year. In other words, rental housing is more expensive than owner-occupied housing.

The reason why rental housing is more expensive than owner-occupied housing in this example is entirely due to capital income taxation. If we assume that there is no capital income tax, but maintain the other assumptions made above, the market rent would still be 6 000 euros. But a household that shifts from owner-occupied to rental housing would now earn a net return of 5 000 euros by selling its house and investing it in financial assets. The cost of owner-occupied and rental housing would thus now be the same; by selling its house, investing in financial assets and becoming a renter, the household would earn 5 000 euros as a return on its financial assets and save 1 000 euros in maintenance costs.

As long as rental income and returns to financial savings are taxed, a logical way to make the tax system neutral between owner-occupied housing and rental housing would be to impose a tax also on the so-called imputed rent. Imputed rent is an estimate of the rental value of an owner-occupied house. At the same time, it is also an estimate of the amount of money that a household saves in rents by owning its house. This saving can be seen as a return on owner-occupied housing. If only the return on rental housing is taxed, the tax system treats owner-occupied housing and rental housing very differently.

In our example, the imputed rent, net of maintenance costs, would be 5 000 euros. Taxing it with the same 30 percent tax rate that the rental income of the landlord is taxed would equalize the cost of owner-occupied and rental housing in the example, as owner-occupied housing would then incur an additional tax bill of 1 500 euros compared to the situation described above. Of course, in the real world, as opposed to our examples, there may also be various non-tax reasons that make owner-occupied housing less expensive than rental housing; the point of these examples is only to illustrate the role of taxation.

Real world tax systems often favour owner-occupied housing over private rental housing in a way that is broadly in line with this example and the low or non-taxation of the imputed rent is often seen as the main tax advantage of owner-occupied housing.[84] In Finland, for instance, the capital income tax rate that applies to rental

84. Fatica and Prammer (2018) provide quantitative estimates of the main tax benefits of owner-occupied housing in euro area countries.

income and interest and dividend income, is 30–34 percent, and there is no tax on the imputed rent (or other tax that would be specific to owner-occupied housing alone). The non-taxation of the imputed rent has recently been estimated to imply a tax revenue loss of 4 billion euros, or about 1.7 percent of Finnish GDP (Ministry of the Environment 2020).

According to the OECD (2019), Iceland is one of the few countries that directly taxes the imputed rent. Denmark in turn has a separate tax on owner-occupied housing that is based on property values (OECD 2019). It is important to note that such a tax can be designed so that it is more or less equivalent to a tax on the imputed rent (especially in a dual income tax system). In our example, a 1.5 percent tax rate on the market value of an owner-occupied house would be equivalent to a 30 percent tax rate on the imputed rent. However, I am not aware of studies that would seek to estimate to what extent Denmark and Iceland have managed to equalize the taxation of owner-occupied housing and rental housing with these taxes.

Also the Swedish property tax or 'fee' (*fastighetsavgift*) is higher on owner-occupied properties than on rental properties. However, the difference appears to be very small, which means that the Swedish property tax cannot really compensate for the non-taxation of the imputed rent (Swedish Tax Agency 2021).

More generally, any tax that applies to owner-occupied housing only would reduce the overall tax benefits of owner-occupied housing. Tax benefits targeted to landlords or renters would have the same effect.

In the example, rents were assumed to be freely determined based on market forces. However, of the Nordic countries, Denmark, Norway and Sweden have some form of rent control in place (Kettunen & Ruonavaara 2020). Rent control may raise new questions regarding the taxation of owner-occupied and rental housing, at least if it is strict and binding. For instance, it would be problematic to use actual rents to estimate imputed rents if rental housing is not easily available due to rent control. I am not aware of an economic analysis of housing taxation in the presence of rent control.

2.1.2 Capital gains taxation

In the example above, house prices were implicitly assumed to be constant over time. This is not the case in reality. Both owner-occupiers and landlords may therefore make capital gains or losses on housing sales. With the exception of Sweden, which taxes capital gains on all housing transactions, the Nordic countries tax capital gains on rental property but usually leave capital gains on owner-occupied principal residences untaxed.[85] In Finland, for instance, capital gains on housing sales are tax exempt if the owner or a member of the family has lived in the house continuously for at least two years. Given that house prices tend to increase over time, this differential tax treatment of capital gains on rental and owner-occupied housing provides an additional tax benefit for owner-occupied housing compared to rental housing.

In principle, it would be logical to tax capital gains on owner-occupied housing the same way as capital gains on other assets. It is important to realize, however, that the usual way of taxing capital gains can be quite distorting. The problem is that

85. Barrios et al. (2019) document the tax treatment of capital gains on housing sales in EU countries.

capital gains taxes are usually due only when the asset is sold. Since people prefer to pay taxes later rather than sooner, they have an incentive to postpone the selling of assets that have increased in value.

This so-called 'lock-in effect' can be especially harmful when the asset in question is primary residence. A capital gains tax on housing sales is likely to reduce housing transactions and induce some households to stay in their current house even when their housing needs have changed. It may also reduce households' geographical mobility with negative consequences for the labour market.

The Swedish tax system mitigates the lock-in effect by allowing to defer paying the capital gains tax on principal residences if the seller buys a new residence for a higher price (Englund 2020). No interest has to be paid on the deferred tax payment. The tax rate is also lower than the standard capital income tax rate (22 percent vs. 30 percent).

2.2 Can the tax-favoured status of owner-occupied housing over rental housing be justified?

Favouring owner-occupied housing over private rental housing in taxation is likely to induce some households that would otherwise prefer rental housing to choose owner-occupied housing instead, thereby distorting households' behaviour relative to a more neutral tax system. The question is whether the preferential tax treatment of owner-occupied housing can be justified based on some efficiency or equity considerations.

It is sometimes argued that owner-occupied housing has certain social benefits that are not associated with rental housing. A possible mechanism is that owner-occupier households, who benefit from rising house prices in their neighbourhood, have a stronger incentive than renters to participate in socially beneficial communal activities. The social benefits associated with these activities can in principle provide an efficiency argument for favouring owner-occupied housing over rental housing. However, the evidence for such benefits seems quite weak. For a discussion of the related literature, and empirical evidence from Finland, see Kortelainen and Saarimaa (2015).

As for equity considerations, it should be noted that households in owner-occupied housing tend to have higher incomes than renters. Therefore, favouring owner-occupied housing over rental housing runs counter to the strong emphasis on income equality in the Nordic countries. The results in Saarimaa (2011) and Bø (2020), that are based on Finnish and Norwegian data respectively, support this view.

2.3 Debt vs. equity financing of owner-occupied housing

In the previous example, we assumed that houses are financed with savings (or equity). Let us now consider a household that finances purchase of a house with a mortgage of 100 000 euros. Let us also assume, for simplicity, that the mortgage interest rate is the same (5 percent) as the return on financial savings. An owner-occupier thus needs to pay 5 000 euros in annual interest.

The main issue regarding the tax treatment of debt financed housing is whether the interest payments are tax deductible or not. Most Nordic countries allow deducting mortgage interest payments on owner-occupied homes (OECD 2019, The Norwegian Tax Administration 2021). In Finland, however, the mortgage interest deduction is being gradually phased out. In Sweden and Norway all interest expenditures are deductible as a rule, so there is no need for a specific mortgage interest deduction.

Let us first assume that mortgage interest payments are tax deductible. In a dual income tax system, mortgage interest expenses are primarily deductible from capital income. Those with no capital income can be treated as having a deficit in capital income, which is then deducted from taxes on earned income (this is how the Finnish and Swedish tax systems treat mortgage interest expenses). As long as a household earns enough to pay taxes on earned income, the deduction then effectively lowers its net interest payments by a fraction that is determined by the capital income tax rate, even if it has no capital income. In our example with a 30 percent capital income tax rate, the net interest payments are 3 500 euros.

The comparison between owner-occupied and rental housing is very similar to the case of equity-financed housing. By selling its house, the household could pay back its mortgage loan, saving 3 500 euros in annual interest payments (after deduction) and 1 000 euros in maintenance costs. These savings are not sufficient to cover the 6 000 euros rent for an identical house. In fact, with these assumptions, the difference in the cost of rental and owner-occupied housing is exactly the same (1 500 euros per year) as in the case of equity-financed housing. Again, the cost of equity- and debt-financed owner-occupied housing may of course be different for reasons that are not directly related to taxation. A key assumption in this example is that the before-tax mortgage interest rate is the same as the return on financial assets.

If instead mortgage interest payments are not tax deductible, the household would save 5 000 euros in mortgage interest payments by selling its house and moving to rental housing. Total annual savings (interest payments and maintenance costs) then equal the annual rent. So in this case (and abstracting from capital gains taxation) capital income taxation no longer favours owner-occupied housing over rental housing. This also means that without mortgage interest deduction, the main tax benefits of owner-occupied housing accrue only to households who finance their housing with savings rather than with debt.

More generally, the mortgage interest deduction should not be seen as a fundamental tax advantage of owner-occupied housing. While a reform that would eliminate the mortgage interest deductibility can be seen as a way to partially even out the tax treatment of owner-occupied and rental housing when the imputed rent goes untaxed, it would also make debt-financed owner-housing more expensive relative to equity-financed owner-occupied housing.

A more fundamental tax reform (in countries that currently do not tax the imputed rent or have some other tax that is specific to owner-occupied housing), and one that would usually be in line with the overall system of capital income taxation, would be to impose a tax on the imputed rent, while allowing homeowners to deduct mortgage interest payments from it. (Naturally, also landlords are allowed to deduct relevant interest expenses from rental income.) Such a reform would result in a more symmetric treatment of equity- and debt-financed owner-occupied housing and

rental housing.

As for equity considerations, many studies based on U.S. data have found that the mortgage interest deduction tends to benefit high-income households the most, see e.g. Poterba and Sinai (2008). However, that result is largely driven by the fact that in the U.S. mortgage interests are deductible according to a progressive income tax schedule, implying that the deduction is especially valuable for high income earners. In the U.S., the mortgage interest deduction is also only relevant for taxpayers who have deductions that add up to more than a relatively high standard deduction.

In Nordic countries with a dual tax system, the mortgage interest payments are deductible against a constant, or nearly constant, capital income tax rate, and the deduction applies to small interest expenses as well. This makes the mortgage interest rate deductibility much less regressive in the Nordic countries than in the U.S.[86] Of course, we should also take into account that households who need a mortgage to finance their housing have relatively little wealth.

2.4 Owner-occupied housing vs. financial savings

Leaving the imputed rent untaxed does not favour only owner-occupied housing over rental housing, but also accumulating wealth in the form of housing instead of financial assets such as stocks. One implication is that households' net worth is likely to be more exposed to house price risk than what would be the case under a more neutral tax system. This is problematic at least from the efficiency point of view.[87]

The distributional implications of favouring housing wealth over financial assets in this way are less clear. Housing wealth is more evenly distributed across households than financial wealth, which is often largely in the hands of the wealthiest households. This can perhaps be seen as an argument for favouring housing wealth over financial wealth in taxation. On the other hand, a higher tax burden on owner-occupied housing could be used to finance e.g. lower taxes on labour income, which might be desirable also from the distributional point of view.

2.5 Housing capital vs. business capital investment

One concern related to the typical tax benefits of owner-occupied housing is that it increases investment in residential buildings at the expense of investments in business capital such as machines, equipment and factory and office buildings. If the imputed rent goes untaxed, it is likely that the overall returns to housing capital (residential buildings) are taxed much lighter than the return on investments in business capital, unless property taxes on residential housing are relatively high.

Here we should take into account both personal taxation and corporate taxation. The return on equity-financed investment in business capital is often subject to double taxation: first at the firm level (corporate tax) and then at the personal level (income taxation of dividends). In Norway, however, dividend returns below the so

86. Fjærli (2004), Saarimaa (2010) and Gruber et al. (2017) examine how the move to a dual tax system affected the use of mortgage interest deductions in Norway, Finland and Denmark, respectively.
87. For sure, rental housing is not a riskless either because rents may increase in the future. Owning a house can be seen as an insurance against rent risk (Sinai & Souleles 2005).

called 'normal return' – the nearly risk-free return on savings that anyone can obtain from the financial markets – are deductible so that only returns above the normal return are taxed (Sørensen 2005). This lowers the overall tax burden on business capital investments.

Under certain conditions, the tax rates on the return on business and housing capital should be the same (Eerola & Määttänen 2013).[88] A revenue neutral tax reform that reduces the current asymmetry by increasing the tax burden on housing capital and lowering the tax burden on business capital should increase business capital investment. That could benefit not just investors and stock owners but also workers, because higher investment should increase labour productivity and wages. Numerical analysis based on general equilibrium models of the economy have often found that such reforms would increase the long run business capital stock as well as household welfare substantially, see for instance Gervais (2002).

The model used in Gervais (2002), and in many other studies that consider the link between capital taxation and capital accumulation, depicts a closed economy. The Nordic countries are better modelled as small open economies that are integrated in the international financial markets. In such a set-up, the link between taxation and capital accumulation depends on the details of the tax system.

For instance, while lower capital income taxation at the personal level should increase households' financial savings, it would not automatically increase domestic investment. This is because investment may also be financed by foreign savings, for instance by firms borrowing on international capital markets, and international interest rates are unaffected by tax changes of a small country. On the other hand, lowering business capital taxation via the corporate tax rate should increase investment by lowering the required before-tax return on investments in the domestic economy even if they are financed by foreign savings.

3 Property taxes

House prices reflect not just the value of the buildings, but also the value of land on which they stand. The most expensive houses tend to be in locations where land is very valuable. There is a strong efficiency argument for taxing land. Since land is in fixed supply, taxing it cannot reduce the amount of land available for construction or some other purposes. More stringent land taxation would allow us to lower the tax burden on activities that are sensitive to taxation.

