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Housing prices during the COVID-19 pandemic: insights from Sweden

Ceny mieszkań podczas pandemii COVID-19: spostrzeżenia ze Szwecji

Keywords:
COVID-19, housing preferences, house prices, macro-prudential policy, pandemic, Sweden

Abstract: The COVID-19 pandemic triggered a major global economic recession, to which policymakers around the world responded with massive fiscal and monetary support. While housing prices generally fall during economic downturns, they have risen during the pandemic in all OECD countries. A number of factors may have contributed, including expansionary monetary policy, the lifting of some macro-prudential constraints and a shift in housing preferences. This paper uses monthly data to examine the behaviour of real house and flat prices during the pandemic in Sweden, at the national level and in the three biggest cities. While a model containing usual determinants of housing prices tracked price developments well before the pandemic, it underestimates house prices and generally overestimates flat prices in the pandemic period. This suggests a preference shift from flats towards houses, which is consistent with findings from the recent literature on other countries. The introduction of mortgage amortisation requirements in 2016 and 2018 is estimated to have lowered housing prices. However, their lifting during the pandemic seems to have had a relatively minor effect on housing prices.

Słowa kluczowe:
COVID-19, preferencje mieszkaniowe, ceny domów, polityka makroostrożnościowa, pandemia, Szwecja

Streszczenie: Pandemia COVID-19 wywołała poważną globalną recesję gospodarczą, na którą decydenci na całym świecie zareagowali, udzielając ogromnego wsparcia fiskalnego i monetarnego. Podczas gdy ceny mieszkań zazwyczaj spadają w okresach spowolnienia gospodarczego, w czasie pandemii wzrosły we wszystkich krajach OECD. Przyczyniło się do tego wiele czynników, w tym ekspansywna polityka pieniężna, zniesienie niektórych ograniczeń makroostrożnościowych oraz zmiana preferencji mieszkaniowych. W niniejszym opracowaniu wykorzystano dane miesięczne do zbadania zachowania rzeczywistych cen domów i mieszkań w czasie pandemii w Szwecji, na poziomie krajowym i w trzech największych miastach. Podczas gdy model zawierający typowe determinanty cen mieszkań śledzi zmiany cen na długo przed pandemią, to w okresie pandemii zaniża on ceny domów i generalnie zawyża ceny mieszkań. Sugeruje to przesunięcie preferencji z mieszkań w kierunku domów, co jest zgodne z ustaleniami z najnowszej literatury dotyczącej innych krajów. Szacuje się, że wprowadzenie wymogów dotyczących amortyzacji kredytów hipotecznych w latach 2016 i 2018 obniżyło ceny mieszkań. Wydaje się jednak, że ich zniesienie w czasie pandemii miało stosunkowo niewielki wpływ na ceny mieszkań.

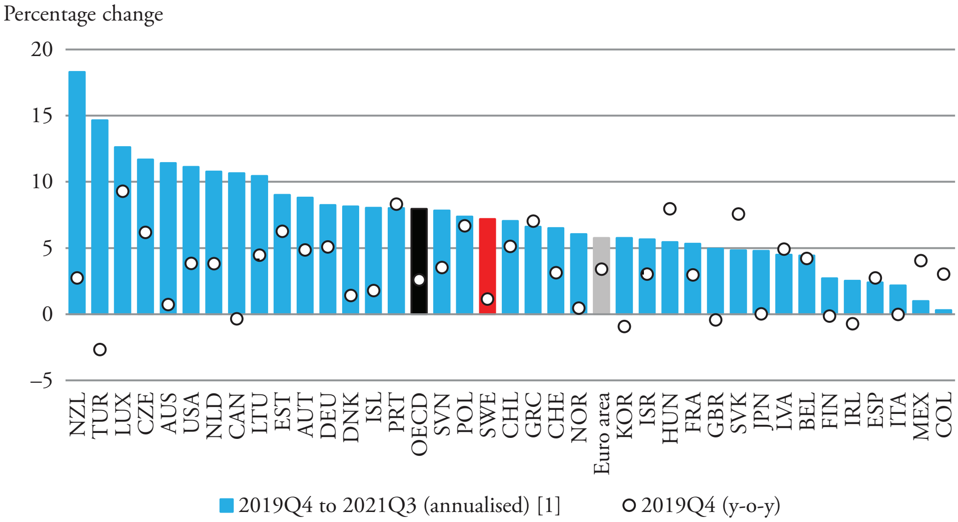
JEL:
R21, R31, G18

Introduction

The exogenous nature of the COVID-19 crisis and the size of the policy response that followed make their long-term repercussions on the economy difficult to foresee. The long-term impact of the pandemic on housing prices is also difficult to predict. When the disease started spreading around the world, many observers feared housing prices would fall, in line with developments following most past economic recessions. However, the pandemic affects housing prices in many different and opposite ways, leaving the direction of their evolution an empirical question. On the one hand, falls in GDP and household real disposable income should lower housing prices. Nevertheless, this effect may be limited if the loss of income is perceived as temporary and, at least in some countries and for some categories of workers, government transfers largely compensate labour income losses. On the other hand, monetary policy easing and the lifting of some macro-prudential constraints may support housing prices. Furthermore, physical distancing and confinement measures, and the expansion of teleworking, seem to have increased demand for space, representing a shift in preferences towards housing or specific types of dwellings. Recent research has identified such a shift in other countries. In the United States, housing demand has moved towards lower density areas (Liu and Su, 2021; Ramani, Bloom, 2021). A similar shift has been identified in Italy (Guglielminetti et al., 2021).

In all OECD countries, real housing prices have risen since the beginning of the pandemic. On average, they have increased at an annual rate of 8% (Figure 1). In all the countries experiencing above-average growth except Portugal, prices have risen at a faster pace since the start of the pandemic than before. Sweden, like the other Scandinavian countries, has seen a marked acceleration in housing prices. Only a few countries, mainly from Latin America and Central and Eastern Europe have witnessed a slowdown in housing price increases.

Figure 1 Real housing prices in OECD countries



Note: 2021Q2 for CHL and NZL.
Source: OECD, House price database.

Against this background, this paper examines house and flat price developments during the COVID-19 pandemic in Sweden. It also assesses how policy responses, and particularly the temporary lifting of the mortgage amortisation requirement, may have affected these developments. Simple growth equations for nationwide average house, flat and all dwelling prices are estimated. Looking at different types of dwellings is particularly relevant in the context of the COVID-19 crisis, which seems to have affected demand for houses and flats in a different way. The model incorporates demand, supply and policy variables and is estimated on monthly data from 2014. The data used have the advantage of being timely and to include a breakdown by location and type of dwelling, which are important features for understanding and closely monitoring market developments during the pandemic. A drawback is that the sample is relatively short. This prevents longer-term analysis, including assessing equilibrium price levels and over/undervaluation. However, recent literature has already examined this issue using error-correction models. As described below, these models suggest housing prices were roughly in line with fundamentals at the beginning of the pandemic. Hence, to examine the impact of the latter, using short-term dynamic models seems appropriate. Furthermore, dynamic simulations using those models since 2014 track the data very well, with in particular very small differences between actual and estimated values at the start of the crisis.

