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Government-made house price bubbles? Austerity, homeownership, rental, and credit liberalization policies and the “irrational exuberance” on housing markets^{*}

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Abstract

Housing bubbles and crashes are catastrophic events for economies, implying enormous destruction of housing wealth, financial default risks, construction unemployment, and business cycle downturns. This paper investigates whether governmental housing policies can affect economies' propensity to build up speculative house price bubbles. Specifically, we focus on the liberalization effects of rent and credit regulation as well as homeownership and austerity policies. Drawing on a long-run time series from 16 countries since 1870, we identify speculative price bubbles through explosive root tests, corroborated by a narrative approach. Estimating logit models, we find that tighter rent and credit controls make bubbles less likely to emerge by dampening price increases, while certain homeownership and tenant subsidies and government austerity increase the likelihood of bubbles. The paper illustrates the logic of rent, credit, homeownership and austerity effects with two case studies.

Key words: speculative house price bubbles, rent control, homeowner taxation, explosive roots, panel data logit model.

JEL codes: C43, O18, R38.

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1. Introduction

Excessive house price increases and bursting housing bubbles, particularly when accompanied by credit booms, are catastrophic events in modern societies with considerable high economic costs: significant housing wealth, one of the most widely held assets, is destroyed through dispossessions and price crashes (Rosnick and Baker, 2010), mortgage defaults put the financial system at risk, and foreclosure waves feed back into the real economy through higher unemployment (Mian and Sufi, 2016) and business cycle downturns Jordà et al. (2016). Thus, theoretically, the housing market is one further case where both fundamental or rational expectation theories have a difficult time grasping “irrational exuberance” (Shiller, 2015). Therefore, alternative approaches typically focus on “narrative economics,” where narratives, rumors, or social imaginaries (Beckert, 2016), as circulating in media, may drive expectations of seemingly infinite price increases. Other approaches highlight the importance of risk in housing investments as well as psychological and behavioral factors (Brzezicka, 2021).

This study adds to the many commentaries (Norberg, 2009) and studies (McCarty et al., 2013) that see governmental policies at the origins of (expectations about) housing bubbles, but goes beyond studying the effects that run through the fiscal (Agnello and Sousa, 2013) or monetary (Mishkin, 2007) channels. It does so by combining long-run price and rent data from 16 countries since 1870 with a unique set of independent variables reflecting new regulation indices regarding rent, credit, homeownership taxation, and tenant support policies since 1900 (Kholodilin et al., 2023; Kholodilin and Kohl, 2021; Cerutti et al., 2017). As the very definition of what makes a bubble is itself contested, we combine three different approaches, where bubbles are 1) moments of fundamental price-to-rent decoupling,¹ 2) of excessive house price developments (booms), which 3) can be corroborated by narrative case inspection (Baron et al., 2019). These definitions go into our binary dependent variable used to estimate logit models on bubble likelihood in a given country year.

We generally find that tighter rent and credit controls — most prominent between 1914

¹This definition hinges most clearly on the violation of the rational expectation assumption that rational actors compute prices as the sum of discounted future rental incomes.

and 1960 in Europe — reduced the likelihood of excessive house prices, while their post-1960 deregulation, particularly in Anglophone countries, together with increasing tax support for homeowners (particularly, capital gains tax exemptions), was followed by more boom and bubble episodes. Rent control reduces the prospects of future returns on housing investments in general and the regulated rental segment in particular. It may divert capital away from the housing sector, whereas tax breaks for homeowners incentivize more people to buy, thus driving demand. Yet, not all homeownership subsidies have price-driving effects, as they may also make housing cheaper by reducing costs through provision of cheaper loans, land plots, and construction materials.

Beyond the known effects of a boom-restricting tighter monetary and fiscal policy (through higher interest rates and more mortgage lending), we also document that decreasing housing construction and government austerity tend to inflate bubbles, as less supply of government bonds makes investors shift to other assets including mortgage debt and housing (Korevaar, 2018). The presence of demand-side subsidies like housing allowances rather have inflationary effects. We illustrate the mechanisms qualitatively with historical case studies of the price-conservative tenant countries of Germany and Switzerland between 1914-1960 and the price-excessive homeownership regime in the US in the run-up to the housing bust of 2006.