Land values are typically taxed by property taxes.[89] This makes property taxes potentially a very useful part of the overall tax system. Ideally, property taxes should be mainly based on land values rather than the value of the buildings (unless they are used to tax the imputed rent of owner-occupied housing).[90] To some extent, this

88. The optimal tax treatment of housing capital vs. business capital may depend on household preferences. In theory, the interaction between housing and labour supply may call for a differential tax treatment of housing and business capital. However, we lack information about certain key elasticities that would be relevant here. See also Sandmo (1988).
89. They may also be taxed via wealth tax, which is in use e.g. in Norway.
90. To be more precise, the correct tax base should be the value of unimproved land in order to avoid reducing

is the case in e.g. Finland, since the Finnish property taxation differentiates between the value of buildings and the value of land and imposes a higher tax rate on land value. Also, Denmark has a separate, local land tax.

For sure, providing precise separate estimates of the value of land and structures for all properties is difficult. However, what matters for incentives and the efficiency of the property tax is the extent to which new construction or renovation increases the tax burden of the property owner. As long as the tax rate on the value of structures is low, new construction or renovation does not increase the tax burden much, even if the initial taxable values do not closely reflect the replacement cost of the buildings and the value of the land.

In many Nordic countries, property taxes generate relatively little tax revenue. In 2018, property tax revenue in Finland was about 0.8 percent of GDP (OECD 2020) compared to about 1.5 percent of GDP in EU-28 (European Commission 2020). The share was even lower in Sweden (0.7 percent) and Norway (0.4 percent) but higher in Denmark (1.3 percent) and Iceland (1.7 percent) (OECD 2020).[91] In Sweden, the property tax is capped in absolute value (Englund 2020).

From an efficiency point of view, it is somewhat odd that the Nordic countries, with a high tax revenue requirement, do not rely more on taxes on land values. It is also hard to see why land taxation would violate equity goals. Related to this, it is important to see that there is little reason to believe that property taxes based on land values would make housing more expensive; while they increase the tax burden on housing, they also lower house prices.

Land values are tightly connected to urban planning and land use regulations. This makes it possible to generate public revenues by charging development fees or by selling construction permits. This can be a good way of effectively taxing part of the land value appreciation resulting from public infrastructure investments and the positive agglomeration effects related to the growth of cities rather than from the actions of private landowners. The process should be made as transparent and efficient as possible, e.g., by using auctions to sell construction rights.

4 Transaction taxes

In many countries, housing transactions are taxed via transaction taxes or 'stamp duties'. The efficiency cost of transaction taxes stems from the fact that they discourage mutually beneficial transactions. Homeowners can avoid the tax by not moving. A number of studies have demonstrated that housing market transaction taxes indeed reduce housing transactions and household mobility. Exploiting a quasi-experimental setting, Eerola et al. (2019) find that a recent 0.5 percentage point increase in the transaction tax rate in Finland reduced household mobility (frequency of household moves) by about 7 percent.

Economists tend to view transaction taxes as a particularly inefficient form of

landowners' incentives to invest in things like drainage or sewers.

91. These numbers refer to recurrent taxes on immovable property.

taxation. For instance, the highly regarded Mirrlees review states that 'There is no sound case for maintaining stamp duty' (Adam 2011, p. 404). On the other hand, the efficiency cost of the transaction tax of course depends on its level. Määttänen and Terviö (2020) study the welfare cost of housing market transaction taxes using a structural model that is broadly in line with the empirical evidence regarding the impact of the transaction tax on the transaction volume. In the model, the transaction tax lowers welfare by distorting the allocation of different houses across households with different housing needs. They find that the welfare cost increases rapidly with the transaction tax rate, with the Laffer curve peaking at about 10 percent.[92]

While some European countries have transaction rates close to that level, the Nordic countries have much lower rates. For instance, the transaction tax in Finland is currently 2 percent of the sales price for most apartments and 4 percent for single-family houses. The (marginal) welfare cost of the current Finnish transaction tax rate is not much higher than typical estimates of the welfare cost induced by labour income taxation. In Sweden, there is no transaction tax for apartments in housing cooperatives (*bostadsrätt*) but the tax rate for (directly owned) single-family houses is 1.5 percent of the price (Englund 2020). In Denmark, the tax rate is 0.7 percent (Barrios et al. 2019).

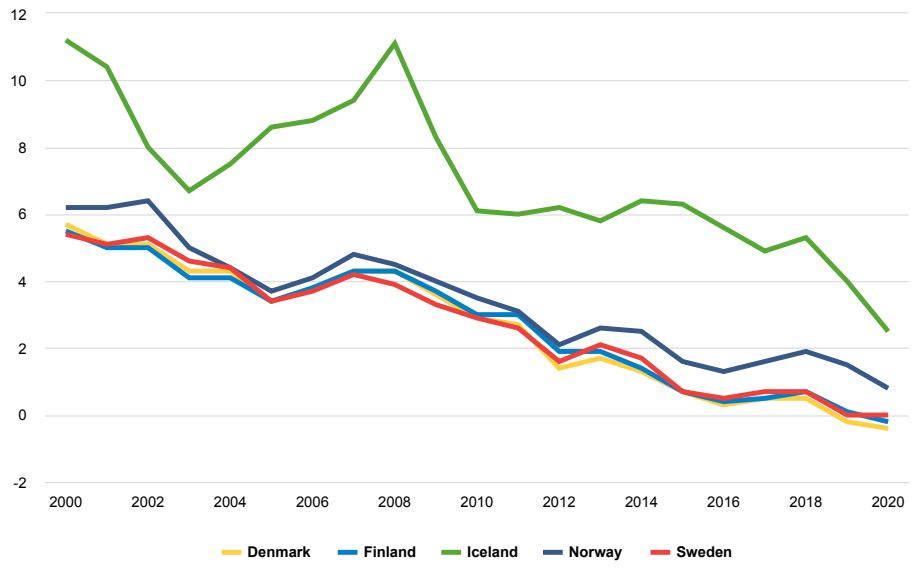
Whether or not the transaction tax should be lowered or abolished on efficiency grounds depends on which taxes would be increased to compensate for the loss in tax revenues. A natural option would be to increase property taxes. That would leave the overall tax burden on housing unaffected while making it less distortionary, at least if property taxes are mainly based on land values. It is also hard to see why housing transaction taxes would be particularly desirable from an equity perspective. The burden of transaction taxes is distributed in a somewhat arbitrary fashion across individuals. For instance, some transactions are triggered by divorce.

92. The peak of the Laffer curve is the point where increasing the tax rate no longer increases tax revenue.

5 Low interest rates and macro-prudential policies

Over the last few decades, interest rates have been on a downward trend internationally. Figure 1, which shows the annual nominal interest rates on long-term government bonds from 2000 to 2020, reveals that this trend is very clear also in the Nordic countries.

Figure 1 Long-term interest rates, percent



Source: OECD (2021)

Nominal mortgage interest rates tend to follow nominal interest rates on government bonds. Moreover, although inflation has recently declined somewhat in many countries, it is clear that there has also been a major decline in real interest rates (nominal interest rate less inflation). In the end, it is the real interest rate, rather than the nominal interest rate, that should matter for long-term investments like housing.

A decline in real interest rates directly lowers the cost of financing owner-occupied housing with a mortgage. It should also lower the required rate of return on rental property by lowering the return on alternative assets (government bonds and other interest-bearing assets). By the same token, it should make households and other investors willing to buy more housing. This in turn increases house prices unless the supply of housing increases fast enough. House prices are most likely to increase in growing cities where housing supply is often limited by the availability of land for construction.

A natural consequence of lower interest rates and higher house prices is an increase in household leverage. Many households need to take larger mortgages than before in order to finance their owner-occupied housing. It is also natural for households to seek longer mortgages, including mortgages that they do not expect to pay off completely. Given current interest rates, a middle-income household could easily finance a house worth, say, half a million euros, with an interest only mortgage. On the other hand, it may make little sense for most middle-income households in Nordic countries to accumulate half a million euros in housing equity, unless they wish to leave a large bequest. This is because their old-age insurance needs are largely covered by mandatory pension schemes.

Increased household indebtedness that is related to lower interest rates and higher house prices has raised concerns regarding macroeconomics risks. One concern is that by decreasing households' net wealth, a fall in house prices during a recession would lead to a drastic fall in private consumption, which in turn would aggravate the recession. This mechanism is likely to be stronger the higher is the general house price level and the higher are typical loan-to-value ratios. In such a situation, even a moderate decrease in house prices can result in relatively large changes in household net worth relative to their income. As an example, consider a household that owns a house initially worth half a million euros financed with a 90 percent loan-to-value mortgage and no other assets or loans. If house prices fall by 20 percent, the net worth of the household will fall from 50 000 euros to -50 000 euros. The fall in net worth is especially problematic if household income decreases or mortgage interest rate increases at the same time.

Mian et al. (2013) provide evidence that a fall in the net worth of highly leveraged households due to a decline in house prices at the onset of the 2009 financial crisis indeed had a large negative effect on private consumption in the U.S. A fall in household net worth and collateral values may also imply credit losses for the banks.

These concerns and results have induced many countries to implement so-called macro-prudential policies that aim at limiting household leverage. In practice, this has meant restricting the size and length of mortgages loans. For instance, in 2016 Finland imposed a cap on the loan-to-collateral ratio, which is currently at 90 percent (95 percent for first-time buyers). There are also plans to impose a cap on the loan-to-income ratio. In 2016, Sweden introduced a minimum amortization requirement, on top of a cap on the loan-to-value ratio (Finansinspektionen 2015).

These measures may aggravate some of the problems with current housing taxation. In particular, stricter constraints for mortgage loans limit the ability of wealth-poor households to enjoy the tax benefits of owner-occupied housing, which is problematic from the equity perspective. A typical household wants to buy early in the life cycle before having had time to accumulate much wealth.

Amortization requirements also limit the ability of homeowners to freely allocate consumption. In some situations, they might even increase aggregate fluctuations by constraining households' ability to maintain consumption in the event of negative shocks (Svensson 2020). From the point of view of efficiency, and taking into account mandatory pension and other social security schemes in the Nordic countries, it is possible that current mortgage regulations and the tax incentives for

owner-occupied housing induce many households to save too much relative to a more neutral tax system.

Ideally, macro-prudential policies and housing taxation should be considered jointly (Eerola 2019). The need to impose tighter borrowing constraints for home buyers is an additional argument for reducing the tax benefits of owner-occupied housing vis-à-vis rental housing. That would mitigate the distributional concerns related to macro-prudential regulation and should also reduce household borrowing in itself.

The concerns behind the macro-prudential policies should also be seen as an additional reason to increase property taxes. By lowering house prices, higher property taxes would decrease the extent to which a given relative change in house prices affects households' net wealth relative to their income. Since house prices tend to be high in areas where land values are high, property taxes on land values would be especially desirable also from this perspective. Higher property taxes should also help to stabilize house price fluctuations. This is because increasing house prices would result in increasing property taxes (in terms of euros or kronor), and vice versa. This requires, however, that the assessed values on which property taxes are based on, are regularly updated.

6 The short-run effects of tax reforms

In the previous sections, I have taken a long run perspective on taxation in the sense that I have not considered how changes in the tax system would affect current households who have already made major housing-related decisions under the current tax system. In a sense, I have compared different tax systems without considering the move from the status quo to a new tax system. The short-run effects of tax reforms are often different from their long-run effects.

Consider, for instance, a reform that would increase the tax burden on housing capital and lower the tax burden on business capital. While a lower taxation of business capital may increase the wage level thereby benefiting also households that have little or no capital income, this effect takes time to fully materialize. The impact effect is a windfall gain for current business capital owners, who benefit from lower taxation of past investments and savings. At the same time, higher housing taxation is likely to lower house prices, which can reduce the net wealth of highly leveraged households substantially. These mechanisms may decrease the efficiency gains of the reform relative to its long-run effects. They are also likely to make it politically difficult to implement.

Some of the recent research on housing taxation accounts for this type of short-run effects as well. Kragh-Sørensen (2020) considers a reform that would increase the tax burden on owner-occupied housing and lower the tax burden on business capital using a numerical model of household savings and consumption decisions that is calibrated to the U.S. economy. He finds that while households would prefer to be born into a society where housing is taxed at a much higher rate than currently, moving to such a system would hurt many existing households at the time of the reform. Moreover, compared to a long-run perspective, the aggregate welfare gains

from raising the property tax and decreasing capital taxation are much smaller when the transitionary dynamics are taken into account.

Of course, other type of tax reforms might have more positive short-run effects. For instance, instead of increasing the taxation of owner-occupied housing to lower the taxation of business capital, one could use the extra tax revenue from housing taxation to reduce the taxation of labour income.

In any case, similar concerns are likely to arise also with other types of reforms towards more neutral housing taxation. For instance, Määttänen and Terviö (2020) find that a large share of households are likely to lose out from a reform that replaces the transaction tax with a revenue neutral property tax. Intuitively, the gains from a such a reform would be unevenly distributed in the short run. In particular, households who have recently moved are unlike to benefit from the reform, because they are unlikely to move soon. From their perspective, the reform mainly implies a higher tax bill in the form of a higher property tax.

In theory, if a reform is desirable on efficiency grounds, those who lose out from the reform could be compensated with lump-sum transfers from those who benefit from it. In practice, however, such transfers are not available. One way to mitigate this type of concerns would be to change taxation only slowly and gradually.

7 Conclusions

Tax systems in most Nordic countries favour owner-occupied housing over private rental housing as well as saving in owner-occupied housing over saving in financial assets. The Nordic countries are by no means an exception here. Many other countries provide similar tax benefits to owner-occupied housing. The main reason is that rental income and returns on financial assets are subject to capital income taxation whereas the imputed rent, or the return on owner-occupied housing in the form of rent savings, usually goes untaxed. Another common tax benefit of owner-occupied housing is that the capital gains on a primary residence are tax exempt. The tax-advantaged status of owner-occupied housing is hard to justify on efficiency or equity grounds.

For sure, tax reforms that would radically alter the current tax status of owner-occupied housing are politically difficult. This is partly because they would have significant distributional effects among households that have already made major housing-related decisions under the current tax system.

At the very least, however, the current tax status of owner-occupied housing should be kept in mind when considering other tax changes. For instance, increasing the capital income tax rate without increasing the taxation of owner-occupied housing, would be problematic in that it would further strengthen the tax benefits of owner-occupied housing over rental housing or financial savings.