The main findings of this paper are as follows:

- A model incorporating lags of the dependent variable, changes in GDP and the nominal mortgage rate, a supply indicator and the amortisation requirement tracks house and flat price developments well before the pandemic.
- In December 2021, the level of house prices was about 7% higher than predicted by the model, while the price of flats stood around 4% below the model's prediction. A fall in the number of houses put on sale during the pandemic contributed to support house prices. Conversely, the supply of flats remained relatively steady over the same period. These results suggest a shift in preferences towards houses since the beginning of the pandemic.
- Estimates for the three main cities, Stockholm, Gothenburg and Malmö, are in line with the national-level estimates. House prices in December 2021 range from about 6% higher than model projections in Gothenburg to close to 9% in Malmö, while flat prices are slightly above fitted values in Stockholm and around 4% to 6% below in Malmö and Gothenburg, respectively.
- A mortgage amortisation requirement introduced in June 2016 imposes amortisation of 1% and 2% of the loan per year for new mortgages with loan-to-value ratios above 50% and 70% respectively. From March 2018, households borrowing over 450% of their gross income are required to amortise an additional 1%. This is estimated to have lowered dwelling, house and flat price levels by respectively about 4%, 2.5% and 8% before the amortisation requirement was lifted due to the pandemic in April 2020.
- The lifting of the amortisation requirement is estimated to have had a limited impact on house prices. The model estimates a larger impact on the fundamental price level of flats, but actual prices have not adjusted to this level, either because the shift of preferences towards houses has reduced the demand for flats, or because flat buyers did not take advantage of the easing of the amortisation requirement, as it was temporary.
- Forecasts assuming GDP grows in line with December 2021 OECD projections and mortgage rates remain constant suggest flat prices could rise by close to 15%, while house prices could fall by around 7% by December 2023 if the shift in preferences towards houses since the beginning of the pandemic proves temporary, which remains very uncertain.

Data

The data run from 2014M1 to 2021M6 (Figure 2). Nominal dwelling, house and flat prices are measured by the HOX indices from Valueguard, a financial information service company that computes quality-adjusted housing price indices based on sales transaction data from real estate brokers (https://valueguard.se/indexes). Housing prices have been seasonally adjusted and deflated by the consumer price index with constant mortgage rate, the CPIF (also seasonally-adjusted). Regarding demand drivers, GDP is Statistics Sweden's new monthly indicator and the mortgage rate is the rate for new and renegotiated agreements from monetary financial institutions (MFI), mortgage credit companies and alternative investment funds (AIF), for up to three months (floating rate). The supply variable is the supply indicator from Hemnet, an on-line housing marketplace (https://www.hemnet.se/statistik), which has been adjusted for seasonality. The variable measures the total number of flats and houses that were active on Hemnet during the period. The Hemnet indicator is used despite being potentially endogenous, as its variations explain housing price dynamics much better than alternative measures based on housing stock or completion data that have been tried. The sign of its coefficient is negative, suggesting that reverse causality is not dominant. Indeed, while housing prices affect construction, their impact on short-term dynamics is likely to be limited given the time required to build new dwellings. The impact of households' decisions to sell existing homes could be more important. However, potential sellers' responses to housing prices tend to be asymmetric, as households generally show loss aversion (Tversky, Kahneman, 1991; Engelhardt, 2003). As the sample covered in the current paper does not include large falls in prices, the impact of sellers' behaviour is likely to be limited.

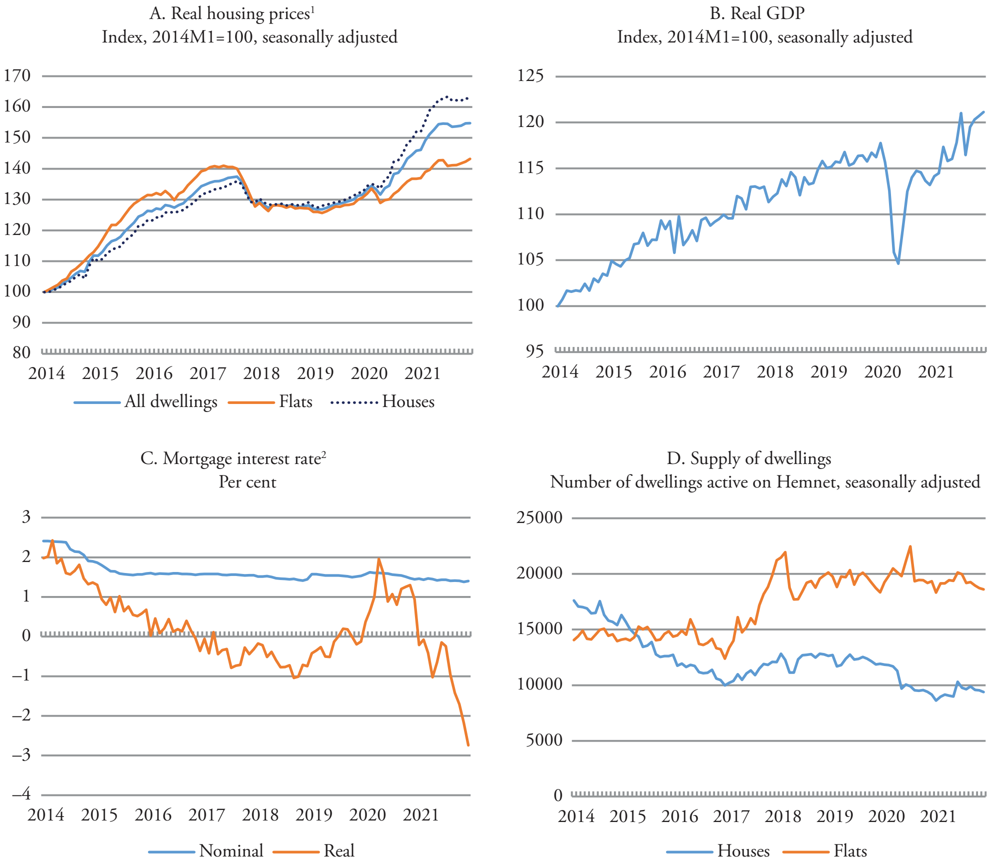
The Hemnet series start in 2014M1, which limits the estimation period. Indicator variables account for policy changes regarding the amortisation of mortgages.

1. Housing prices are deflated using the CPI with fixed mortgage rate (CPIF).
2. Mortgage rate for new and renegotiated agreements from monetary financial institutions (MFI), mortgage credit companies and alternative investment funds (AIF), for up to three months (floating rate). The real mortgage rate is computed by subtracting the year-on-year percentage change in the CPIF from the nominal rate.

Housing price and supply series are also available for the three main cities, Stockholm, Gothenburg and Malmö. They are used to estimate equations at the city level. In these regressions, national series are used for the mortgage rate and GDP, as a regional decomposition on a timely basis is not available.

Most series contain a unit root, but are stationary in first differences (Annex 1). Given that the sample is too short to estimate meaningful co-integration relationships and that the focus is on short-term dynamics, especially during the COVID19-crisis, a model in log-differences is estimated.

Figure 2 Recent developments in national housing prices and their main determinants in Sweden



Sources: Valueguard, Statistics Sweden and Hemnet.

Model

The model relates real dwelling, house and flat prices to standard determinants, capturing income, financing conditions and supply. It is written as follows:

$$\Delta logRHP^{i}_{t} = a_0 + \gamma(L)\ \Delta logRHP^{i}_{t} + a_1\ \Delta logGDP_{t} + a_2\ \Delta NMR_{t} + a_3(logSUPPLY^{i}_{t} - logSUPPLY^{i}_{t-4}) + a_4\ \Delta AMORT1 + a_4\ \Delta AMORT2 + \varepsilon_{t}$$

With i = houses, flats, dwellings (houses + flats). γ(L) is a lag polynomial, RHP is real housing prices, NMR is the nominal mortgage rate, SUPPLY is the Hemnet indicator of housing supply. AMORT1 is a dummy variable that takes the value of one from the introduction of the mortgage amortisation requirement in June 2016 until March 2020. It takes the value of zero from April 2020 to August 2021, as the amortisation requirement was lifted during this period, as a result of the COVID-19 pandemic. It reverts to one from September 2021, when the amortisation requirement was reinstated. AMORT2 takes the value of one from September 2017 to March 2020, zero from April 2020 to August 2021, and one from September 2021 onwards. It represents the tightening of the amortisation requirement for borrowers with a high debt-to-income ratio from March 2018. Anecdotal evidence and price developments suggest the tightening was widely anticipated by banks and applied already in late 2017. On this basis and that of statistical significance of the coefficient, it was decided to set the variable to one from September 2017. ε is a zero-mean random error, assumed to be normally independently distributed.