This paper is structured as follows: in section 2, we review existing literature of studies explaining excessive house prices. Section 3 introduces the unique long-run data set. While section 4 explains the construction of the dependent variable, section 5 presents different combinations of logit regressions. Section 6 illustrates the findings by presenting two short historical case studies, section 7 concludes.

2. Literature review

This section first introduces quantitative studies of house price bubbles and, second, qualitative historical accounts of singular bubbles. Quantitative studies on speculative house price bubble can be subdivided into two groups. Studies in the first group focus on the detection of speculative bubbles and the analysis of their temporal properties as well as, sometimes, interregional or international co-movements (e.g., Caspi 2016; Engsted et al. 2016; Yiu et al. 2013). Studies in the second group, investigate the impact of various macroeconomic variables

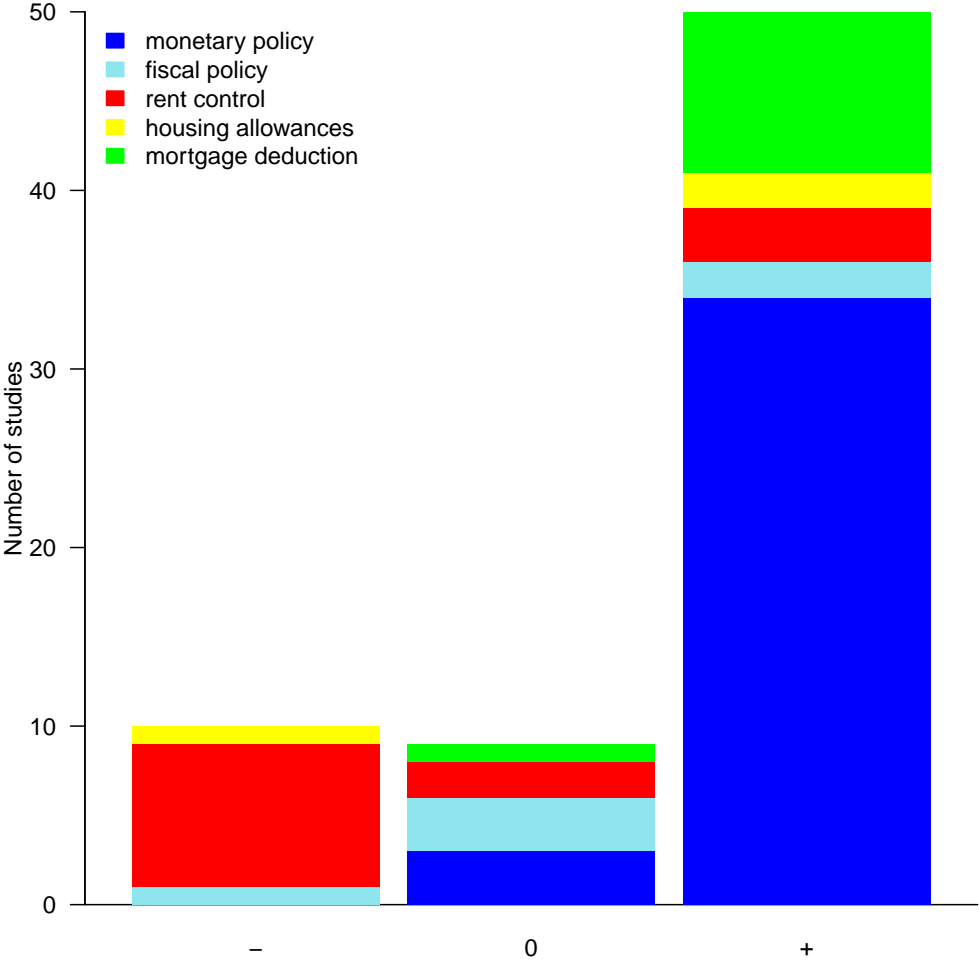
on the formation of speculative bubbles (for instance, [Agnello and Schuknecht 2011](#); [Beltratti and Morana 2010](#); [Cerutti et al. 2017](#); [Cesa-Bianchi et al. 2015](#); [Igan et al. 2011](#); [Kholodilin and Michelsen 2019](#); [Punzi 2016](#); [Vogiazas and Alexiou 2017](#)). While the vast majority of studies concentrate on the period starting in the 1970s, [Jordà et al. \(2015\)](#) were the first to extend the sample back to 1870. The most important determinants of housing prices throughout this literature are demographic factors, income, interest rates, and credit.