It would also be useful to consider housing taxation as an alternative tool to address the macro-prudential concerns that have led many Nordic countries to impose tighter regulations on mortgage borrowing. Increasing property taxes (gradually) from their current relatively low levels should help reducing household indebtedness,

via lower house prices, and stabilizing house prices. Ideally, property taxes should be mainly based on land values. Increased reliance on land taxation would also reduce the efficiency costs of taxation by shifting the tax burden towards an asset that is in fixed supply.

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Appendix

This appendix complements the examples discussed in Section 2 by providing a somewhat more general illustration of how capital income taxation affects the cost of owner-occupied housing. The idea here is to ask how much non-housing consumption a household needs to give up in order to consume one unit of housing without changing its savings or next period net worth.

Let us assume a linear tax system with a capital income tax rate τ on interest income, or returns to financial savings more generally, a tax rate τ^h on the imputed rent, and a parameter τ^m describing the share of the mortgage interest payments that are tax deductible against the income tax rate. If $\tau^m = 1$, mortgage interest payments are fully tax deductible from capital income. Let us also assume that if a household with a mortgage has no capital income, it will be treated as having a deficit of capital income, which is deducted from its taxes on non-capital income.

Consider the following household budget constraint

$$c + ph' + a' - m' = (1 + (1 - \tau)r)a - \left(1 + \left(1 - \tau^m \tau\right)r\right)m + \left(p - \kappa\right)h - \tau^h r^h h + y$$

where c is non-housing consumption, $p > 0$ the (constant) unit price of housing, h the (quality-adjusted) size of the house, $a \geq 0$ financial assets, $m \geq 0$ mortgage debt, $r > 0$ the interest rate, $r^h > 0$ the imputed rent per unit of housing (net of maintenance costs), $\kappa \geq 0$ direct housing costs relative to the house size, y non-capital income, and primes refer to next period values of the variables as opposed to current period values. The left-hand side of the budget constraint consists of non-housing consumption, new housing, financial saving and mortgage borrowing. The right-hand side consists of current financial assets and mortgage debt (including the after-tax interest income and expenditures) together with the value of the current house less maintenance costs and a tax on the imputed rent, and current non-capital income.

Let us denote household net worth by

$$v = \left(1 + \left(1 - \tau\right)r\right)a - \left(1 + \left(1 - \tau^m \tau\right)r\right)m + \left(p - \kappa\right)h - \tau^h r^h h$$

Solving for a from this definition, we get

$$a = \frac{v + \left(1 + \left(1 - \tau^m \tau\right)r\right)m - \left(p - \kappa\right)h + \tau^h r^h h}{1 + (1 - \tau)r}$$

This expression determines how much financial assets the household must have given its net worth, mortgage, and housing. By denoting next period net worth by v', we can also write

$$a' = \frac{v' + \left(1 + \left(1 - \tau^m \tau\right)r\right)m' - \left(p - \kappa\right)h' + \tau^h r^h h'}{1 + (1 - \tau)r}$$

Inserting this expression and the above expression for v into the budget constraint and arranging terms, we get

$$c = v + y - \frac{v'}{1 + (1 - \tau)r} - \frac{\left(1 - \tau^m\right)\tau r}{1 + (1 - \tau)r}m' - \frac{(1 - \tau)rp + \kappa + \tau^h r^h}{1 + (1 - \tau)r}h'$$

This equation determines current consumption given current and next period net

worth, income, mortgage borrowing (m') and housing (h'). It thus gives us the cost of housing in terms of current consumption (c).

If mortgage interest expenses are fully tax deductible ($\tau^m = 1$), the term in front of m' is zero. The cost of one unit of housing in terms of current consumption is then given by the term in front of h'. If the interest rate is not very high, the cost is approximately $(1-\tau)rp+\kappa+\tau^h r^h$. With $r^h = rp$ and $\tau^h = \tau$, this simplifies to $rp+\kappa$, which is the same as the market rent if we assume (as in the example in Section 2.1) that the before-tax return on rental housing equals the interest rate r. On the other hand, if $\tau^m < 1$, the cost of housing increases with the mortgage.

Comment on N. Määttänen: Housing taxation in the Nordics: efficiency and equity

Niels Kleis Frederiksen

In his paper, Niku Määttänen makes the case for increased taxation of owner-occupied housing, including replacing transaction taxes by recurrent taxes on housing. The basic argument builds on the idea of achieving neutrality – or at least moving the tax system towards it – between investment in housing and investment in other (financial or real) assets. The argument is a compelling one and hence I will focus on some important points of nuance, including certain issues related to the appropriate level of the housing tax rate from an efficiency viewpoint.

Dwellings make up a significant portion of the capital stock in Nordic countries. Based on 2018 National Accounts data, the value of residential structures equals 120–150 percent of GDP, with Sweden at the lower end of the range, and Denmark and Finland at the top. Owner-occupation is the predominant ownership form, although there is significant variation across countries: In Sweden, almost 45 percent of the housing stock is owned by the non-household sector, while in Denmark the share is roughly one-third and in Finland a bit more than one-fifth. Hence, rental housing – either in the form of commercial or social housing – plays a perhaps more important role in Nordic housing markets than is generally acknowledged in the discussion of housing taxation, where the focus is almost always on owner-occupation and its interaction with the income tax. As explained below, this may have implications for how to think about the taxation of owner-occupied homes.

To get a quantitative picture of the stakes, it is useful to calculate the potential efficiency gain from achieving investment neutrality for owner-occupied dwellings, ignoring for a start other types of housing. Supplementing Määttänen´s parameter values of a 5 percent nominal interest rate and 30 percent income tax rate by a 2 percent rate of inflation and annual economic depreciation of 2 percent, the after-tax user cost of housing becomes $(1 - 0.3) \times 5 - 2 + 2 = 3.5$ percent in the absence of recurrent taxes on housing assets. However, social user cost – i.e., the cost to society from investing in housing instead of other real or financial assets – is simply equal to the real interest rate of 3 percent plus the depreciation rate of 2 percent, in total 5 percent. Hence, the income tax system provides an indirect subsidy equal to 30 percent of the cost of owner-occupation.

In Finland, households own residential structures equal in value to roughly 130 percent of GDP. Assuming a long-term user cost elasticity of housing of -1, the value of the stock of residential structures would be 30 percent – equal to 39 percent of annual Finnish GDP – lower in the long run under a system of neutral housing

taxation. Since the tax wedge is 1.5 percentage points, the distortionary cost of the beneficial tax treatment of housing returns becomes *0.5 × 0.015 × 39 = 0.3* percent of GDP. This is clearly a significant loss of allocative efficiency. At the same time, it is not surprising, since it builds on the assumption that housing investment is entirely untaxed, while the real returns to financial investments are taxed at an effective rate of 50 percent.

The way to achieve investment neutrality in this standard textbook approach is to introduce either a tax on the value of owner-occupied properties equal to 1.5 percent (i.e., equal to the tax shield provided by interest deductions) or fully taxing imputed rent, where the latter is calculated as the market interest rate times the market value of residential property.[93]

Such a policy would – in principle – eliminate the above-mentioned distortion and hence raise economic welfare by an amount equal to 0.3 percent of GDP. If the housing tax rate is instead, say, 0.5 percent, the long-term allocative gain would be equal to 0.17 percent of GDP. Hence, although the tax rate is 'only' one-third of what is required to achieve investment neutrality, more than one-half of the baseline efficiency loss is eliminated.

This is, of course, due to the fact that the deadweight loss rises with the square of the (net) tax rate and accordingly, a seemingly modest level of taxation may generate rather significant gains. If property tax reform is difficult to implement it may thus be better to get property taxes 'roughly right' in the above sense rather than risking reform failure from political backlash by attempting to implement the often drastic tax increases needed to achieve investment neutrality.[94]

Furthermore, there are a few reasons why the standard approach may need to be modified at least somewhat. One reason is related to whether investment neutrality can in fact be obtained in practice. Another leads to questioning the quantitative estimates provided above, when the role played by non-owner occupation is taken explicitly into account.

Imposition of a housing tax requires measurement of the tax base, i.e. the market value of the individual property. Since residential property is traded infrequently, the tax authority will have to rely on econometric methods to calculate tax-assessed property values. In this way the tax base for each property can be determined based on price data from traded properties and information about location, year of construction, size of the property, as well as features such as heating system, type of structure, materials used and other physical features. However – and importantly – it is unlikely that the tax authority will have access to reliable information on the *condition* of the *individual* property, as this will reflect past decisions of owners regarding maintenance, refurbishments etc. and thus may vary greatly across individual homes. Rather, the average or typical price from actual property transactions will reflect the *average condition* of traded properties.

This implies that while a well-designed property value assessment system should be

93. Under a dual income tax, where household capital income is taxed at a uniform rate, these two alternatives are essentially identical.
94. It is sometimes claimed that taxpayer opposition to property taxes reflects irrationality or lack of understanding of how the property market or taxation works. It is not surprising that taxes that tend to be partly or completely capitalized in asset values also generate disproportionate attention among those subjected to the impact.

able to produce reasonably accurate estimates of market values on average, it is unlikely to treat new construction on the one hand and repairs and improvement on the other hand symmetrically. A newly constructed dwelling faces a level of property taxation that will rise over time in line with market values in the neighborhood, reflecting the general increase in quality as income growth drives housing demand up. However, the decision of the individual homeowner to invest in repair or improvement of his property will not be reflected in the tax base (unless the investment gives rise to a discretionary re-assessment by the tax authority, which is likely to be a rare occurrence).

Therefore, a housing tax will introduce a distortion between new construction, which is taxed *excessively*, and investment in maintenance and improvement, which may essentially be *tax-free*.

Certainly, this does not eliminate the need for a tax on owner-occupied housing as an element of a well-designed income tax. But it implies that the efficient level of taxation will be lower than the one that fully eliminates the interest tax shield, i.e. 1.5 percent in the example above.

Another important qualification arises from the interaction with the rental market. Määttänens analysis is based on the premise that the rental market is effectively subject to neutral taxation and therefore may be disregarded in the analysis of housing taxation. For a number of reasons, this may be a questionable assumption. First, in at least some parts of the rental market, governments often provide direct rent subsidies to tenants. Second, investment subsidies are sometimes provided to the construction or financing of social housing. Such subsidies are in principle no different from the tax advantages of owner-occupation.[95] Third, while profits from commercial rental housing will typically be subject to corporation tax, capital gains – which can be a significant portion of the total return – may well escape taxation.[96]

Such direct and indirect subsidies to rental housing will give rise to efficiency losses akin to the deadweight cost mentioned above. Ideally, of course, these sources of inefficiency should be eliminated just like the tax benefits to owner-occupation. However, if such an outcome is unobtainable – for example for practical or political reasons – the desirable level of taxation of owner-occupied properties will be lower than the traditional benchmark of 'investment neutrality' indicates.

It should be emphasized that these two caveats do not amount to an argument against the taxation of owner-occupied housing per se. However, they will tend to reduce the appropriate level of taxation warranted from a strict efficiency viewpoint.

Määttänen correctly emphasizes that property taxes have economic consequences

95. Admittedly, the provision of subsidized housing in less-attractive neighbourhoods may discourage potential high-income tenants – who are willing to pay for an attractive location – from seeking to obtain the subsidies, thus providing a way of potentially reducing the distortionary cost of income redistribution. Such benefits should of course be traded off against the incentive for subsidized, low-income tenants to overconsume (rental) housing.
96. If a *rental* property is owned by a corporate entity, the taxation of accrued capital gains may be deferred potentially indefinitely even in the case where the owner wishes to dispose of his investment. By selling the corporation, rather than the property itself, the taxes on any capital gains on the property will not become due. If, on the other hand, a property has declined in value, it may be sold directly, generating a tax loss. This is in contrast to a property tax on *owner-occupied* housing, where an increase in market values, through the tax-assessment system, will raise the tax base and hence future tax payments. Although the capital gain is not taxed at the time of accrual, it gives rise to a stream of additional, future taxes with similar impact. Indeed, this is precisely the mechanism often alluded to when the role of housing taxation as an 'automatic stabilizer' is discussed.

beyond long-term allocative effects, including – via asset price formation – on short- and medium-term financial stability. By raising the level of user cost, property taxes will dampen fluctuations in property prices generated by changes in, for example, (expected) rates of interest and inflation. Whether this reduction in volatility is desirable or not depends on the presence of other (policy-generated or innate to markets) imperfections. After all, prices of both goods and assets are signals of scarcity and in a low interest rate environment asset prices should react more strongly to, say, a one percentage point change in the interest rate than under high interest rates.

The discussion above leads to the conclusion that the level of property taxation that minimizes the efficiency loss from the tax distortion is likely to be somewhat below what is traditionally referred to as the investment neutral level. If the impact on financial stability turns out to justify property tax rates in excess of what such allocative efficiency considerations imply, a trade-off will need to be made between, on the one hand, the cost of *overtaxing* housing from an investment efficiency perspective against, on the other hand, the potential benefits from improved financial stability. Määttänen indicates that this may be superior to macro-prudential policies directly regulating credit markets through limits on loan-to-value or loan-to-income ratios, as these policies will have some allocative costs because they will limit the financial flexibility of lenders and borrowers.

This latter point is correct, but perhaps financial stability will be better served by instead making financial institutions more resilient through an increase in equity requirements. The key advantage of this alternative is that the owners and decision-makers of financial institutions are forced to assume losses arising from their decisions, thereby improving rather than impairing microeconomic efficiency.

Hence, policy makers do not need to be concerned about the relationship between property taxes and financial stability but rather focus on determining the appropriate level of taxation in the light of the distortions to investment and the choice between renting and owner-occupancy.

Comment on N. Määttänen: Housing taxation in the Nordics: efficiency and equity

Peter Birch Sørensen

The taxation of owner-occupied housing is a policy issue on which practically all economists agree: in an income tax system where the returns to other forms of capital are taxed, an imputed rent on owner-occupied housing should also be taxed. At least, homeowners should pay a property tax as a proxy for a missing tax on imputed rent. However, just as easy it is for economists to agree on this principle, just as difficult it is for politicians and voters to accept it.