The number of lags of the dependent variable is set to six. Although standard criteria like Akaike, Schwarz and Hannan-Quinn would suggest shorter lags in most cases, models with six lags are used because they track housing price dynamics better in some parts of the sample. Monthly GDP is used rather than household disposable income, which is only available at a quarterly frequency.

The nominal mortgage rate fits the data better than the real mortgage rate, which proves statistically insignificant. This is consistent with the literature, which suggests that given that higher nominal rates imply a frontloading of repayments, they tend to act as a borrowing constraint, which may add to the impact of real mortgage rates on housing prices (Meen, 2008). Increases in supply over the past four months are used, as they are stronger predictors of housing prices than monthly changes, which are often volatile.

Estimation results

All equations are estimated over the pre-pandemic period, 2014M5 to 2020M1. The estimation results are displayed in Table 1. The fit for dwelling and flat prices is relatively good, but is somewhat weaker for house prices. The positive constant term implies an exogenous growth trend in the price levels, which could reflect slow-moving variables not included in the model, such as demographic trends or changes in amenities not fully captured by the quality adjustment. In the national level equations, the coefficients of GDP, mortgage rate and supply have the expected sign, are statistically significant at least at the 10% level and are of plausible economic magnitude. The amortisation requirement lowers dwelling prices, but is only statistically significant for flats, which likely reflects higher leverage among flat purchasers, who are generally younger than house buyers.

Results at the city level are broadly similar to national-level estimates, with coefficients of broadly similar magnitudes, even though they tend to be less precisely estimated and in many cases, especially for houses, are not statistically significant. Three coefficients, GDP and mortgage rate for flats in Malmö and the first amortisation requirement for houses in Malmö, have a sign opposite to expectations, but are statistically insignificant.

Diagnostic tests are broadly satisfactory, even though a few equations display some signs of heteroskedasticity, autocorrelation (according to the Breusch-Godfrey test, but not to the Ljung-Box Q test) or non-normality, which is not surprising given the relatively small size of the sample.

Next, dynamic simulations are performed, separately for house and flat prices and the contributions of each explanatory variable are computed (Figures 3 and 4). The results for the aggregate house and flat prices are displayed in Annex 2. The first observation is that the dynamic simulations track the actual prices very well. Residuals during the pre-pandemic period are fairly small. Some overshooting is present in early 2017, which may be related to transactions brought forward in anticipation of the introduction of the amortisation requirement. Flat and especially house prices tend to undershoot in the wake of the latter, albeit not by a large amount. At the start of the pandemic, actual and fitted values are very close, both for flats and houses. Hence the model provides a sound basis for assessing the impact of the COVID-19 crisis.

GDP growth and declining mortgage rates contributed significantly to real house and flat price increases over the estimation (pre-pandemic) period. A decline in the supply of houses also contributed to price increases, while the rise in the supply of flats damped flat price increases from mid-2017. The amortisation requirements introduced in 2016 and 2018 also pulled down flat prices, more than house prices, as discussed further below.

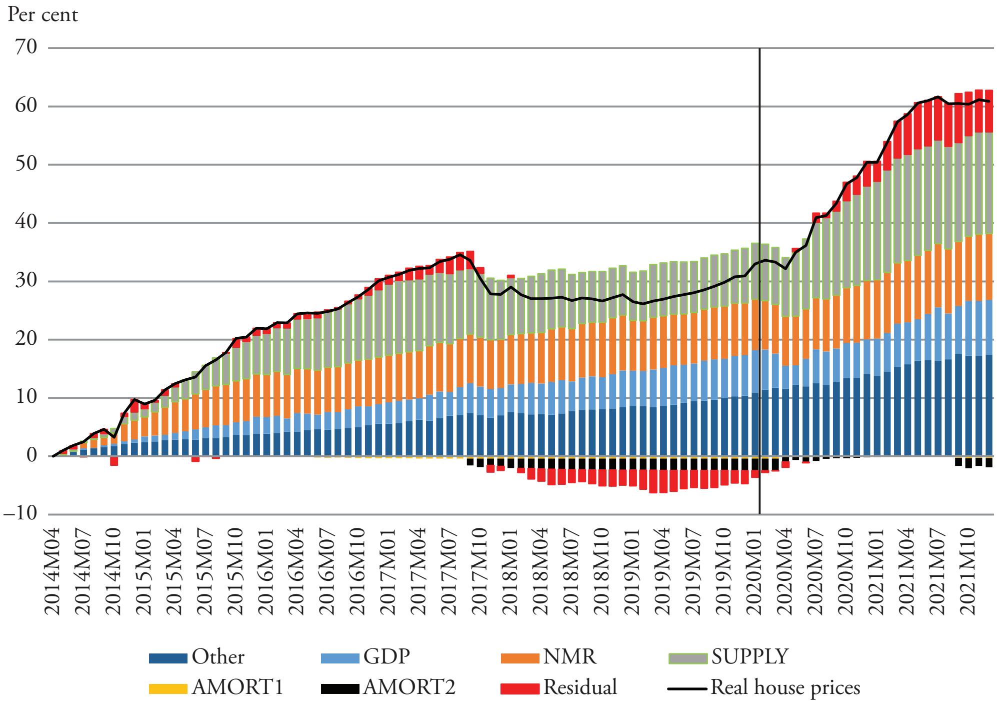
Over the pandemic period, GDP initially fell and weighed on house and flat prices, but rebounded rapidly. A reduction in the supply of houses pushed their prices up. The impact of the fall in the supply of houses during the pandemic was especially large in Stockholm (see Annex 3 for city-level price increases and contributions). Meanwhile, the contribution of the supply of flats remained broadly unchanged. A striking difference is the difference in the residuals of the house and flat equations during the pandemic (Table 2). In September 2021, the level of house prices was more than 8% higher than predicted by the model and the gap has only declined slightly since then. Conversely, the price of flats stood nearly 6% below the model's prediction in July 2021 and has only recovered slightly since then.

Table 1 Individual housing price equations

Dependant variable: DLOG (RHP)	Houses and flats	Houses				Flats			
	National	National	Stockholm	Gothenburg	Malmo	National	Stockholm	Gothenburg	Malmo
Constant	0.001	0.001	0.001	0.002	0.006**	0.001	0.000	0.001	0.003**
DLOG (RHP (-1))	0.300***	0.231*	0.098	–0.340**	–0.492*	0.157	0.248*	–0.263**	–0.059
DLOG (RHP (-2))	–0.258**	–0.303**	0.000	–0.108	–0.079	0.037	–0.021	0.018	0.001
DLOG (RHP (-3))	0.222*	0.275**	0.215	0.156	0.163	0.209**	0.215*	0.189*	0.070
DLOG (RHP (-4))	0.080	0.065	–0.025	0.328***	0.042	–0.135	–0.113	0.183*	0.074
DLOG (RHP (-5))	0.059	0.094	0.140	0.212*	0.027	0.118	0.148	0.314***	0.136
DLOG (RHP (-6))	0.093	0.031	0.209	0.091	–0.057	0.168*	0.105	0.137	0.262*
DLOG (GDP)	0.268***	0.241**	0.158	0.074	0.171	0.279***	0.316***	0.168*	–0.130
D (NMR)	–0.053**	–0.048*	–0.041	–0.039	–0.033	–0.075***	–0.083***	–0.113***	0.048
LOG (SUPPLY) – LOG (SUPPLY (-4))	–0.044*	–0.032*	– 0.014*	–0.012	–0.010	–0.048***	–0.027***	–0.061***	–0.064***
D (AMORTI)	–0.007	–0.002	–0.007	–0.006	0.003	–0.017**	–0.012	–0.005	–0.009
D (AMORT2)	–0.009	–0.009	–0.012	–0.013	–0.014	–0.011*	–0.018*	–0.015	–0.004
R squared	0.61	0.39	0.39	0.23	0.29	0.73	0.68	0.62	0.47
Standard error of regression	0.006	0.008	0.010	0.014	0.014	0.006	0.007	0.009	0.009
Diagnostic tests (p-values) Breusch-Pagan-Godfrey heteroskedasticity	0.247	0.083	0.218	0.720	0.161	0.103	0.001	0.284	0.945
Ljung-Box Q serial correlation (12 lags)	0.389	0.780	0.475	0.982	0.941	0.699	0.569	0.421	0.964
Breusch-Godfrey serial correlation (12 lags)	0.031	0.109	0.041	0.027	0.203	0.230	0.176	0.018	0.286
Ramsey RESET specification	0.524	0.817	0.753	0.590	0.223	0.278	0.623	0.053	0.875
Jarque-Bera normality	0.139	0.000	0.000	0.523	0.703	0.011	0.116	0.468	0.401