There is an extensive literature on potential effects of governmental regulations on property prices generally (not necessarily bubbles). Almost half of these studies consider the impact of land-use regulations. For example, [Huang and Tang \(2012\)](#), using the data on 327 US cities and the Wharton Residential Land Use Regulatory Index of [Gyourko et al. \(2008\)](#), find that restrictive land-use regulations exacerbate the volatility of house price cycles. They explain their finding by a reduction of supply elasticity in housing markets due to regulations. In addition, [Malpezzi \(1996\)](#) develops a more extensive *regulatory environment index* that is based on various housing market regulation measures, including rent control, land use and zoning regulations, infrastructure policies, as well as building and subdivision codes. This index is then used by [Malpezzi \(1999\)](#) to investigate the determinants of house-price-to-income ratios in 133 US metropolitan areas; findings show that the regulatory environment index exerts a positive effect on the equilibrium value of the price-to-income ratio. However, when the endogeneity issue is accounted for using an instrumental variable approach, the effect turns out to be insignificant. Nevertheless, he finds that the stringency of regulation negatively affects the speed of adjustment to equilibrium.

The potential relationships between housing prices and other types of housing policy (including rent control or housing allowances) are mainly estimated using microdata at the level of individual dwellings or residential blocks. [Figure 1](#) summarizes the results of empirical research in this area.

[Figure 1](#) and [Table A1](#) in Appendix report the number of empirical studies on the effects of seven types of housing policies: eviction protection, housing allowances, housing rationing, land-use regulations, mortgage interest deduction, rent control, and social housing — as defined, for example, in [Kholodilin \(2020\)](#). As the right bar shows, most studies find positive effects of housing policies on housing prices. Three policies contribute most to rising property prices:

Figure 1: Effects of housing policies on property prices



The height of each bar corresponds to the number of empirical studies that find statistically significant effects of a policy on housing prices.

land-use regulations, mortgage interest deduction, and housing allowances. The negative effect is especially strong in the case of rent control and housing rationing. The rent control effect appears to depend on the generation of rent control. [St. John \(1990\)](#), for example, finds that stricter first-generation controls dampen housing prices, while the second generation exerts no impact. By contrast, [Malpezzi and Ball \(1993\)](#), using a sample of 51 countries and their own index of rent control stringency, find that countries with stricter rent control tend to have higher housing prices. Fewer studies find no statistically significant or negative significant effects of regulations on housing prices, though this may be a publication bias. Housing allowances appear to exert mainly positive impact on housing prices.

Besides these quantitative studies of house prices and bubbles, a number of qualitative in-depth studies, often motivated by recent major crises, of major housing bubbles exist. The bursting of the bubble in Japan in 1990, as well as, in particular, the subprime mortgage crisis and the resulting 2007–2008 financial crisis, has given a strong impetus to the study of real estate markets. The broader social, economic, and political contexts of the crisis are analyzed by numerous researchers (e.g., [Tooze 2018](#)) and are compared to earlier crises, particularly the Great Depression 1929–1939 ([Reinhart and Rogoff, 2009](#)). However, overall, we still know surprisingly little about the socioeconomic and political drivers of historical housing bubbles. The discussion is dominated by quantitative economic historians, while in-depth studies of historical housing crisis before 1970 remain a research gap ([Yates, 2021](#)). Although the history of urbanization ([Jackson, 1985](#); [Almandoz, 2002](#); [Haiyan and Stapleton, 2006](#); [Pinol and Walter, 2012](#); [Lenger, 2013](#)), urban planning ([Hein, 2017](#); [Glendinning, 2021](#)), housing policy ([Pooley, 1992](#); [Schulz, 1993](#)), transnational reform movements ([Bullock and Read, 1985](#); [Rodgers, 1998](#); [Wagner, 2016](#)) and the promotion of homeownership ([Kwak, 2015](#); [Kohl, 2017](#)), and social housing ([Harloe, 2008](#)) are addressed in a large body of research, real estate markets as a research topic itself is largely neglected by historians ([Weiss, 1989](#); [Kramper, 2022](#)), even though housing bubbles are hardly a new phenomenon. Already the rise of the metropolis in the 19th century was characterized by volatile construction cycles, speculative behavior, and bubbles, with serious consequences for the financial sector and real economy ([Nützenadel, 2011](#)). As a result of globalization, local real estate bubbles could already develop into transnational crises in the 19th century. However, local bubbles seem to have increasingly expanded from local to