A main stumbling block is that imputed rent does not accrue as a cash flow and so it is difficult for ordinary people to consider it as 'true' income. For example, in Denmark a recurring argument against the taxation of imputed rent is that 'you cannot eat bricks'. To this, economists have answered 'No, but you can live behind the bricks'; by owning their home, owner-occupiers save part of the expenses that tenants incur when they rent a similar home. Niku Määttänen's paper illustrates this point in a pedagogical way and corrects the common misunderstanding that abolition of the deduction for mortgage interest payments can make up for the missing tax on imputed rent. When the imputed rent is tax exempt (and there is no property tax in its place), the return to housing equity is left untaxed. This favors housing investment over other forms of investment and discriminates against debt finance. Määttänen's paper also includes a well-informed and balanced discussion of several other issues such as taxation of capital gains on housing, transactions taxes and taxes on pure land values. In my comments below, I will elaborate on some of these issues, but first I will discuss possible economic arguments for tax benefits to owner-occupied housing.

1 Is there an externality argument for tax benefits to home-ownership?

This issue is briefly discussed and quickly dismissed by Määttänen, but since so many non-economists seem to think that tax benefits to homeowners are justified, it is worthwhile to discuss the question more carefully.

In the public debate, it is sometimes claimed that home-ownership should be promoted because homeowners are more motivated to maintain and repair their homes than tenants. While this may be correct, it does not provide an argument for tax subsidies to home-ownership, since the benefits from well-maintained homes accrue to the homeowners themselves and do not represent an externality (apart from the possible aesthetic benefits to others which are unlikely to be large). Moreover, while tenants themselves may lack proper incentives to maintain their homes, their landlords presumably have such incentives, since maintenance of the quality of rental housing will enable landlords to charge higher rents.

Some economists have argued that homeowners have a stronger incentive than tenants do to engage in socially beneficial local activities since this will increase the value of their home by increasing the attractiveness of the local neighborhood. Such value-increasing activities could generate positive externalities, which in principle might justify favorable tax treatment of home-ownership. However, owners of rental housing should also have an incentive to undertake investments that make life in the neighborhood more attractive, since this would likewise increase the value of their property. However, if the landlords themselves do not live in the neighborhood, their incentive may be weaker. Some empirical studies (e.g. Dipasquale and Glaeser 1999 and Haurin et al. 2002) have found that homeowners do seem to display more civic engagement than tenants, and that their children seem to do better, but this may reflect that civic engagement, child outcomes and home-ownership are all determined by more fundamental characteristics of the people involved. It has also been argued by Dipasquale and Glaeser (1999) and Hoff and Sen (2005) that since the transactions costs of moving are higher for home-owners than for tenants, home owners are less mobile and therefore tend to stay longer in their current neighborhood, which makes them more inclined to engage in activities that benefit the local community.

In an interesting paper to which Määttänen also refers, Kortelainen and Saarimaa (2015) point out that if the external benefits from home-ownership are significant, housing units in neighborhoods with higher rates of home-ownership should be more valuable. Applying a hedonic model of property prices to data from Finland, Kortelainen and Saarimaa (2015) find no evidence of such an effect. Other authors like Barker and Miller (2009) and Holupka and Newman (2012) argue that the beneficial effects of home-ownership on various measures of child welfare have been overestimated in the earlier literature, and Engelhardt et al. (2010) find that home-ownership has no effect on the participation of low-income households in local voting processes. Against this background, Määttänen seems justified in concluding that the evidence for positive externalities from home-ownership is too weak to warrant the substantial tax subsidies to homeowners granted by governments in the Nordic countries and elsewhere.

2 Should the tax on the return on owner-occupied housing be 'neutral'?

Määttänen's discussion takes for granted that the tax on owner-occupied housing should be 'neutral', i.e., that the return to owner-occupation should be taxed at the same rate as ordinary income from capital. More precisely, the homeowner's taxable income should include an imputed return equal to the market interest rate times the current value of the property, and this return should be taxed at the homeowner's marginal tax rate on capital income. Under a Nordic-type dual income tax where nominal capital income is taxed at a flat rate, neutral taxation can also be achieved via a proportional property tax levied at a rate equal to the capital income tax rate times the nominal interest rate.

However, as Sandmo (1988) has shown, such neutral taxation of housing is not necessarily optimal. He considers a scenario where the government has chosen to tax labor income and ordinary capital income at certain rates. He then considers whether the government should also impose a tax on owner-occupied housing (which could be interpreted as a tax on imputed rent or as a property tax) if it wishes to minimize the distortionary effects of the taxes on ordinary income. Sandmo's (1988) analysis shows that the optimal tax rate on owner-occupied housing is generally not zero, but whether it is positive or negative and how large it is depends on the degree of substitutability or complementarity between housing services, non-durable consumption goods, and leisure (labor supply). In Sandmo's (1988) analytical framework, household saving can be invested in housing capital or in financial assets. The ordinary capital income tax discriminates against financial saving in favor of housing investment. This tax distortion can be offset by a tax on owner-occupied housing if housing services and other goods are substitutes in consumption, which seems plausible.

The labor income tax induces substitution away from work towards leisure. If housing consumption and leisure are substitutes, a subsidy to owner-occupied housing can counteract the disincentive to work caused by the labor income tax. In popular terms, if home-ownership is subsidized, it becomes more attractive to work in order to acquire a house, so in principle one cannot exclude the possibility that home-ownership should be subsidized on efficiency grounds. On the other hand, since housing services are mostly consumed jointly with leisure, it seems more likely that housing and leisure are complements. In that case, a positive tax on owner-occupied housing can help to counteract the distortion to labor supply caused by the labor income tax, since the tax on housing will then be an indirect way of taxing the consumption of leisure.

Based on Sandmo's (1988) analysis it appears reasonable to assume that the taxation of labor income and ordinary capital income makes it optimal to levy a positive tax on owner-occupied housing, but according to his theoretical model, the optimal housing tax rate will generally differ from the 'neutral' tax defined above. Indeed, Sandmo (1988) shows that the optimal tax rate on housing only corresponds to the neutral tax if labor supply is independent of the user cost of housing (meaning that leisure and housing consumption are neither substitutes nor complements), *and* if housing services and other consumption goods are perfect substitutes. These assumptions are obviously restrictive, indicating that there is nothing 'sacred' about

the neutral housing tax. Nevertheless, since little is known about the magnitude of the relevant own-price and cross-price elasticities of housing consumption and the consumption of other goods and leisure, it is hard to say if the optimal housing tax is higher or lower than the neutral tax. Sticking to the neutral tax may therefore be a sensible policy as a practical matter, since tax neutrality as a general principle may serve as a buffer against lobbyism for favorable tax treatment.

3 Ex-ante versus ex-post taxation of capital gains on housing

While a recurrent annual property tax or a tax on imputed rent is politically unpopular, it is often easier for voters and politicians to accept the idea that capital gains on housing should be taxed since such gains – once they are realized – represent 'cash in hand'. The trouble is that a capital gains tax levied at the time of realization creates a lock-in effect. This lock-in effect may be particularly harmful in the housing market since it not only distorts the wealth portfolio of homeowners; it also hampers their mobility in the labor market, as Määttänen suggests. For this reason, most countries have more or less given up on taxing realized capital gains on housing when the home-owner has lived in the home for a certain period of time deemed long enough to rule out suspicion of a 'speculative sale'.

However, it is worth pointing out that a neutral recurrent housing tax does in fact imply full taxation of the ex-ante *expected* capital gain on housing capital. This may be seen by considering that the market price of a property will tend to adjust until the following arbitrage condition is met, where all variables are measured *per krone* (or per euro) of the market value of the property:

$$\begin{aligned} &\textit{Nominal interest rate} \times (1 - \textit{capital income tax rate}) = \\ &\textit{Value of housing service} - \textit{maintenance cost} - \textit{housing tax} \\ &+ \textit{expected nominal capital gain} \end{aligned}$$

The left-hand side of this equation is the homeowner's opportunity cost of investing in housing capital rather than investing his saving in the capital market where she could earn a return equal to the after-tax interest rate. Alternatively, if the purchase of the property is financed by debt, the left-hand side is the after-tax mortgage interest payment, assuming that interest expenses are deductible from taxable capital income. The right-hand side of the equation is the owner-occupier's net return from owning the house, which includes the expected capital gain on the property. Now suppose the housing tax corresponds to the neutral tax defined above, meaning that

$$\begin{aligned} &\textit{Housing tax} = \\ &\textit{capital income tax rate} \times \textit{nominal interest rate} \end{aligned}$$

When this equation is inserted in the previous equation, it is easy to see that the tax terms drop out. This illustrates that the housing tax is indeed neutral in the sense that it does not disturb the housing market equilibrium that would prevail in the absence of tax. However, as the reader may verify, the two equations above also

imply that

$$\textit{Housing tax} = \textit{capital income tax rate} \times (\textit{value of housing service} - \textit{maintenance cost} + \textit{expected nominal capital gain})$$

This confirms that the neutral housing tax falls on the full net return to owner-occupied housing, *including* the expected capital gain. In other words, although capital gains are not explicitly included in the base for the neutral housing tax, it is only the *unanticipated* part of a capital gain that escapes taxation. One can say that the neutral tax on imputed rent or the neutral property tax involves ex ante taxation of expected capital gains on a current basis as opposed to ex post taxation of realized gains. The neutral housing tax avoids the unfortunate lock-in effect mentioned above, but it admittedly sacrifices some ex post equity by leaving unanticipated gains free of tax.

4 Taxing pure land values

Niku Määttänen rightly emphasizes the strong efficiency argument for a tax on the pure land value that allows a deduction for investment in improvements like drainage or sewers. However, he does not clarify whether he refers to a general tax on land in all uses or only a tax on land used for housing purposes. A general uniform tax on all land values is fully capitalized in the market price of land since the total supply of land is fixed. Such a tax is non-distortionary, as it works like a lump-sum tax on existing landowners without increasing the user cost of land.

By contrast, a separate tax on land used for housing will have a distorting effect by discouraging the supply of land in this particular use. Sørensen and Vastrup (2015) compare the welfare effects of a land value tax and a property tax levied on the sum of the value of land and buildings. In both cases, the taxes only apply to property used for housing. Using a model that allows for elastic supply of housing land and for the possibility of substitution between land and buildings in the production of housing services, Sørensen and Vastrup (2015) show that if the government starts out from a neutral property tax on the total value of the property, it can increase total tax revenue without reducing consumer welfare by lowering the property tax and introducing a tax on the value of land so as to keep the total user cost of housing constant. The reason is that the land tax gets capitalized in land prices to some extent (although not fully, due to elastic land supply), whereas a tax on buildings causes a corresponding increase in the user cost since the producer price of buildings cannot fall below the construction cost in the long run. Hence, it is possible to raise more revenue without increasing the cost of housing services by taxing land at a higher rate than buildings.

All of this suggests that a well-designed system of housing taxation should include a tax on imputed rent or a tax on the total value of owner-occupied property to avoid favoring housing investment over other forms of investment, plus a surtax on the pure land value to exploit the attractive efficiency properties of a land tax. To arrive at this conclusion, I have relied on efficiency arguments, but as Niku Määttänen

nicely argues, considerations of equity only strengthen the case for such a tax system.

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Low-income housing policies: affordability and integration

Essi Eerola

Abstract

I review the literature on housing policies intended to improve the housing conditions of low-income households and discuss the conclusions that can be drawn from the literature. I distinguish between tenant-based programs like housing benefits and place-based programs like social housing and discuss the general characteristics of these policies in Nordic countries. Finally, I review the effects of these programs on recipient households and segregation in Finland where a large housing allowance program co-exists with a social housing sector.

Keywords: Housing policy, housing allowances, social housing, segregation.

JEL codes: H22, R21, R31.

1 Introduction

Housing policies tend to have a wide range of different objectives. For instance, in Finland the aims of housing policy include everyone's right to good and affordable housing, socially sustainable neighbourhoods, and housing supply that promotes the functioning of the labour market and supports the vitality of the regions (Ministry of the Environment 2020).

Given the broad overall scope, governments intervene in housing markets with multiple goals and multiple programs. A typical goal is the improvement of housing affordability and housing standards of low-income households. A related goal is the prevention of harmful segregation in large and growing cities. In recent years, especially after the financial crisis of 2007–2008, governments have also tried to reduce household indebtedness, for instance by limiting mortgage borrowing as part of a broader set of policies aimed at securing macroeconomic stability. At the same time, most governments have a long history in promoting homeownership, for instance through favourable tax treatment.

These types of housing policies are likely to become even more important and debated in the future. One important reason is urbanization, which creates large economic benefits but also poses significant challenges for social sustainability. For instance, agglomeration effects often increase land and housing prices in large cities. High housing prices directly reduce affordability and may also increase segregation. Together, high household indebtedness and high housing prices may also increase macroeconomic instability.

In this article, I review low-income housing policies in the Nordic countries. I will concentrate on three interconnected issues: affordability, access, and residential segregation. Although the Nordic countries are similar in many respects, their housing policy regimes have historically been based on quite different general principles. These differences concern not only the publicly subsidized housing sector, but also the relationship between rental and owner-occupied housing, regulation of the private rental market and the role of housing benefits as part of the overall welfare system.

The structure of the article is as follows. In Section 2, I discuss why and how housing consumption of low-income households is subsidized. In the discussion, I will distinguish between tenant-based programs like housing benefits and place-based programs like social housing. I will argue that although the two types of programs are based on different principles, they also have important similarities. In Section 3, I discuss the general characteristics of housing policies in the Nordic countries. In Section 4, I focus on the effects of these programs on recipient households and segregation in Finland, where a large housing allowance program co-exists with a large social housing sector. Section 5 concludes.

2 Low-income housing policy: why and how?

2.1 Why subsidize housing?

When thinking about housing policies from the point of view of low-income households, two important objectives include provision of affordable housing and reduction of residential segregation through social mixing.

Affordability is a difficult concept. It tends to aggregate into a single metric different issues ranging from income distribution and housing quality distribution to government housing market regulation and municipal decisions affecting neighbourhood quality and supply of housing. Changes in affordability over time are particularly difficult to interpret without additional information about the different components of the measure. For instance, the average rent-to-income ratio may decrease because renters experience a positive income development or because access to housing credit becomes more difficult and as a result middle-income households rent their housing more often than previously.[97]

To make matters even more complicated, affordable housing sometimes refers to a certain segment of the housing stock. In this case, affordability is defined relative to market prices. From this perspective, affordable housing becomes synonymous with social housing or rental housing sector with rents below market rents. Affordability, or lack thereof, can also refer to general level of rents or housing prices in a given urban area.