Note: GDP and the mortgage rate are measured at the national level in all equations. Real house prices and supply are available at the city level. *, ** and *** denote statistical significance at the 10%, 5% and 1% level respectively. The null hypothesis is homoscedasticity for the Breusch-Pagan-Godfrey test, no serial correlation for the Ljung-Box Q and Breusch-Godfrey tests, no misspecification for the Ramsey RESET test and Normality for the Jarque-Bera test.

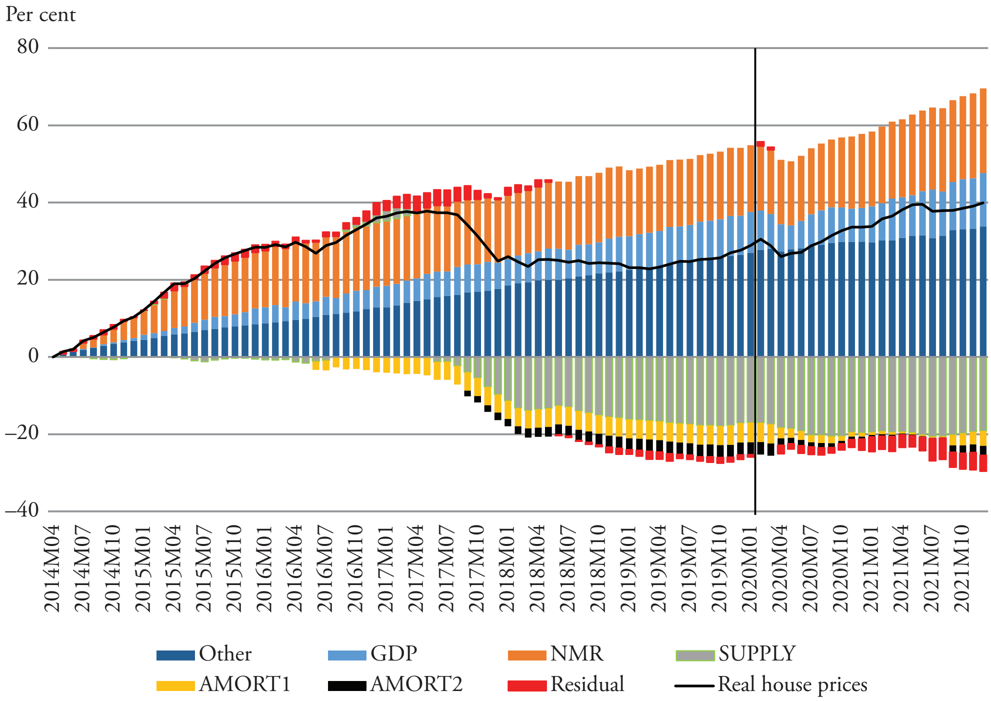
Figure 3 Cumulative national house price increases and contributions



Note: "Other" mainly reflects an upward trend. It also includes a small discrepancy between the sum of the contributions calculated through dynamic simulations and the fitted value. NMR corresponds to the nominal floating mortgage rate. AMORT1 and AMORT2 account for the mortgage amortisation requirements introduced in June 2016 and March 2018 (see text for details).

The results at the city level are consistent with the national level findings, with large positive differences between actual and fitted house prices in all cities, while flat prices are close to fitted values in Stockholm and significantly below them in Gothenburg and Malmö, as of December 2021. It is worth noting, however, that the gap between actual and fitted house prices has narrowed in Gothenburg and Malmö during the second half of 2021, while it has remained roughly unchanged in Stockholm. Whether the dynamic simulations are performed from the start of the sample or the beginning of the pandemic makes little difference, as dynamic predictions were very close to actual values in early 2020. The difference in the residuals of house and flat price models suggests a shift in preferences towards houses since the outbreak of the pandemic. Whether this shift is temporary or at least partly permanent will have implications for future price developments.

Figure 4 Cumulative national flat price increases and contributions



Note: "Other" mainly reflects an upward trend. It also includes a small discrepancy between the sum of the contributions calculated through dynamic simulations and the fitted value. NMR corresponds to the nominal floating mortgage rate. AMORT1 and AMORT2 account for the mortgage amortisation requirements introduced in June 2016 and March 2018 (see text for details).

Table 2 Deviation from fitted values over the pandemic period

	Dynamic simulations from:					
	2014M5			2020M2		
	Maximum gap	Date	2021M12	Maximum gap	Date	2021M12
Houses and flats (national)	4.4	2021M5	2.5	4.4	2021M5	2.5
Houses						
National	8.4	2021M9	7.1	8.4	2021M9	7.1
Stockholm	7.3	2021M12	7.3	7.6	2021M12	7.6
Gothenburg	10.2	2021M6	6.3	10.2	2021M6	6.3
Malmo	14.0	2021M6	8.7	14.0	2021M6	8.7
Flats						
National	–5.8	2021M7	–4.2	–5.8	2021M7	–4.2

	Dynamic simulations from:					
	2014M5			2020M2		
	Maximum gap	Date	2021M12	Maximum gap	Date	2021M12
Stockholm	–2.0	2020M4	1.6	–1.7	2021M7	1.6
Gothenburg	–6.0	2021M12	–6.0	–6.0	2021M12	–6.0
Malmo	–3.9	2020M4	–3.8	–4.7	2020M4	–3.9

Although studies examining the behaviour of Swedish housing prices during the pandemic are still scarce, some literature is relevant for the results of this paper. One important question is whether housing prices deviated from their equilibrium level at the beginning of the pandemic. If prices were undervalued at that point, subsequent increases could at least partly reflect an adjustment to equilibrium. However, Anundsen (2021) estimates that housing prices were somewhat overvalued in Sweden at the end of 2019. The Swedish central bank, using a modified version of the model of Claussen (2013), which relates housing prices to disposable income and mortgage rates, finds that the recent housing price increases cannot be explained by fundamentals (Sveriges Riksbank, 2021a), which is consistent with the results of this paper.