global crises over time (Shiller, 2015). Yet, beyond a few case studies, we still know very little about the history of these bubbles as well as the actors, institutions, and practices that kept the real estate markets running over the centuries (few exceptions, e.g. Yates 2015; Führer 2016) and our narrative approach below will heavily build on these.

3. Data

The real and nominal house price and rent indices as well as the resulting price-to-rent ratios are taken from four different sources: Bank of International Settlements (BIS),² International House Price Database of the Federal Reserve Bank Dallas (FRB),³ the Macrohistory database,⁴ Organization for Economic Cooperation and Development (OECD).⁵ Table A2 reports the availability of nominal house price data for each of these four sources by country and time. To make the indices more comparable they are all set to the base year 2010. All values of the quarterly indices are divided by the average of the four quarters of 2010 of this index. Based on the different price indices, a combined house price index is constructed as the median of the alternative price indices. In general, the original house price indices are strongly correlated among each other, where the correlations between nominal house price indices are higher than between the real house price indices, owing to the difference in the overall price indices used as deflators. Moreover, the Macrohistory house price indices have weaker correlations with other indices. The combined house price-to-rent index is also computed as the median of the OECD and Macrohistory indices. The price-to-rent ratios of the OECD appear to be more volatile, which can be explained by their original higher frequency.

Our main explanatory variables are regulatory indices based on the coding of legal documents regarding rent control, homeownership taxation, tenant support, and credit regulation.

Rent control. The intensity of rent control is approximated by an index that is based on a thorough analysis of the corresponding legal acts and mapped into numeric values, as explained in detail in Kholodilin (2020). Based on a set of questions, each related to a specific aspect of the rental price regulations, binary variables are constructed that equal one, if regulation is

²https://www.bis.org/statistics/pp_detailed.htm.

³<https://www.dallasfed.org/institute/houseprice>.

⁴<http://www.macrohistory.net/data/>.

⁵<https://data.oecd.org/price/housing-prices.htm>.

more stringent, and zero, otherwise:

$$I_{jt} = \begin{cases} 1, & \text{if restriction } j \text{ is present in period } t \\ 0, & \text{otherwise} \end{cases}$$

where t is the date on which the law containing such provision is enacted. Thus, each binary variable represents an answer to a question characterizing a particular aspect of the corresponding regulation. If the answer is “yes,” then the binary variable takes value 1; if the answer is “no,” then the variable takes the value zero. Typically, the positive answer corresponds to more limitations from the standpoint of landlords.

Following [Weber \(2017\)](#), we define six binary variables: “Real rent freeze” (the rents are not allowed to grow faster than inflation), “Nominal rent freeze” (the rents are frozen in nominal terms), “Rent level control” (some government body, arbitration council, or court fixes the rent level at the beginning of new contracts), “Intertenant decontrol” (if the rent control ceases with a change of tenant), “Other specific rent decontrol” (certain types of dwellings or settlements are no longer subject to the rent control), and “Specific rent recontrol” (certain types of dwellings or settlements are subject to more stringent controls).