Low-income households tend to spend a large share of disposable income on housing. As housing is not easily divisible, housing consumption is costly to adjust. Therefore, when households experience transitory negative income shocks, they are more likely to first reduce spending on non-durables like food, clothing, or transportation. One concern is therefore that low-income households find it hard to afford consumption of other goods.

Another concern relates to household location choices and differences in housing costs across different labour market areas. As housing costs vary substantially across areas, moving to another labour market area might involve an increase in the cost of housing. Subsidizing housing costs aims at mitigating the negative effects of high housing costs on mobility. This issue has become more important as the housing costs in large growing cities have been increasing.

In principle, these concerns could be addressed by unconditional cash transfers instead of housing subsidies, but there may be reasons to think that subsidies tied to housing choices are more efficient. One argument follows from housing as a merit good. Housing has similar characteristics as education and health care in that households may not fully recognize the private benefits from housing consumption or housing consumption may generate positive externalities within the household. An important aspect relates to how the housing choices of adults affect children.[98]

97. For discussion on the issue, see e.g. Quigley and Raphael (2004) who decompose changes in affordability in the US over time to study the relative importance of different components.
98. See Collinson et al. (2016) for more discussion on the arguments for in-kind transfers relative to cash transfers.

In addition to these concerns relating to direct effects on low-income households in terms of affordability and access, housing programs may also have important effects beyond the direct effects on the recipient households. One important issue is related to neighbourhood effects and residential segregation. Within a labour market area, the cost of housing is directly linked to the neighbourhood characteristics. This means that local amenities are capitalized into the price of housing. Given that high-income households are willing to pay more for neighbourhood quality than low-income households, they tend to outbid low-income households for better quality neighbourhoods. This leads to residential sorting according to income. While this type of segregation is a natural phenomenon in urban areas with heterogeneous localities, it may also have negative consequences.

Of course, policymakers may care about neighbourhood segregation for its own sake. However, living in a deprived neighbourhood may affect, for instance, children's school outcomes and their future labour market outcomes. In the presence of such neighbourhood effects, housing programs may improve overall welfare if they affect the neighbourhood quality of low-income households. Two issues make understanding and tackling this problem quite difficult. First, income is an important determinant of household location choices. This makes it difficult to identify the direction of causality when studying the relationship between residential segregation and income. Second, identifying neighbourhood effects does not in itself give sufficient guidance for choosing appropriate policies to tackle the issue.

To date, there exists credible evidence on the causal effects of neighbourhoods, especially on children's long-term outcomes (see e.g., Chetty et al. 2016 and Chyn 2018). However, this evidence is mainly from the US, and it is unclear to what degree these results on neighbourhood effects can be generalized to the Nordic context because of differences in the overall welfare systems and in the quality distribution of publicly provided services. It is therefore important to obtain evidence on the magnitude of these effects also in settings were the socio-economic differences between the neighbourhoods are relatively modest.

In general, it seems fair to say that the mechanisms behind neighbourhood effects are not well understood. One potential mechanism is residential instability. Involuntary moves could have damaging effects not only on those moving by breaking up social networks and forcing children to change schools, but also on those who remain. However, the social life of individuals and families in large urban areas may be segregated for many different reasons. Clearly, these questions are important not only for housing policy, but also for the supply of local services, especially schools, public transportation, and accessibility more generally as well as for political representation.[99]

It is also important to note that measuring changes in the degree of segregation over time is not straightforward, especially if one is interested in segregation based on income. It is also not clear what the relevant geographic scope of the neighbourhood effects is. This is partly explained by data availability. Often researchers are forced to resort to data with location information based on administrative borders. Fortunately, this is rapidly changing. Increased availability of

99. For instance, Harjunen et al. (2021) show that in Finland, residential sorting leads to geographic inequality in political representation that affects school closures. The changes in the school network in turn further reinforce residential segregation.

exact location information of households for research purposes will allow a more flexible analysis of the geographic scope of the neighbourhood externalities.

2.2 How to subsidize housing - social housing and housing benefits

Social housing is a general term for quite different models and programs applied in different countries under different names. I define social housing as rental housing with three main characteristics: i) rents are regulated, ii) housing units are allocated according to specific rules, often targeting low-income households or specific groups like the elderly, students or the disabled, and iii) housing units are owned and managed by municipalities, non-profit organizations or other actors with a public benefit purpose and are subsidized by central and local governments.[100]

In the social housing sector, rules regulating rent setting vary a great deal. OCED (2020) distinguishes four main types. *Market-based* rents are determined relative to market rents of similar properties. *Cost-based* rents are determined by maintenance and capital costs of the property. *Income-based* rents depend at least partly on the income of the tenant. *Characteristic-based* rents are based on dwelling characteristics. Clearly, these different rent-setting models will create different incentives for the tenants and owners of the buildings. They will also result in different distributions of benefits for the tenants as measured by rent savings relative to market rents.

Rules on tenant selection are typically based on individual tenants (for instance, household income and composition, nationality, housing need). Some rules relate to the building so that a certain fraction of units must be allocated to households with incomes below a threshold (OECD 2020). In most countries, the right to occupy a particular unit is granted indefinitely (Scanlon et al. 2015).

Finally, the ownership structures and financing of social housing take different forms. In some cases, governments and municipalities directly provide social housing. In addition, governments may provide grants, tax credits, loans or loan guarantees to social housing providers. Local governments also subsidize social housing by supplying land at discounted prices (Scanlon et al. 2015).

Typically, social housing programs co-exist with some type of direct subsidy program. Important examples of the latter include housing allowances, which are means-tested benefits and depend on household size and composition and on housing costs. In addition to the household characteristics, the benefit may depend on location or other characteristics of the building. These programs may be broad or more targeted to certain groups of households, such as families with children or pensioners. The benefits are entitlements in that all eligible households receive the allowance if they apply for it. As a result, the overall amount of outlays typically varies over the business cycle.[101]

100. In the Nordic context, social housing defined in this manner does not cover all non-profit housing segments. For instance, in Sweden the aim has traditionally been to make municipal housing available for all citizens. I will return to this issue in the next section when discussing the Nordic regimes.
101. The organization of, say, the US housing choice voucher system is quite different. A household is eligible for a voucher if its income is low enough relative to the local income level. Given a fixed budget, only a fraction of eligible households receives a voucher. After having received a voucher, the recipient needs to find a dwelling that satisfies the requirements of the program.

The differences between social housing programs and housing allowances are often highlighted in the public discussion. However, social housing and housing allowance programs are also similar in three important ways. First, to the extent that social housing rents are below market rents, both constitute a transfer to recipient households. In the case of housing allowances, the transfer is a cash subsidy. In the case of social housing, the transfer comes in the form of rent savings relative to market rents.

Second, both programs also impose costs to taxpayers. For housing allowances, these costs are direct budgetary costs. For social housing, they consist of direct subsidies and foregone income. If the amount of foregone income is not estimated on a regular basis, a transparent comparison of program costs is not possible.

Finally, both may subsidize housing in a manner that increases the aggregate demand for housing. This can happen in two different ways. First, housing allowances or rent savings in social housing increase disposable income of recipient households and reduce disposable income of households who finance the system (income effect). This may increase overall housing demand if the income effect is larger for recipient households. Second, both allowances and rent savings may also reduce the cost of housing relative to other consumption for recipients (substitution effect). If the programs reduce the cost of the marginal housing unit relative to other consumption, they may increase demand for housing. Depending on the supply conditions, this may lead to higher rents in the private rental market.

Given these important similarities, why favour one over the other? Housing allowance programs are often more transparent than social housing programs. Social housing units need to be rationed when rents are set below market rents. Therefore, the details of the allocation mechanism determine the distribution of benefits. Equal treatment of similar households cannot be guaranteed with a fixed number of housing units. Housing allowance programs are also more flexible when the need for support is growing. At the level of the economy as a whole, housing allowance programs act as automatic stabilizers by complementing other segments of social security systems.

There are, nevertheless, at least two reasons to think that social housing programs could dominate housing allowance programs in helping low-income households. The first relates to location. Social housing tenants are required to reside in specific buildings. This means that in principle it is possible to design a social housing program so that it helps to reduce residential segregation. Second, housing is different from many other consumption goods in that it is possible to be excluded from the private rental market for various reasons. It is hard to claim that direct transfers could ever solve this problem. However, as the discussion in the following sections shows, it is not always obvious that the actual social housing programs are able to realize these advantages.

3 On the Nordic housing policy models

In all Nordic countries, a majority of households own their home. For the most part, the rest live in rental housing. The organization and size of the private rental market varies between the Nordic countries. In Finland, the private rental market is unregulated and quite flexible while in Denmark, Norway and Sweden different types of rent regulations are in place (Kettunen & Ruonavaara 2020). In addition, the non-profit rental market can take different forms, including social housing discussed above.

Table 1 shows the share of households living in owner-occupied housing (including so called co-operative or tenant-owned housing) in the Nordic countries and the share of non-profit rental housing stock.

Table 1 Owner-occupied housing and non-profit rental housing in Nordic countries

	Share of home owner households, percent		Non-profit dwellings, as percent of owerall housing stock	
	2010/2011	Latest	2010/2011	Latest
Denmark	57	53	22	21
Finland	68	65	13	11
Sweden	56	63	23	16
Norway	77	73	5	4
Iceland	75	73	9	11

Note: For Sweden, the first two columns contain the share of dwellings, not households.

Sources: For Sweden, Grander (2020, Table 6). For other countries, OECD Affordable Housing Database.

Apart from Sweden, the share of the households living in owner-occupied housing has declined slightly in recent years. There is some indication that especially among young households the share of owner-occupiers is declining. For instance, in Finland the share of owner-occupiers among the 30–34-year-old adults was less than 50 percent in 2018 compared to 58 percent a decade earlier (Statistics Finland 2019). A similar trend has been previously documented for Sweden and Denmark (see e.g., Enström Öst 2012 and Nielsen & Jensen 2011).[102]

The second general trend is that the share of non-profit rental housing is slightly falling. Provision of non-profit housing has not kept pace with overall construction and part of the stock has been privatized, freed from regulation, or demolished.[103] Together these two trends mean that a well-functioning private rental market is highly important when aiming to guarantee affordable housing for

102. Several potential explanations have been put forward to explain the phenomenon (see Eerola et al. 2021).
103. The same trend is true in many other European countries (Scanlon et al. 2015) and the US. In the US, after the Second World War, government-managed public housing was the only major form of federal low-income housing assistance. During the past twenty years, the public housing stock has shrunk, but this reduction has been more than offset by new recipient households in tenant-based programs (Collinson et al. 2016).

low-income households.

Housing policy regimes in the Nordic countries differ quite substantially, both in their general aims and principles as well as in implementation. Bengtsson et al. (2014) discuss the differences in a comparative study taking a historical perspective starting in the early 1900s. The authors classify the Nordic systems along two dimensions. The first dimension relates to whether the regime explicitly favours owner-occupied housing relative to rental housing. The second dimension relates to whether the housing policy can be characterized as universal or selective. A universal housing regime aims at ensuring good quality housing for all citizens. A selective regime aims at targeting certain groups of individuals or households based on different criteria. The latter regime can also be more closely connected to the social security system. Bengtsson et al. (2014) classify the Danish and the Swedish regimes as universal, and the Finnish and the Icelandic regime as selective.

In Denmark, non-profit housing is defined as general housing (*almen bolig*) and is provided at cost-based rents through a variety of public interest housing associations. The housing associations receive government subsidies of capital costs (Svarer et al. 2005).

The Swedish system has traditionally included a broad model of non-profit housing managed by municipal housing companies for the 'benefit of everyone' (*allmännytta*). The Swedish regime also contains a small selective *secondary housing market* for households excluded from the rental market. Within this program, the municipalities' social services rent housing units from private and public housing companies and sublet the units to their clients. Initially this program was designed to provide housing for those incapable of obtaining housing on their own, for example due to substance abuse or other social problems (Grander 2017).

The Finnish system is based on government-subsidized public and private non-profit organizations providing rental housing that is allocated based on need and income.

Of course, the actual degree of universality or selectivity will ultimately depend on the details of implementation. In addition to tenant selection rules, an important factor is position of the non-profit housing units in the quality distribution of the overall housing stock. The location and other characteristics of the non-profit housing units will determine who will apply for the units.

In all Nordic countries, the non-profit housing sector co-exists with a housing allowance program. Table 2 compares the housing allowance programs in the Nordic countries. There are clear differences between countries both in the distribution of recipient households across income groups and in the size of the programs.

Table 2: Housing allowance (HA) in Nordic countries

	Share of households receiving HA by income quintile					HA spending as percent of GDP
	Bottom	2nd	3rd	4th	Top	
Finland	57.3	21.3	8.5	4.4	2.9	0.9
Denmark	40.8	39.4	10.1	2.9	1.5	0.7
Sweden	38.3	9.1	3.7	1.4	0.7	0.3
Iceland	39.4	35.8	29.2	24	9.3	0.2
Norway	14	2.1	0.3	0.3	0.1	0.1

Note: Share of households receiving housing allowance in 2017.

Source: OECD Affordable Housing Database.

In Finland, the program consists of two distinct schemes (general housing allowance and pensioners' housing allowance) with no restrictions on eligibility except income. The Finnish housing allowance system covers a large share of the population and has been extended in recent years. Since the beginning of 2000s, the number of recipient households living in rental housing has more than doubled.

In Sweden, in contrast, the number of households receiving housing allowance has decreased since the early 2000s. The system is targeted to families with children and young adults under 29 years of age. Housing allowance is paid primarily to single parents (Swedish Social Insurance Agency 2019). In addition, there exists a separate system based on income and wealth for pensioners older than 65 in full retirement pension. Some 30–35 percent of the pensioner population are likely to be eligible, but only 15 percent of the population receive the housing supplement (Engström et al. 2019).