Amortisation requirement

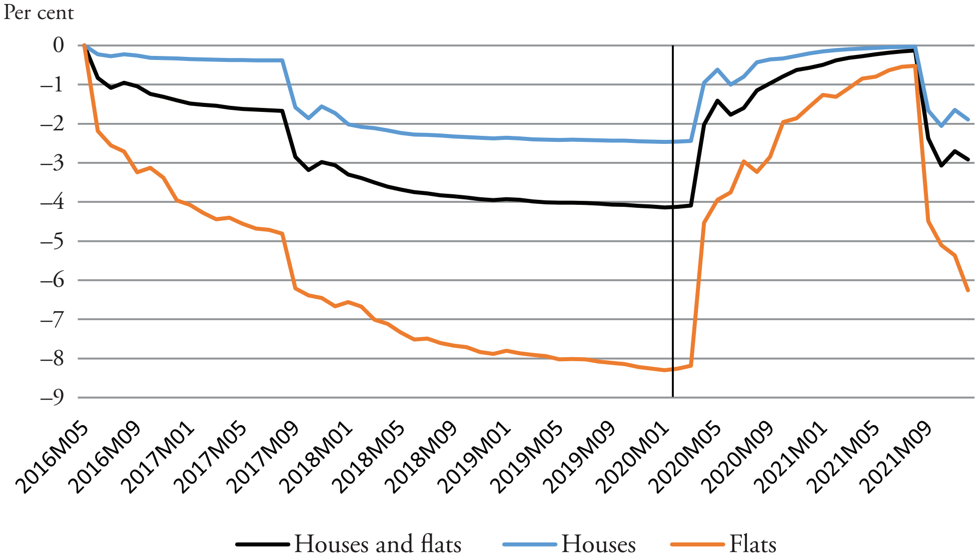
The amortisation requirement for new mortgages introduced in mid-2016 and its tightening in March 2018 are among the main macro-prudential instruments used to curb the rise in household debt in Sweden. They complement general measures like the systemic risk and counter-cyclical capital buffers and other measures targeting household debt, like the 85% cap on the loan-to-value ratio introduced in 2010 and the minimum risk-weights on mortgages, which were set at 15% in 2013 and raised to 25% from 2014.

According to the model estimates, amortisation requirements have a significant impact on flats prices, but a smaller impact on house prices (Figure 5). The substantially larger effect found for flats than for houses is consistent with a higher average loan-to-value ratio for flat purchasers than for house buyers (Finansinspektionen, 2020). The fact that the coefficient of the tightening of the amortisation requirement (AMORT2) is the highest and the most statistically significant in Stockholm is consistent with the highest share of new mortgagors with a loan-to-income ratio of more than 450% in the capital city (Andersson and Aranki, 2019). The order of magnitude of the amortisation requirement impact estimates looks plausible. Andersson and Aranki (2019), using mortgage survey data, find that new mortgagors buy dwellings that are about 3%

and 1% less expensive, due to respectively the amortisation requirement and its tightening. One should note, however, that these numbers are not strictly comparable, as they only concern the prices of dwellings bought by new mortgagors and are not estimates of the impact of the amortisation requirements on market prices. Other market participants also affect housing prices and new mortgagors may have bought different homes (e.g. size, area) than they would have without the amortisation requirements. Arena et al. (2020), using a vector autoregression model, find that the 2016 amortisation requirement lowered year-on-year housing price increases by more than five percentage points in late 2016 and early 2017, even though the result lies within the 95% confidence interval.

The re-instatement of the amortisation requirements in September 2021 may have contained housing price increases. However, their estimated effect on house prices is modest. Flat prices have risen less than predicted by the model during the pandemic. This could reflect a change in preferences, but the lifting of the amortisation requirements may also have had a weaker effect than assumed by the model, as it was temporary. If such is the case, the reinstatement of amortisation requirements is also likely to have had a weaker impact than when these measures were initially introduced.

Figure 5 Estimated impact of the amortisation requirement on price levels



Note: The impacts of the mortgage amortisation requirements are derived from the equation estimated over the pre-pandemic period. Amortisation requirements were introduced in June 2016 and March 2018 and suspended from April 2020 to August 2021 (see text for details).

Forecasts

The national level equations for houses and flats are used to forecast prices until the end of 2023. This requires setting values for the exogenous variables. Projections from the December 2021 OECD Economic Outlook for GDP in 2022 and 2023 are used (respectively 3.4% and 1.6%). Since these projections are quarterly, growth is in each month of the quarter is assumed to be a third of the quarterly growth. The mortgage rate is held constant at the value of June 2021 over the full forecast period. A relatively constant mortgage rate is plausible, as Swedish mortgage loans are predominantly at floating rates and the central bank expects the repo rate to remain at zero until mid-2024 (Sveriges Riksbank, 2022).

The supply of flats has hovered around a relatively constant level since mid-2018 (Figure 2, Panel D). Hence, in the forecasts, supply is kept constant at its December 2021 level over the whole forecast period. On the contrary, the supply of houses has fallen during the pandemic. The extent to which this is a temporary or a permanent shift is uncertain. The fact that the fall in the supply of houses is not matched by a reduction in the supply of flats suggests that obstacles to trading, like physical distancing measures, are not the main cause behind the lower supply of houses. House-owners seem to have held more to their houses during the pandemic. However, they could have only delayed planned sale. Alternatively, their preferences between flats and houses may have shifted more durably. To account for this uncertainty, two alternative scenarios are considered. In the first one, supply is held at its December 2021 level. In an alternative scenario, it is assumed that the supply goes back to its 2019 average level by the end of 2022 and remains at that level throughout 2023.

Table 3 Forecasts to end-2023

	Houses – scenario 1	Houses – scenario 2	Flats
Forecasts relative to 2021M12 fitted values			
2022M12	3.1	–1.0	5.2
2023M12	5.6	–0.1	9.8
Forecasts relative to 2021M12 actual values			
2022M12	–3.8	–7.6	9.7
2023M12	–1.4	–6.7	14.6

Note: Scenario 1 holds the supply of houses at its December 2021 level. Scenario 2 assumes that supply reverts to its 2019 average level by the end of 2022 and remains at that level throughout 2023. For flats, supply is assumed to remain at its December 2021 level until end-2023.

The re-instatement of the mortgage amortisation requirement from September 2021 is also taken into account. The model points to continued increases in flat prices, but suggests house prices may fall, especially if supply reverts to pre-pandemic levels (Table 3). The main uncertainty, however, relates to whether the shift in preferences towards houses observed during the pandemic is reversed. This would imply that actual values would likely converge back to the model estimates. In that case, house prices could fall by around 7% by end-2022 and recover only marginally in 2023. It is also necessary to keep in mind that those forecasts are conditional on projected developments in GDP and interest rates. If the economic recovery proved weaker than expected, for example due to geopolitical events, or if inflation pushed interest rates up, there would likely be a negative impact on housing prices.

Robustness checks

Two types of robustness checks are performed. First, alternative specifications of the individual equations are estimated at the national level. Second, given that the sample is relatively small and that a number of coefficients are not statistically significant in the city-level equations, panel estimates are introduced.

Individual equations

The model is estimated with three lags of the dependent variable instead of six. Then, the change in the spread between the mortgage rate and the money market rate is added to the baseline model, as a proxy for the change in the stringency of mortgage lending conditions. The variable is significant at the 5% level for all three housing price series. The results obtained with the alternative specifications do not differ much from those of the baseline model. Table 4 shows that the deviations between actual prices and the estimates obtained through dynamic simulations of the different models are close.

Table 4 Difference between actual housing prices and model predictions – alternative specifications

	Baseline model 2021M12	3 lags of the endogenous variable	Mortgage spread
Houses and Flats	2.5	3.7	3.4
Houses	7.1	8.0	7.4
Flats	–4.2	–3.8	–3.5

Note: Dynamic simulations from 2020M2.

Panel equations

The prices of houses and flats in the three main cities are now pooled. Wald tests indicate that imposing the equality of the coefficients on GDP and the amortisation requirement across cities and types of dwellings is consistent with the data. For the mortgage rate, the equality restriction is narrowly rejected at the 5% level. However, this is exclusively due to the coefficient of flats in Malmö, which is positive and hence inconsistent with economic theory. Hence, the restriction of a single coefficient for the mortgage rate across all cities is imposed. Supply variables are specific to each city and type of dwellings. Two specifications are estimated, one where the same dynamics are imposed for all cross-sections and one where specific coefficients on the lags of the dependent variable are allowed for each city and type of dwellings. The coefficients of GDP, the mortgage rate and the second amortisation requirement are statistically significant at the 5% level. Supply variables are always significant for flats, but only so in Stockholm for houses (Table 5). Overall, the results are consistent with those of the individual equations.

Table 5 Panel estimates

Dependant variable: DLOG (RHP)	Same dynamics	Own dynamics
DLOG (GDP)	0.109**	0.124**
D (NMR)	–0.049***	–0.044***
LOG(SUPPLY)–LOG(SUPPLY(–4)) – Houses Stockholm	–0.016**	–0.014*
LOG(SUPPLY)–LOG(SUPPLY(–4)) – Houses Gothenburg	–0.010	–0.012
LOG(SUPPLY)–LOG(SUPPLY(–4)) – Houses Malmo	–0.007	–0.009
LOG(SUPPLY)–LOG(SUPPLY(–4)) – Flats Stockholm	–0.039***	–0.025**
LOG(SUPPLY)–LOG(SUPPLY(–4)) – Flats Gothenburg	–0.054***	–0.060***
LOG(SUPPLY)–LOG(SUPPLY(–4)) – Flats Malmo	–0.056***	–0.055***
D (AMORTl)	–0.009*	–0.006
D (AMORT2)	–0.014***	–0.013***
R squared	0.31	0.39
Standard error of regression	0.011	0.011

Note: GDP and the mortgage rate are measured at the national level. The model includes city fixed effects and lags of the dependent variable. In the "same dynamics" model, the coefficients on the lagged dependant variable are unique. In the "own dynamics"model, they are allowed to vary across cities. *,** and *** denote statistical significance at the 10%, 5% and 1% level respectively.

The differences between actual housing prices and panel estimates are also broadly in line with the results from the individual equations (Table 6).

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Table 6 Difference between actual housing prices and panel model predictions in 2021M12

	Dynamic simulations from:					
	2014M5			2020M2		
	Same dynamics	Own dynamics	Memo item: individual equations	Same dynamics	Own dynamics	Memo item: individual equations
Houses Stockholm	9.3	7.0	7.3	9.4	7.4	7.6
Gothenburg	6.2	6.6	6.3	6.1	6.6	6.3
Malmó	5.5	8.7	8.7	5.6	8.7	8.7
Flats Stockholm	0.5	0.8	1.6	0.5	0.8	1.6
Gothenburg	–8.2	–6.7	–6.0	–8.3	–7.0	–6.0
Malmó	–2.7	–1.8	–3.8	–2.7	–1.8	–3.9

Conclusion

As in most other OECD countries, housing prices in Sweden have risen sharply during the COVID-19 pandemic, despite the economic headwinds. A short-term model based on monthly data shows that flat prices have tended to increase less than expected, but that house prices have risen much more. This holds at the national level, as well as in the three main cities and suggests a preference shift towards houses, which looks consistent with a search for space and dwellings located in lower-density areas during the pandemic. Whether this change proves permanent, at least to some extent, will shape the future of Swedish house prices. Policies have essentially supported the housing market by reviving GDP growth and allowing mortgage rates to remain low through interventions to stabilise financial markets. The lifting of the mortgage amortisation requirement provided liquidity to many households, but seems to have had a relatively minor effect on housing prices, in part because it was temporary. Its reinstatement from September 2021 may have moderated house price increases, but the evolution of housing preferences, the interest rate path, the strength of the economic recovery and the supply of dwellings are likely to be the main drivers of housing prices in the coming years.

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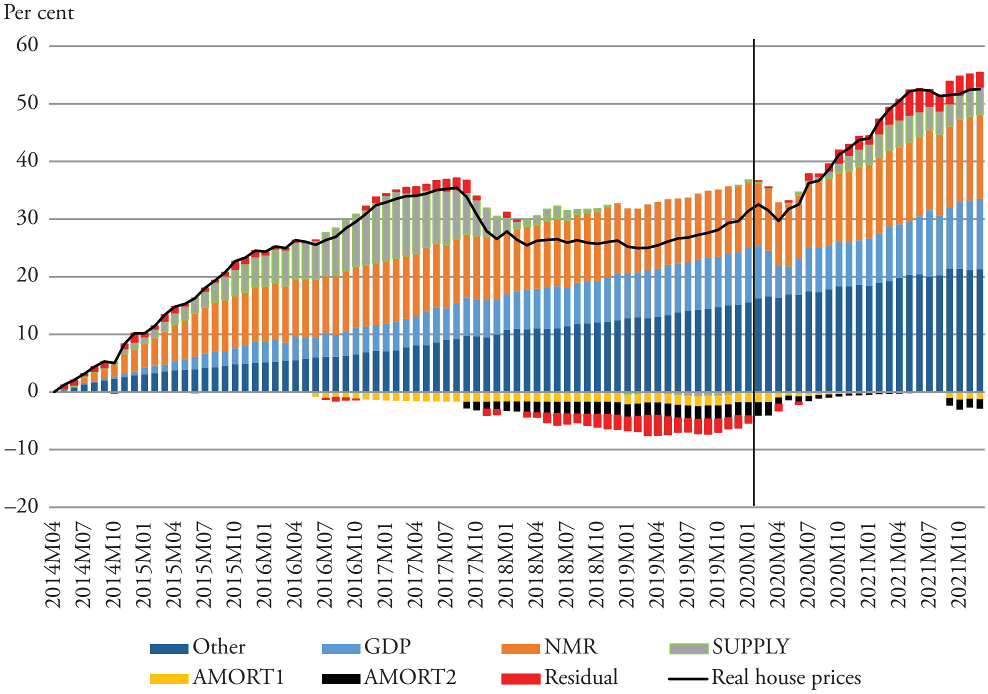
Annex 1 Unit root tests

Variable	Level		First-difference	
	ADF p-value	PP p-value	ADF p-value	PP p-value
Real housing prices All (houses + flats)	0.28	0.30	0.00	0.00
Flats	0.07	0.06	0.00	0.00
Flats Gothenburg	0.04	0.01	0.00	0.00
Flats Malmó	0.52	0.53	0.00	0.00
Flats Stockholm	0.11	0.09	0.00	0.00
Houses	0.53	0.61	0.00	0.00
Houses Gothenburg	0.25	0.23	0.00	0.00
Houses Malmó	0.86	0.82	0.00	0.00
Houses Stockholm	0.50	0.58	0.03	0.00
Supply All (houses + flats)	0.20	0.25	0.00	0.00
Flats	0.45	0.49	0.00	0.00
Flats Gothenburg	0.21	0.24	0.00	0.00
Flats Malmó	0.23	0.19	0.00	0.00
Flats Stockholm	0.02	0.03	0.00	0.00
Houses	0.35	0.37	0.00	0.00
Houses Gothenburg	0.01	0.01	0.00	0.00
Houses Malmó	0.15	0.27	0.00	0.00
Houses Stockholm	0.02	0.02	0.00	0.00
Real GDP	0.44	0.60	0.00	0.00
Nominal mortgage rate	0.00	0.00	0.00	0.00

Note: All variables are in logarithms except the nominal mortgage rate. ADF and PP stand respectively for Augmented Dickey-Fuller and Phillips-Perron tests. A constant is included. In the ADF test, the number of lags is selected according to the Schwartz information criterion. The PP test uses Bartlett kernel estimation and Newey-West bandwidth selection. The sample is 2014M1-2021M12.