3.1 Finland vs. Sweden

Given the quite different premises for the housing policy regimes, it is interesting to compare the distribution of households with respect to tenure in Sweden and Finland. In Finland, the well-off are almost always owners. Most households in the lowest income decile are renters, while 90 percent of households in the highest income decile are owner-occupiers. Social housing tenancy is more common in the lowest income deciles, but even in the highest income decile, a fifth of renters live in social housing (Hirvonen et al. 2014). Also in Sweden, tenure is strongly driven by income. Renters have on average lower incomes than owners do, and tenants in municipal rental housing have lower incomes than tenants in the private rental market. In addition, the share of immigrants from non-EU countries is higher in municipal housing than in private rental housing (Grander 2020). In general, although the overall level of ethnic segregation is lower in Helsinki, immigrants seem

to be more concentrated in social housing in Helsinki than in Stockholm (Andersen et al. 2016).

Concentration of low-income households in non-profit housing in large cities cannot be considered good or bad without further information. On the one hand, the cost of housing is high in large cities and non-profit housing may offer low-income households the only possibility to live in these cities. On the other hand, the concentration may be problematic if the non-profit housing is geographically very concentrated.

The Swedish municipal housing regime has changed in important ways in the 2000s because of privatizations and the need to adapt to EU legislation. The latter has resulted in a change in the law regulating municipal housing companies. Now, municipal housing companies should act in a 'businesslike way' but also have a 'public purpose' (Elsinga & Lind 2013).

Currently, the Swedish municipal housing companies impose financial requirements for households to be eligible to rent. The requirements might include, for instance, permanent employment or an income threshold.[104] At the same time, households in municipal housing in Sweden have become poorer in relative terms (Grander 2017). One possible reason is the expansion of the secondary housing market. Because of income thresholds in municipal housing, low-income individuals may be forced to rent in the secondary housing market.

Another potential reason is the conversion of municipal rental housing into private cooperatives. For instance, the city of Stockholm allowed municipal housing tenants to buy their dwellings if at least half of the tenants were in favour of buying.[105] Andersson and Magnusson Turner (2014) study the tenant composition in the municipal housing buildings before and after the conversions. Two things happened to the population mix. First, because most conversions took place in inner city neighbourhoods already dominated by cooperative housing, municipal rental housing became increasingly concentrated to the periphery. Second, households moving out from converted municipal housing had lower earnings and a lower rate of employment, and were less likely to have university education than those replacing them.

The overall social housing program has changed importantly in the 2000s also in Finland, but for different reasons. A large share of the social housing units has been freed from regulation, overall demand for housing has shifted from small municipalities to large cities with increasing rent levels, and the tenant selection legislation has been modified. I will discuss the recent developments in the next section.

104. See e.g. Elsinga and Lind (2013) and Grander (2017).
105. In Stockholm, three municipal housing companies used to own about 110 000 housing units or 30 percent of the housing stock. They privatized 12 200 units between 1999 and 2004 (Sodini et al. 2016).

4 Evidence from Finland

4.1 Institutional context

In Finland, owner-occupied housing enjoys a tax-advantaged position relative to rental housing and investment in financial assets. Housing is also the single most important form of wealth for Finnish households. In 2016, according to the Statistics Finland Wealth Survey, roughly 50 percent of household net wealth was in the form of owner-occupied housing as principal residence, 6 percent in secondary residences and 10 percent in other real estate.

Households either own their housing directly or own shares of a housing cooperative. Housing cooperatives own the building and often the lot. Owning shares gives the right to occupy, renovate and rent out a particular unit.

The most common alternative to owner-occupied housing is rental housing. The rental market can be divided into an unregulated, private rental market and a social housing sector. Landlords in the private rental market are private corporations and foundations, large institutional owners such as banks and insurance companies, and private individuals. Units owned by private individuals constitute roughly two thirds of the private rental market. In the social housing sector, municipalities own more than 60 percent of the dwellings. The rest are owned and managed by non-profit corporations and associations.

Tenant selection in the private rental market is not regulated. Landlords are entitled to use their own criteria when selecting tenants and have the right to check the credit history of potential tenants. Rent setting is free but was controlled in different ways until the early 1990s. Starting in the late 1960s, rents were allowed to be freely set only when the unit was rented for the first time, but rent increases were not allowed thereafter. In the 1970s, rent control was extended to new units. The regulation then applied to all rental units, and the maximum acceptable rent increases were determined annually by the government based on proposals made by tenant and landlord representatives. Rent control was gradually abolished in the early 1990s.[106]

Despite a long tradition of social mixing policies and low-income inequality in the society as a whole, there are some indications of increased segregation in Finnish urban areas. Saikkonen et al. (2018) study the recent development of income inequality and segregation in the Helsinki, Turku and Tampere regions. They conclude that the regions are different in terms of segregation. Ethnic segregation is strongest in the Turku region while the Helsinki region, and especially the city of Helsinki, is characterized by stronger segregation in terms of household income.

4.2 Two large overlapping programs

The details as well as the stated objectives of the social housing program in Finland have varied over time. Currently, the main objective is to provide affordable housing for low-income households and to create socially balanced neighbourhoods and buildings that are diversified in terms of household composition. Part of the subsidized housing stock is explicitly directed towards special groups such as the

106. Kettunen and Ruonavaara (2020) discuss the history of the rent control in Finland.

disabled, students and the elderly.

The aim of the housing allowance program is to reduce the cost of housing to the recipient households. There is substantial overlap between the two programs. In 2018, roughly 40 percent of general housing allowance recipients were social housing tenants.

4.2.1 Housing allowance in Finland

Initially, in the 1940s, housing allowance was paid to families with many children. In the early 1960s, all low-income families with children living in rented flats became eligible. By the 1980s, housing allowance had been gradually expanded to apply to all kinds of households and tenure.

The program has been further reformed and extended during the 2010s. First, in 2015, the housing allowance was made more generous as part of a large reform which radically simplified the way in which the allowance depends on household income and the characteristics of the housing unit. In 2017, a separate system for students was abolished and students were included in the general housing allowance program. This reform led to more generous allowances for students not living with a working partner.

The housing allowance is a means-tested benefit covering up to 80 percent of the rent up to a rent ceiling. The rent ceiling varies based on local affordability, and the allowance depends on household size as well as household income. The same rules apply to tenants in social housing and in private rental housing. Eligibility does not depend on tenure, but 95 percent of the housing allowance recipients live in rental housing.

Housing costs of low-income households are also covered through the social assistance system. Social assistance is provided to individuals and families whose income and assets do not cover their essential daily expenses. Unlike the general housing allowance program, social assistance can reimburse reasonable housing costs in full. The limit for what is considered reasonable varies by municipality. If the housing costs are judged unreasonably high, the beneficiary should search for more affordable housing.

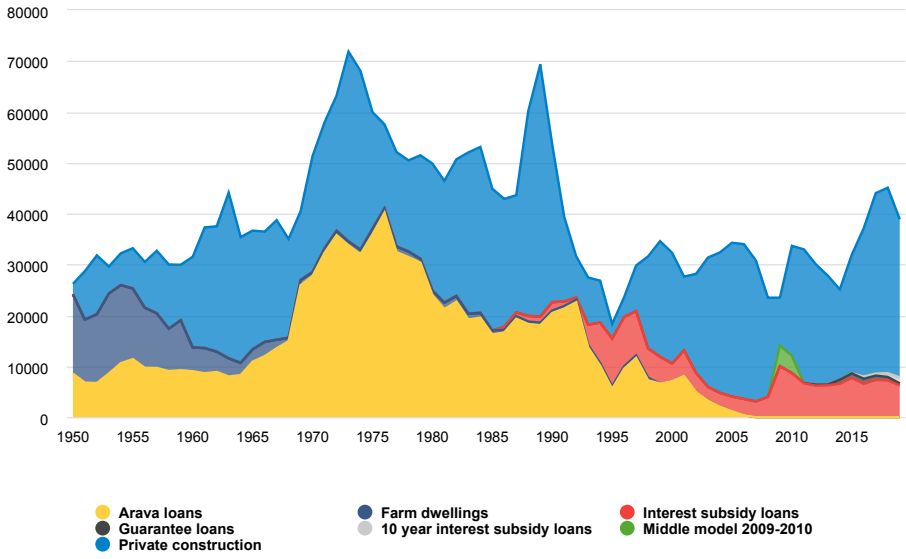
4.2.2 Social housing in Finland

The Finnish social housing program dates from the mid-1940s. Initially the program consisted of various subsidy schemes for construction and renovation of rental housing and owner-occupied housing. In the 2000s the main focus has been on rental housing in growing urban areas. More than 90 percent of construction of subsidized dwellings was located in growing cities in 2019. The program is implemented by the Housing Finance and Development Centre of Finland (ARA), an off-budget governmental agency operating under the supervision of the Ministry of Environment. The same program covers housing owned by municipalities and by non-profit corporations and associations.

Figure 1 shows annual residential construction in Finland from 1950 to 2019 divided into private construction and different ARA programs. As the figure shows, subsidized construction constituted a large share of all construction, especially in the 1970s and 1980s, but its share was gradually shrinking after the 1990s recession until the financial crisis. During the last ten years or so, different new programs have been established, some of which have been temporary. The figure also shows that private construction is quite sensitive to the business cycle, with remarkable reductions in

construction during the severe recession in the early 1990s and the financial crisis in 2008–2010. During the early decades of the ARA programs, most dwellings were built with AVARA loans granted by ARA, while in the 2000s the main forms of construction subsidies have been interest subsidies and loan guarantees.[107]

Figure 1 Residential construction in Finland, 1950–2019



Notes: For units in category '10 year interest subsidy loans' rent setting and tenant selection restrictions are in place for 10 years. For units in category 'Model 2009–2010' there were no rent setting and tenant selection restrictions.

Source: Own calculations from Statistics Finland building and dwelling construction data and ARA construction data.

The subsidized rental properties are subject to different types of regulation regarding the use and transfer of properties. A typical restriction period is 40 years. After the restriction period, the owner can freely set rents, select tenants and sell the units at market prices.

Over one million dwellings have been constructed within the social housing program and currently more than 400 000 units are still subject to the tenant selection and rent setting restrictions. Although the absolute number of social housing units subject to restrictions has remained quite stable in the 2000s, their share of the overall housing stock has decreased since the early 2000s. The share of social units is highest in large cities. For instance, there are some 76 000 social housing units in the city of Helsinki, which amounts to roughly 20 percent of the overall housing stock in the city (Housing Finance and Development Centre of Finland 2019).

Rent setting is cost-based. The average rent depends on the capital and

107. Bengtsson et al. (2014) discuss in more detail the evolution of the system.

maintenance costs of the building, but rents of specific units may vary depending on unit characteristics. The general idea is that the owner receives subsidies that reduce capital and maintenance costs. Through the rent setting regulation, the subsidies lower the rents paid by the tenants. This means that the rents in social housing units relative to market rents vary across municipalities and neighbourhoods.

Tenant selection is based on legislation. Previously, tenant selection legislation included formal income limits. The limits were relatively high in European comparison and were abolished in 2008 (Andersson et al. 2010). Income limits were re-introduced in the Helsinki Metropolitan Area in 2017. The limits were again relatively high. Only 18 percent of all households and 25 percent of owner-occupiers in Helsinki had income levels exceeding the limits. The limits were abolished in 2018. At the same time, the government abandoned plans to introduce periodic income inspections for tenants in social housing units (Vuori & Raunionmaa 2018).

Currently, the selection criteria include the applicant's urgency of housing need, wealth, and income. Details of the selection process depend on the owner. Typically, however, there is no explicit ranking of the applicants or a formal queuing system. In the case of the city of Helsinki, the applicants cannot apply for a specific flat, but instead express preference for a neighbourhood. Once a household has obtained a social housing unit, it has the right to occupy the unit indefinitely, regardless of changes in its income or wealth.

The buildings are owned by municipal rental housing companies and by non-profit organizations.[108] Municipalities are important decision makers within the program. However, especially in large cities, the decisions are also directly affected by the ARA regulations. For instance, one prerequisite for ARA construction is a reasonable lot price. ARA approves the lot prices and the approval is regulated by regionally determined maximum lot prices. This restricts the municipalities' freedom in terms of locating new social housing units in certain neighbourhoods.

Regarding financing, the government subsidizes social housing through the different programs managed by ARA. In addition, municipalities subsidize the municipal housing companies in particular by not including capital costs in the cost-based rents, by providing loan guarantees, and by subsidizing lot rents and selling prices (Kaleva et al. 2013).

The overall costs of the social housing program to the taxpayers consist of direct subsidizes and guarantees administrated by ARA and various subsidies and discounts granted by the municipalities. There exist no systematic data on these costs.

4.3 On the effects of the programs

4.3.1 Direct effects on recipient households

The effects of the housing allowance program are constantly under scrutiny in Finnish public discussion. This is probably explained by the high degree of transparency of the program costs combined with increasing overall outlays during the last decade. The main concerns relate to the potential effects of the program on

108. ARA grants non-profit status. In 2020, some 550 organizations had non-profit status.

rents paid by recipient households and on the overall rent level. These are important issues because large rent effects would substantially undermine the efficiency of the program. However, both are difficult research questions because of reverse causation. That is, housing allowances may affect rents but rents may also affect the amount of housing allowance received.

Eerola and Lyytikäinen (2021) use two different strategies to isolate the rent effects of housing allowances from other factors affecting rents. First, they exploit the discontinuities in the Finnish housing allowance scheme that was in place until 2015. The system featured discontinuities caused by rent ceilings, which varied as a function of the characteristics of the dwelling. The discontinuities are used to assess whether differences in the housing allowance generosity affect rents paid by the recipients. The second research design is based on a housing allowance reform implemented in 2002. The reform changed in different ways the rent ceiling in different types of housing units. The resulting exogenous variation in housing allowances can be used to identify the rent effects.