Annex 2 Aggregate house and flat price developments

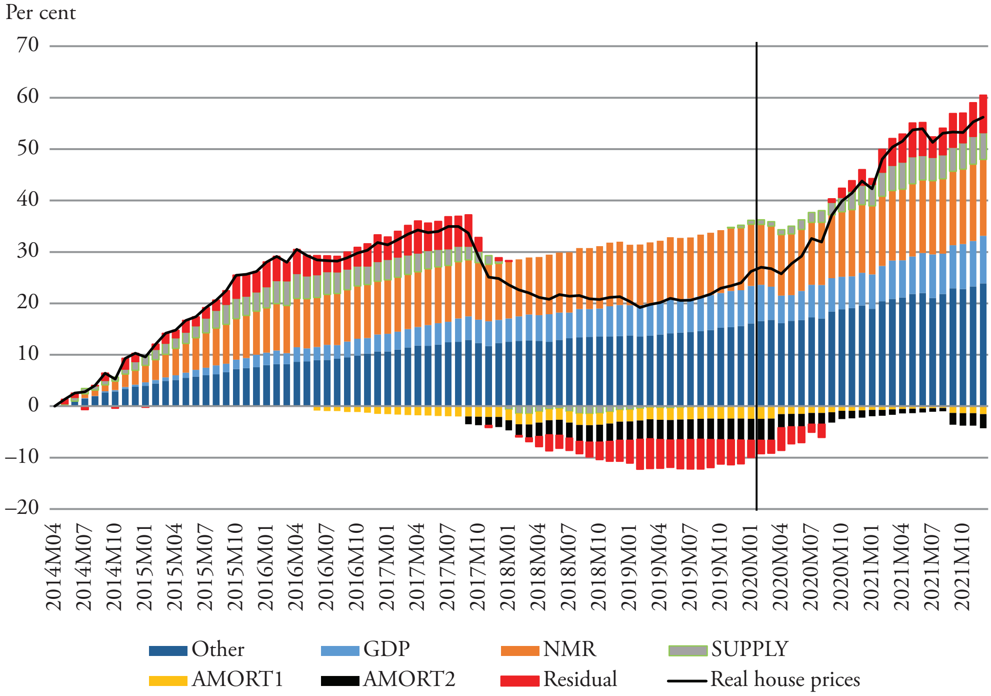
Figure A2.1 Cumulative national house and flat price increases and contributions



Note: "Other" mainly reflects an upward trend. It also includes a small discrepancy between the sum of the contributions calculated through dynamic simulations and the fitted value. NMR corresponds to the nominal floating mortgage rate. AMORT1 and AMORT2 account for the mortgage amortisation requirements introduced in June 2016 and March 2018 (see text for details).

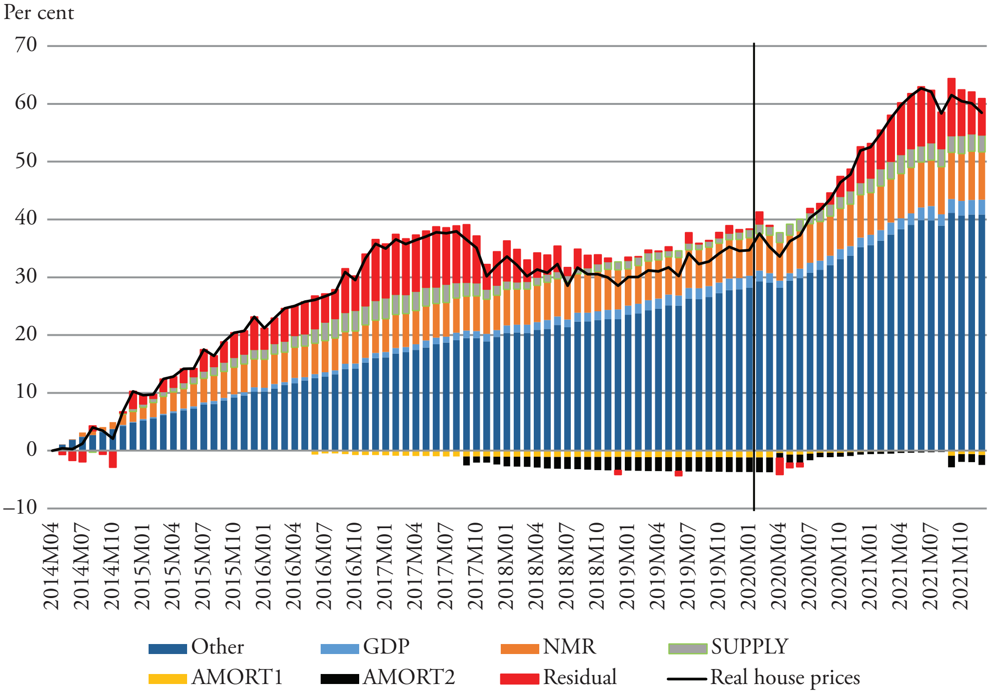
Annex 3 Housing price developments at the city level

Figure A3.1 Cumulative Stockholm house price increases and contributions



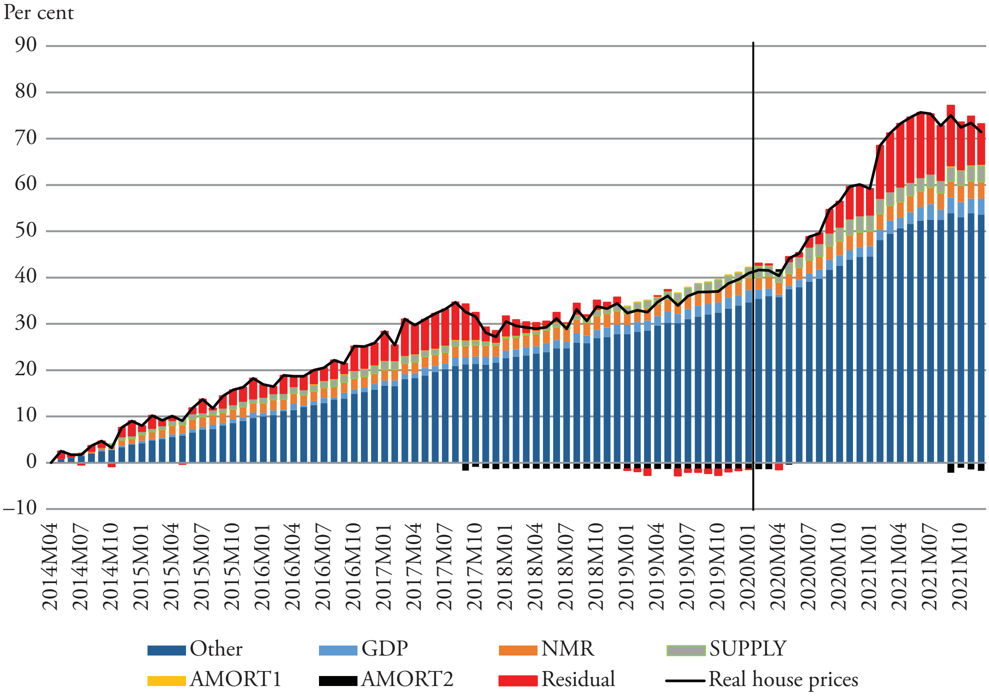
Note: "Other" mainly reflects an upward trend. It also includes a small discrepancy between the sum of the contributions calculated through dynamic simulations and the fitted value. GDP refers to the national aggregate. NMR corresponds to the nominal floating mortgage rate. AMORT1 and AMORT2 account for the mortgage amortisation requirements introduced in June 2016 and March 2018 (see text for details).