Both analyses suggest that the rent effects of housing allowances are small. That is, differences in the housing allowance generosity do not translate into differences in rents of the recipient households.[109] One possible reason for these relatively small rent effects is related to the nature of housing consumption. Housing consumption can only be adjusted by moving, which is always costly. It is conceivable that the differences in the housing allowance generosity are too small to induce mobility. However, as housing units with similar characteristics are close substitutes, conditional on moving, a recipient household should find a unit with more generous housing allowance more appealing. The evidence from a UK reform that reduced housing benefits for social housing tenants deemed to have a spare bedroom supports this hypothesis. The aim was to promote mobility and reallocation of the social housing stock. Although the policy was not successful in encouraging mobility, it did incentivize those who moved to downsize (Gibbons et al. 2020). If the Finnish program had similar effects, they were not large enough to be detected in the analysis.

The incentives generated by the housing allowance program also depend on the expected length of the housing allowance spell. If the expected housing allowance spell is short, changes in disposable income do not result in housing consumption adjustments, but instead affect non-housing consumption. In this respect, different types of recipients are likely to be in quite difference situations. Students constitute a particularly interesting group. The length of the expected housing allowance spell should be more predictable for students than, for instance, the unemployed.

Despite the large scale of the Finnish housing allowance program, its effects on labour supply or housing consumption choices have received much less attention in research. Although the negative incentive effects on labour supply as well as the incentives related to location choices are much discussed, there is no clear evidence on the magnitude of the effects.

Because social housing rents in Finland are cost-based, they can be expected to be lower than market rents, especially in large cities. To understand the distributional impact of the program one must first determine the rent savings generated by the

109. Kangasharju (2010) found substantially larger rent effects of the 2002 housing allowance reform.

program.

Eerola and Saarimaa (2013, 2018) assess the rent savings accruing to social housing tenants in the city of Helsinki, where the city owns a large stock of subsidized rental units. Rent savings are defined as the difference between the market rent of a social housing unit and its actual regulated rent. Of course, the market rents of the social housing units are not observed and are likely to vary substantially depending on location and physical attributes of the unit. To overcome this problem, the study uses detailed micro data on the attributes, rents and the location of private and social rental housing units in Helsinki.

Implicit prices for housing attributes within the unregulated rental market are recovered using hedonic regression methods with spatial fixed effects. These implicit prices along with estimates of spatial fixed effects are then used to predict market rents and to calculate rent savings for individual social housing units. This can be done without information about the tenants, as social housing rents do not depend on tenant characteristics.

Eerola and Saarimaa (2013) analyse rent savings in dwellings owned by the city and non-profit organizations respectively and examine how the rent subsidy varies according to the characteristics of the dwelling. The rent savings are substantial in dwellings owned by the city but vary considerably depending on the size and location of the dwelling. The rent savings decrease with distance to the city center and are highest in expensive neighbourhoods. In contrast, rent savings in dwellings owned by non-profit organizations are on average significantly smaller.

Eerola and Saarimaa (2018) match unit level rent savings with household register data for social housing dwellings owned by the city. The aim is to study the distribution of rent savings as well as to compare the distribution of the rent savings with the distribution of housing allowances.

The total rent savings to social housing tenants are considerable and comparable to the total amount of housing allowance. Housing allowances are much more concentrated to low-income households than rent savings. The households in the lowest income quintile receive 66 percent of the total amount of housing allowances, but only 34 percent of the total rent savings. Moreover, 22 percent of the rent savings in social housing accrue to households with income above median income.

4.3.2 Effects on segregation

In theory, both programs may be important for residential segregation. In an unregulated housing market, local amenities are capitalized into housing prices and increase the cost of housing. Therefore, housing allowances that enable families to move to dwellings that are more expensive also enable them to move to more advantaged neighbourhoods and thereby reduce segregation. In the social housing sector, the neighbourhood choice of the program participants is determined by the location of the subsidized buildings. Therefore, at least in principle, locating social housing to sought-after neighbourhoods and avoiding large concentrations in specific areas may serve to reduce segregation. Reliably detecting these effects is notoriously difficult as the location choices of households are affected by a host of factors typically unobservable to the researcher.

To shed light on this issue, Eerola and Saarimaa (2018) compare the socio-economic

mix and quality of the neighbourhoods of social housing tenants and similar households in private rental housing in Helsinki. One potential strategy for reducing the spatial concentration of poor households is to allocate part of the social housing subsidy to middle- and high-income households. This can be done by actual tenant selection or by giving the right to occupy the subsidized dwelling indefinitely. Analysing the neighbourhoods that social housing tenants occupy, however, suggests that this strategy does not work as intended.

Not surprisingly, there is clear residential sorting according to income in the private rental market. High-income tenants tend to live in neighbourhoods with higher median income, less poverty, higher education level and higher market rents. Interestingly, a similar pattern can be observed across income quintiles in the social housing buildings owned by the city. Tenants higher up in the income distribution live in better-quality neighbourhoods than the ones in the lowest income quintile. More importantly, social housing tenants in the lowest income quintile live in poorer, less educated, and lower quality neighbourhoods than households in the same income quintile in the private rental market.

Low-income social housing tenants are therefore exposed to poorer, less educated, and lower quality neighbourhoods (measured either at the level of post code area or building) than similar low-income households in the private rental market. This finding suggests that social housing programs may lead to more segregation than tenant-based alternatives, even when neighbourhood mixing is an explicit aim of the program.

There may be several reasons for this observation. One potential issue relates to the difficulty of attracting middle-income households to social housing dwellings in neighbourhoods where social housing sector is large relative to overall housing stock. Another issue is the tax advantages of owner-occupied housing. These advantages generate a strong incentive for middle-income households to become owners. As most of the social housing buildings are reserved for tenants who qualify for social housing, those wanting to become owners need to move, which limits the potential for social mixing.

4.3.3 General equilibrium effects

As discussed in Section 2.2, in addition to all other effects, both social housing and housing allowances may influence the overall rent level. In the social housing sector, the logic is as follows: When part of the overall housing stock is allocated with regulated, below market rents, some households choose to apply for a bigger or a more centrally located dwelling than in the absence of the regulated rents. As a result, given the size of the overall housing stock, the effective supply left for households that do not have access to subsidized housing is smaller. This leads to higher rents in the unregulated rental market.[110]

The same mechanism works for housing allowances. However, almost all studies on the incidence of housing allowances use variation generated within the housing allowance program to assess the effects on rents paid by recipient households. Identifying the effects of housing allowances on the overall rent level requires a different research design. If the rental housing market is competitive, a change in

110. Kaas et al. (2021) offer a model analysis on the German social housing stock taking these rent effects from the social housing segment to the private rental market into account.

housing allowances will affect the rents of all tenants regardless of their recipient status. Therefore, comparing the rent development of different household groups (treated and untreated) will underestimate the effect of housing allowances on rents.[111] To date, there are no reliable assessments on the effects of the social housing and housing allowance programs on the overall rent level in the Finnish context.

The above discussion assumed a fixed housing stock. However, social housing construction may directly influence the overall housing supply. It is likely, however, that in densely populated urban areas, subsidies to social housing construction lead to substantial crowding-out of private construction. On the other hand, by increasing housing demand, both housing allowances and social housing may affect municipal decisions on land use. These indirect effects on housing supply are difficult to identify and further complicate the assessment of the subsidies on the overall rental level.

5 Conclusions

I have discussed housing policies, especially housing allowances and non-profit (or social) housing, their rationale from the point of view of low-income households, and their design in the Nordic countries. In discussing the effects of the programs, I focused on evidence from Finland. Four general conclusions can be made.

First, housing costs can be reduced either by housing benefits or vouchers, or by supplying housing with below market rents. Both alternatives will improve the living standards of the recipient households. Other things equal, they leave the recipients with more disposable income for non-durable consumption. However, both also incur costs for the taxpayer, direct budgetary costs in the case of housing benefits and foregone revenue in the case of social housing.

Second, the overall effects of the programs do not directly follow from the stated objectives. The effects are typically complicated and difficult to establish reliably. The details of implementation will determine whether programs based on quite distinct principles lead to different distributions of benefits. It seems, for instance, that the distribution of tenant characteristics in Swedish municipal housing and Finnish social housing are more similar than the principles and stated objectives of the programs might suggest.

Third, a difficult tension is built into the social housing programs. On the one hand, there is a clear justification for directing public support to low-income and vulnerable households. On the other hand, one may want to avoid creating neighbourhoods with a high concentration of disadvantaged households. Changes over time in the program rules and location of non-profit housing reflect changes in the awareness of this tension.

As housing costs in sought-after neighbourhoods in growing cities continue to increase, this tension will become more difficult in the future. True and sustainable

111. For instance, Gibbons and Manning (2006) use differences in the share of recipient households in different regions to assess the general equilibrium effects of housing allowance in the UK.

affordability is more likely to come in the form of increased overall housing supply than subsidized demand, be it through below market rents or housing allowances. All housing construction is useful in this respect and will benefit the low-income households due to the filtering effect, since increased supply will serve to lower the cost of housing generally. Insufficient construction in growing housing market areas is a distinct problem from providing housing subsidies for low-income households. These two issues call for different types of solutions.

Finally, most research on low-income housing programs focuses on the program participants. However, programs that seek to change the supply side of the housing market or the distribution of low-income families across neighbourhoods presumably affect also non-participants through channels other than the tax burden associated with financing the programs. These effects operate through demand and supply responses in the housing market, affect housing prices, rents, and residential sorting. Research on the indirect and sometimes potentially unintended consequences of these programs would be highly useful for the design of the programs in the future.

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Comment on E. Eerola: Low-income housing policies: affordability and integration

Matz Dahlberg

I enjoyed reading the paper by Essi Eerola. She provides an informative overview of low-income housing policies in the Nordic countries in terms of affordability, access, and residential segregation, she discusses the rational for subsidizing housing consumption for low-income households (distinguishing between tenant-based and place-based programs), and she presents research examining the effects of social housing policies in Finland on recipient households and on segregation.

My comment adds to the discussion in Eerola in three ways. First, I will make some further remarks on housing policies in the Nordic countries, next, I will highlight the importance of geographic scale when evaluating housing policies in terms of neighborhood integration and neighborhood outcomes, and, finally, I will discuss the political economy of housing policies.

1 On housing policies in the Nordic countries

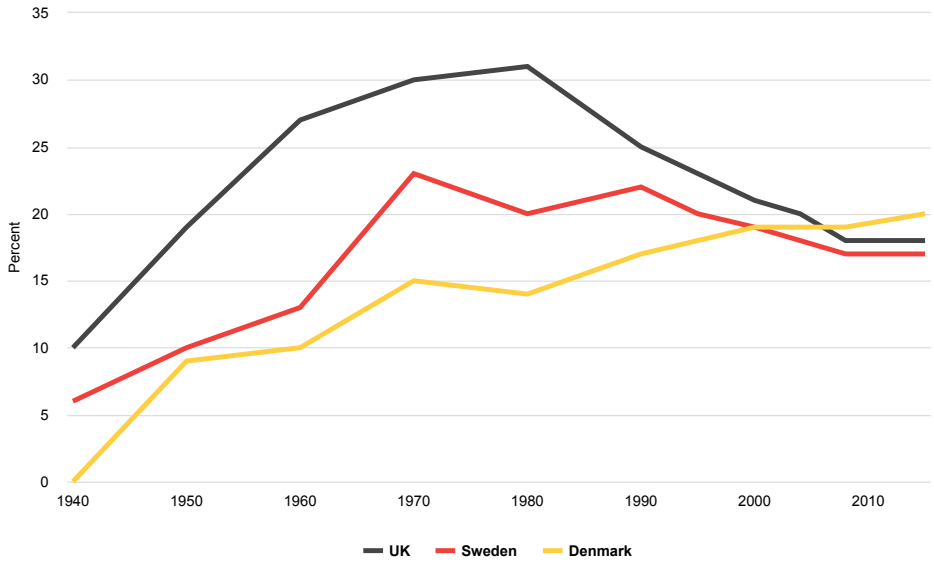
Eerola provides a nice summary and discussion of the general characteristics of the housing policy models in the Nordic countries, but with focus on Finland and Sweden. Here I will add two aspects related to the resilience of social housing, which I think is important for the general understanding of the Nordic model: changes over time in the size of the social housing stock and the security of tenure.

Over the last decades, there has been a discussion on how and to what extent different types of housing market policies (such as conversions via right-to-buy policies, sales to non-public landlords via privatization reforms, and the size and structure of new construction) have eroded the social housing sector in different countries (see, e.g., Blackwell and Bengtsson 2021, and the references cited therein). Since this is related to the resilience of social housing, it is of both interest and importance to examine how the share of social housing evolves over time. In a comparison of the development of social rental dwellings in Denmark, Sweden and the UK from 1940 to 2015, Figure 5 in Blackwell and Bengtsson (2021; reproduced here as Figure 1) reveals an interesting pattern.[112] Even though the three countries have rather similar shares of social rental housing by the end of the period (around 17–21 percent), they have followed rather different trajectories to get there. While

112. The definition used for Sweden is municipality-owned housing ('*Allmännyttan*').

the social housing sector in Denmark has been growing steadily over the entire period, the social housing sector in Sweden (and the UK) has been on a downward trend over the last three to four decades.[113] As argued by Blackwell and Bengtsson (2021), a social rental sector lacks resilience if it decreases too much in size (giving fewer citizens access to non-profit housing). Even though they argue that the absolute size of the social housing sectors in Denmark and Sweden is probably not an issue for major concern in terms of access, the trends might be. An understanding of this type of time-dynamics is important, but is not evident in the more static description in Table 1 in Eerola's paper. Related to this, it is interesting to note the figures for Norway in the same table in Eerola's paper; the share of social housing is just above 4 percent in Norway, implying that access to social housing is highly limited.

Figure 1 Social rental dwellings as proportion of total dwelling stock in Sweden, Denmark and the UK, 1940-2015



Source: Blackwell and Bengtsson (2021, Figure 5).

Another important aspect of the resilience of social housing is security of tenure: What is the length of the tenants' rental contracts? What happens when their income increases? To what extent are they protected from being arbitrarily evicted (including by large increases in rents)? In this respect, there are differences between the Nordic countries, but there is a major dividing line between the Norwegian system and that of other Nordic countries. While most of the Nordic countries

113. Blackwell and Bengtsson (2021) put forward a tentative explanation for the diverging trends in the three countries; the degree of political centralization in the provision and financing of social housing. They argue that the association-based, non-public, structure of social housing in Denmark with its multilevel system of financing has been more resistant to recent housing policies than the more centralized and publicly funded social housing in Sweden and the UK.

provide rental contracts with indefinite length, do not have means-testing, and have a rent-setting schedule that is typically not based on market-rents (but rather based on regulated, negotiated or cost-based rents), Norway differs in all these dimensions (see Sørvoll 2019, and Aarland and Sørvoll 2021). Norway relies on a strong means-testing system (low income is not sufficient to gain access to social housing), tenants get short fixed-term contracts (typically three- or five-year contracts), and social housing rents are based on market-rents. As pointed out by both Sørvoll (2019) and Aarland and Sørvoll (2021), it is the combination of these characteristics that makes Norway stand out in an international comparison of how social housing policies are designed. One implication of this is that many low-income families face an unstable and insecure housing situation, including frequent changes of neighborhoods (they do, for example risk losing their apartments by the end of the contract period if their economic situation has improved). As pointed out by Eerola, recent research shows that residential instability might have high short-run as well as long-run costs for both adults and children.

2 On the role of geographic scale

When evaluating housing policies in terms of residential integration and neighborhood effects, it is important to have a clear definition of 'neighborhood'. As pointed out by Eerola, data limitations have typically forced researchers to rely on administratively defined geographical units (such as municipalities, parishes, or, in the Swedish case, SAMS-areas). These administratively determined units might however have a poor correspondence with the general perception of distinct neighborhoods. Getting access to fine-grained geocoded data will mitigate these problems.

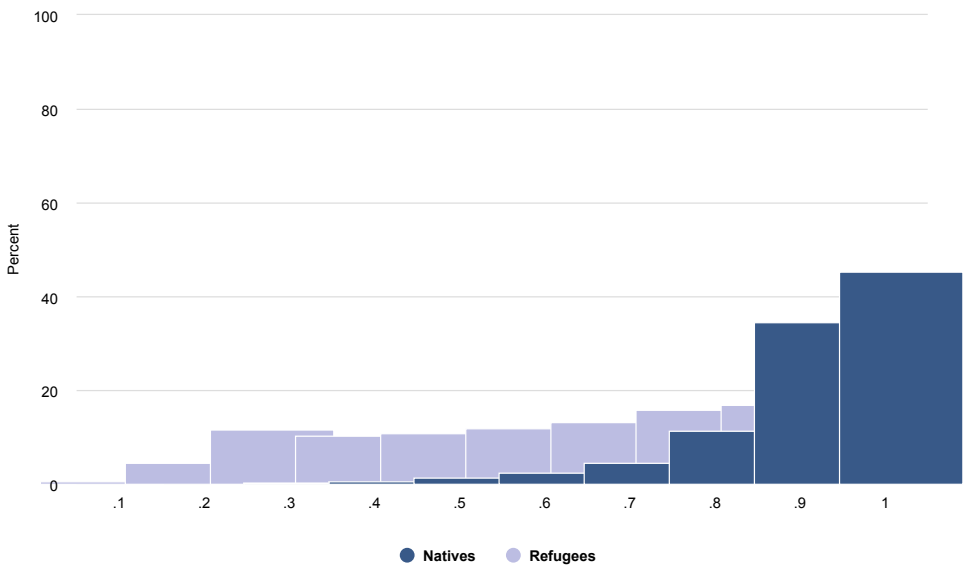
To give an example from Sweden, consider the case of natives and refugee immigrants.[114] Using the detailed coordinate information in the GeoSweden database, Bratu et al. (2021) construct individualized neighborhoods based on a k-nearest neighbor approach (see Östh 2014). An advantage of that approach for defining neighborhoods is that it is as a good representation of the actual urban context surrounding each individual, since it locates the individual at the center of his or her own neighborhoods. Another important advantage is that this approach offers a useful way of performing the analysis at a very small scale. Using this approach for the k=100 nearest neighbors on data from 2014, Bratu et al. (2021) find that individuals born in Sweden and individuals that have arrived in Sweden as refugees live in very different (small-scale) neighborhoods in terms of ethnic and socio-economic composition (c.f. Figure 2 a–d). Not only are refugees much less likely to live close to natives, they also consistently live in neighborhoods with a smaller share of high-income earners, a smaller share of highly educated individuals, and a disproportionately larger share of individuals who receive welfare benefits.[115] The majority of natives live in neighborhoods where around 90 percent of residents are natives, while only around 20 percent of immigrants live in neighborhoods dominated

114. The reason for using refugee immigrants is that this is the definition used by the research the discussion in this section is based on. Using all immigrants to Sweden, without conditioning on their reason for immigration, yields a pattern that is similar to the ones in Figure 2 a–d.
115. Bratu et al. (2021) examine the effects of age at arrival on residential integration in adulthood.

by immigrants.

As discussed by Dahlberg and Valeyatheepillay (2021)[116], small-scale residential integration is important for a couple of related reasons. First, the composition of individuals in the immigrant's immediate neighborhood matter for the generation of social interactions, the formation of networks, and the transmission of information and knowledge about such things as the housing- and labor markets, all of which might be beneficial for the immigrant's future outcomes. Second, the neighborhood composition matters for the generation of trust. Based on contact theory (Allport 1954), arguments have been raised in the literature that inter-group contact in small geographic areas will increase trust, and the level of social capital in a local geographic area is important for different forms of integration.

Figure 2a Share of natives



116. For further references on the topic in this section, see Dahlberg and Valeyatheepillay (2021).

Figure 2b Share of high educated

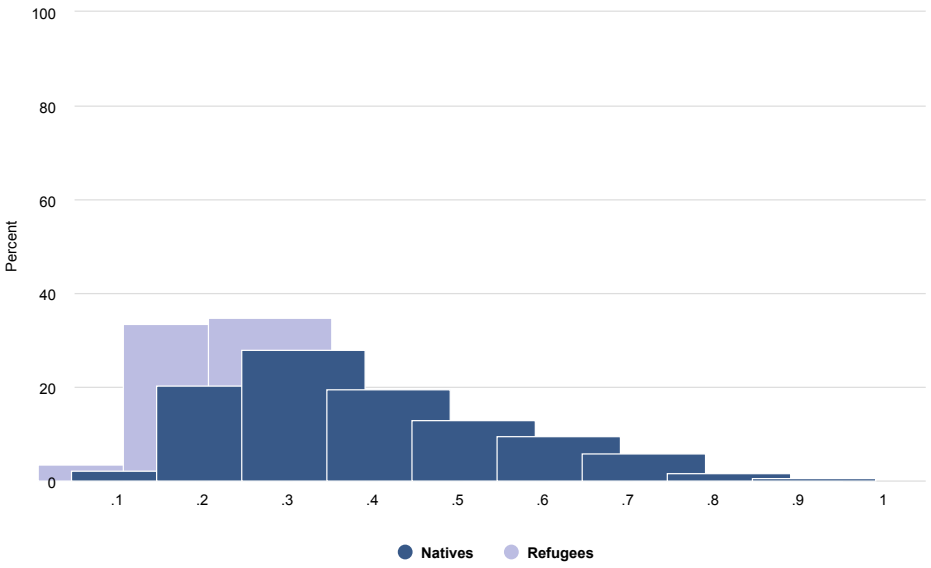


Figure 2c Share of high earners

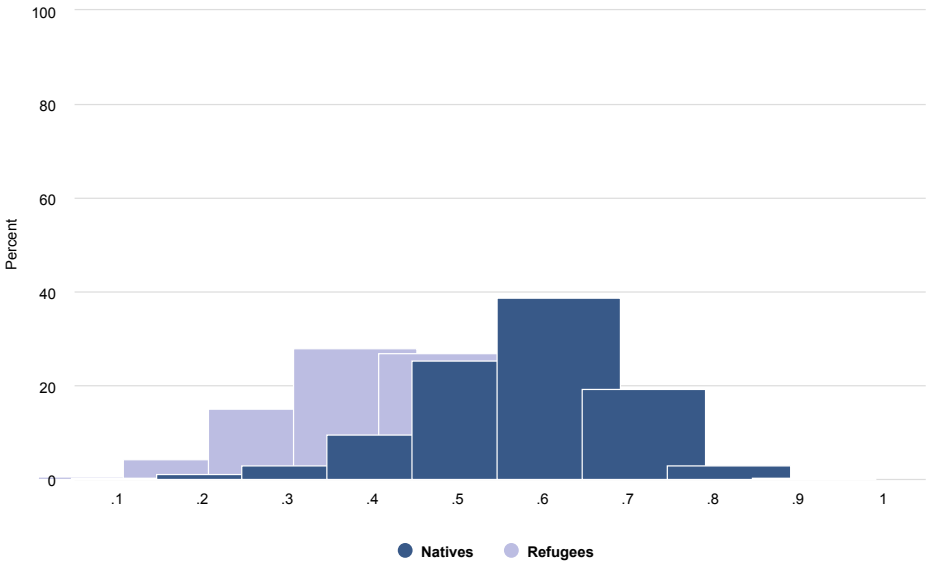
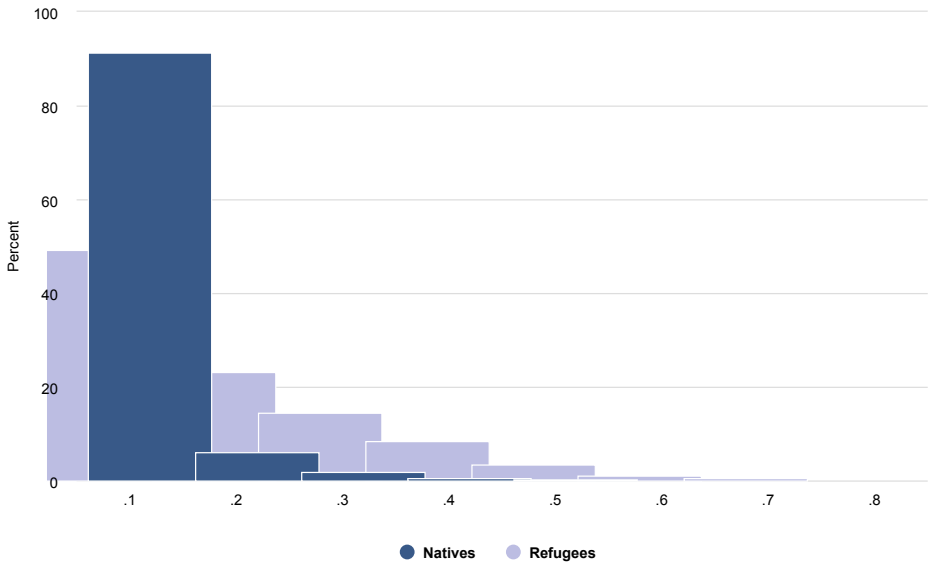


Figure 2d Share on welfare



Note: The figures show the characteristics of the 100 closest neighbors (k=100) for all refugees and natives above the age of 18 who were permanent residents in Sweden in 2014. Refugees are defined based on residence permit data. Natives are individuals born in Sweden, high-educated individuals have an education level with at least some tertiary education, high-earners are defined as those with earnings above the median in the municipality, and on welfare refers to recipients of social benefits.

Source: Bratu et al. (2021, Figure 1).

One type of housing policy that has been used to combat the clustering of refugees into certain areas is so called refugee placement policies (or dispersal policies). Under such a policy, the refugees cannot chose where to locate. Using the Swedish refugee placement policy in 1990 and 1991 and arguing that the policy amounts to an exogenous treatment of refugees with neighbors possessing different characteristics, Dahlberg and Valeyatheepillay (2021) examine the effects of refugees' initial neighborhood characteristics on future residential integration and labor market outcomes by applying the *k*-nearest neighbor approach. Their results indicate that the higher the quality of the initial neighborhood (defined, on the one hand, separately by share of natives, share highly educated, and share of employed, and, on the other hand, on a neighborhood quality index constructed from the three individual variables), the higher is the future neighborhood quality of the refugees (up to one decade after arrival). They find weak indications that the quality of the neighborhood affects earnings positively. These results indicate that a placement policy might play an important role if policy makers care about small-scale residential integration.

To shed further light on the importance of geographic scale, it can be noted that Dahlberg et al. (2021) not only find that politicians live in neighborhoods with more

socio-economically advantaged people, but they also find that the more narrowly they define the neighborhood in terms of the number of nearest neighbors, the stronger this pattern becomes. As pointed out by Eerola, this pattern has important ramifications for the political representation in the neighborhoods of people eligible for social housing.

3 On the political economy of housing policies

One feature not brought up by Eerola when discussing housing policies is the potential political economy aspect. Since social or non-profit housing often comes in the form of multi-family apartment buildings, this form of policy is potentially extra vulnerable to political considerations in its provision. As discussed by Dahlberg et al. (2021), there are a couple of reasons for this. The first is related to the discretion of local politicians in its provision. Local politicians make important decisions about local development and land use. They decide both on which type of buildings to construct (like schools, affordable housing, and cultural and sports facilities) and where they shall be geographically located.

The second is related to the nature of the local public service. Although social housing is a service that benefits the municipality at large, it can have (perceived) negative effects on the inhabitants in the neighborhoods directly affected by the construction (e.g., perceived threats to property values, a deterioration of the local environment from large buildings, and anti-poor sentiments or racial prejudice). Even though most people agree on the value in supplying social housing, resistance from affected neighborhoods makes their exact placement a controversial decision. The closer to a person's home the proposed construction is, the greater the opposition (see for example Tighe 2010). These two things imply that politicians may consider other things than just efficiency and equity when deciding on where to locate these services.

Using detailed population-wide data on the location of local politicians' homes in combination with neighborhood-level data on building permits decided on by the politicians, Dahlberg et al. (2021) analyze whether having politicians in a neighborhood reduces the likelihood that multifamily homes are placed there. Comparing home neighborhoods for politicians with different degrees of political power (ruling majority or opposition) and where power was won in close elections (i.e., elections in which the ruling majority 'barely won' and the opposition 'barely' lost), they find that fewer building permits for multifamily homes are approved in neighborhoods in which more politicians from the local majority party live compared to neighborhoods in which more politicians from the local opposition live. These results indicate that we do not get an optimal allocation of housing for socially vulnerable individuals.

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