Figure A3.2 Cumulative Gothenburg house price increases and contributions



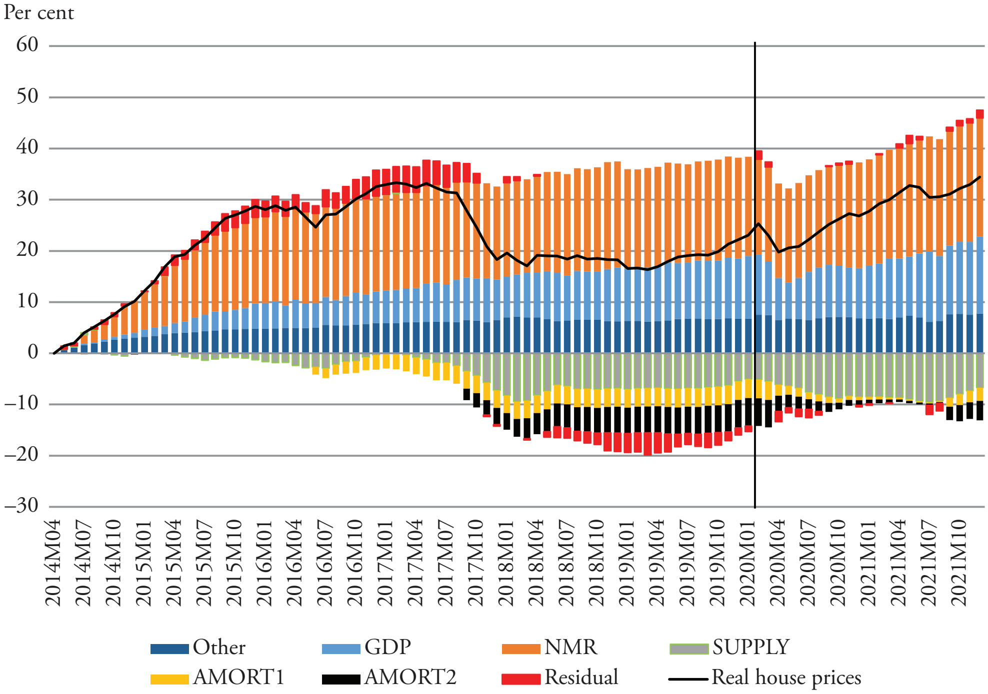
Note: "Other" mainly reflects an upward trend. It also includes a small discrepancy between the sum of the contributions calculated through dynamic simulations and the fitted value. GDP refers to the national aggregate. NMR corresponds to the nominal floating mortgage rate. AMORT1 and AMORT2 account for the mortgage amortisation requirements introduced in June 2016 and March 2018 (see text for details).

Figure A3.3 Cumulative Malmö house price increases and contributions



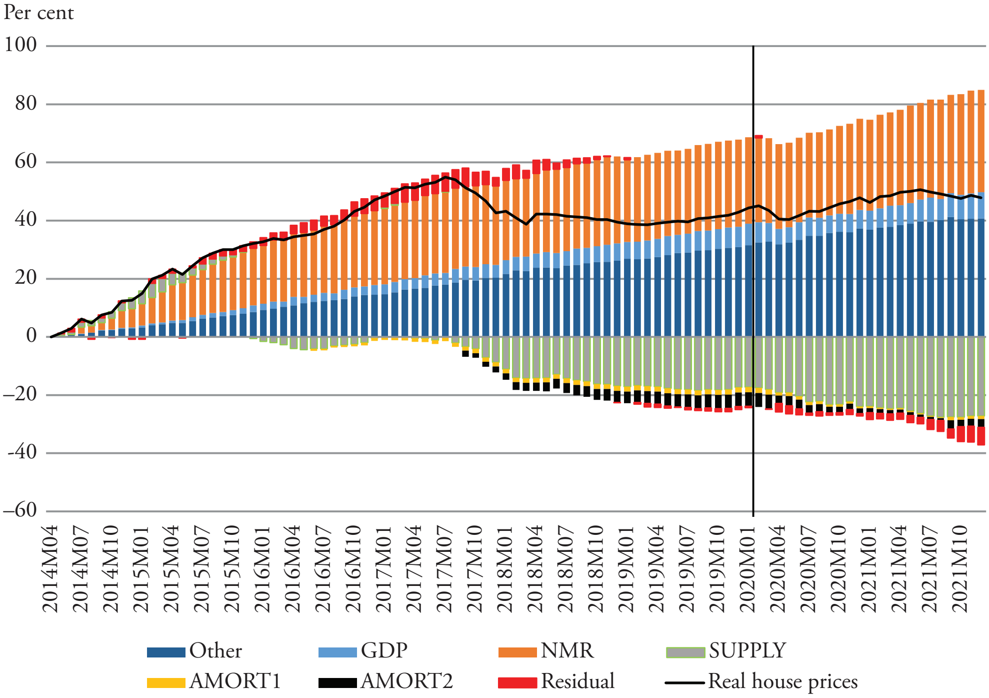
Note: "Other" mainly reflects an upward trend. It also includes a small discrepancy between the sum of the contributions calculated through dynamic simulations and the fitted value. GDP refers to the national aggregate. NMR corresponds to the nominal floating mortgage rate. AMORT1 and AMORT2 account for the mortgage amortisation requirements introduced in June 2016 and March 2018 (see text for details).

Figure A3.4 Cumulative Stockholm flat price increases and contributions



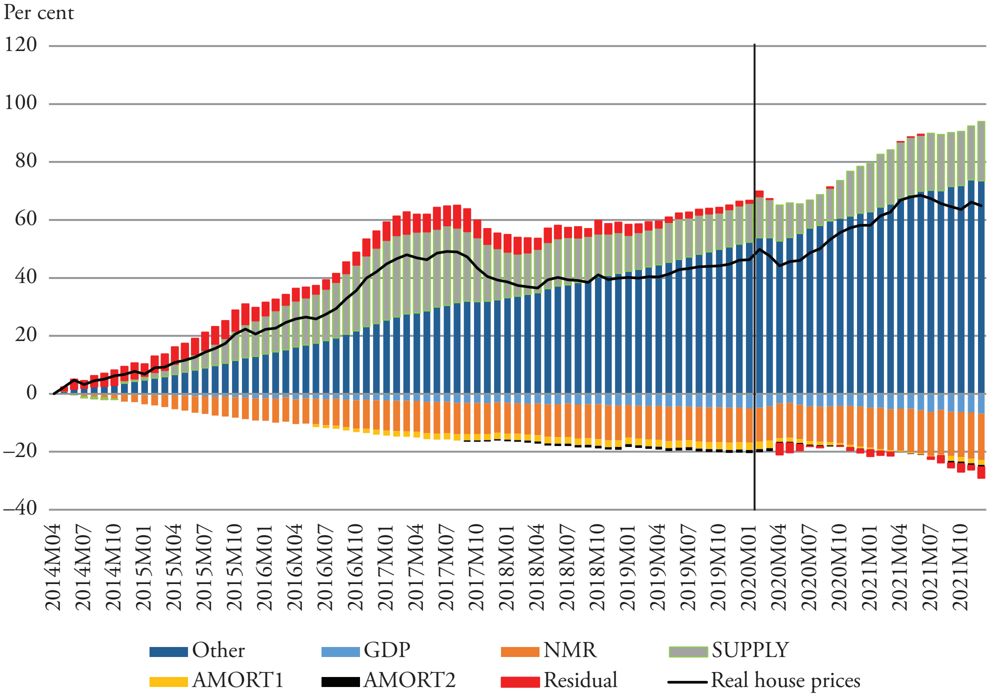
Note: "Other" mainly reflects an upward trend. It also includes a small discrepancy between the sum of the contributions calculated through dynamic simulations and the fitted value. GDP refers to the national aggregate. NMR corresponds to the nominal floating mortgage rate. AMORT1 and AMORT2 account for the mortgage amortisation requirements introduced in June 2016 and March 2018 (see text for details).

Figure A3.5 Cumulative Gothenburg flat price increases and contributions



Note: "Other" mainly reflects an upward trend. It also includes a small discrepancy between the sum of the contributions calculated through dynamic simulations and the fitted value. GDP refers to the national aggregate. NMR corresponds to the nominal floating mortgage rate. AMORT1 and AMORT2 account for the mortgage amortisation requirements introduced in June 2016 and March 2018 (see text for details).

Figure A3.6 Cumulative Malmö flat price increases and contributions



Note: "Other" mainly reflects an upward trend. It also includes a small discrepancy between the sum of the contributions calculated through dynamic simulations and the fitted value. GDP refers to the national aggregate. NMR corresponds to the nominal floating mortgage rate. AMORT1 and AMORT2 account for the mortgage amortisation requirements introduced in June 2016 and March 2018 (see text for details).