Housing allowances: Instead of relying solely on rent control, governments have the option to implement subsidies to alleviate the rental burden on households. These subsidies are granted based on specific criteria, primarily household income and rent-to-income ratio. Eligibility is typically evaluated annually. In this study, we approximate this policy by allowance-introduction dummy variables, inspired by a similar approach used by [Seelkopf et al. \(2021\)](#) in their examination of modern taxes. The index is equal to 1 from the moment of introduction of housing allowances on and is set to 0 before that moment; see Appendix Table [A3](#) for the corresponding laws and dates of introduction. Unfortunately, a long-run data set of housing allowances-to-GDP ratio is only available for shorter time periods [Nelson et al. \(2020\)](#).

Homeownership taxation: Homeownership can be taxed and exempted from taxation in various ways. In the existing literature, the following four types of instruments are mainly considered: the tax on imputed rent, the interest relief on mortgage repayments, the capital gains tax on housing, and the value added tax on the new dwellings (e.g., [Wolswijk, 2009](#); [Figari](#)

et al., 2012). We draw on an existing study that coded the results of existing literature and historical fiscal codes into binary indices of whether a specific tax code promotes homeownership or not (Kholodilin et al., 2023). The four individual binary items are themselves averages and standardized in a composite index that displays the preference a tax system gives to homeowners.

Credit regulation: To approximate how tightly credit markets are regulated, we draw on a set of regulation variables developed by Cerutti et al. (2017), most notably the maximum loan-to-value ratio (LTV), the primary source of mortgage finance (covered bonds versus deposits) and whether there is a full recourse for homeowners.

Finally, we follow the few existing multi-country studies (see Appendix Table A4) for including macroeconomic control variables, most notably GDP and population development, mortgage, government debt, interest rates, and new construction (see Table A5 in Appendix for source details).

4. Identification of speculative price booms and bubbles

The empirical tests for speculative exaggerations in real estate prices are based on the assumption that these — provided that market participants are fully informed and rational — are determined exclusively by their expectation of the present value of future rental income. This means that house prices are linked to expected rent development in the long term. Since it is assumed that all known information is immediately reflected in the valuation, the relationship between prices and rents follows a so-called random walk, so it only deviates unsystematically from the fundamentally justified value. If the prices are not a perfect reflection of the income, the price dynamics in this way of thinking can only be explained by speculation. This means that the price development — in addition to the expected development in real demand — is also determined by the pure expectation of rising property prices in the future. When such assessments become the consensus of market participants, a speculative bubble develops in which prices are increasingly decoupled from demand.

4.1. Explosive roots approach

The so-called Phillips-Shi-Yu test (PSY) was developed to identify multiple, unusually strong, price increases (Phillips et al., 2011). This method, which is used on the basis of quar-

terly data series on the purchase price-to-rent ratios, makes it possible to determine turning points in house price cycles. The PSY test is based on a rolling regression model:

$$\Delta y_t = \hat{\alpha}_{r_1, r_2} + \hat{\beta}_{r_1, r_2} y_{t-1} + \sum_{k=1}^K \Delta y_{t-k} + \varepsilon_t \quad (1)$$

where y_t is the housing price-to-rent ratio, K is the number of lags, α , β , and ϕ are the parameters to be estimated, and ε_t is the disturbance term. The subsample used to estimate this regression using a rolling window starts with r_1 -th fraction and ends with the r_2 -th fraction of the total sample (T). Here, $r_2 = r_1 + r_w$ and $r_w > 0$ define the size of this window in terms of fractions of the sample. The null hypothesis of the tests is a random walk process, where $\beta_{r_1, r_2} = 1$, which is tested against the alternative hypothesis of the explosive dynamics, where $|\beta_{r_1, r_2}| > 1$. Based on this regression, an augmented Dickey-Fuller test (ADF) is calculated for a sequence of the forward expanding subsamples. The size of the window r_w expands from r_0 through 1, where r_0 is the smallest and 1 is the largest window as fraction of the total sample, the latter corresponding to the total sample size. The point of departure of the sequence of subsamples r_1 is fixed at 0. The end of each subsample (r_2) is equal to r_w and varies between r_0 and 1. The PSY test is then the supremum of the following sequence of the ADF statistics:

$$SADF(r_0) = \sup_{r_2 \in [r_0, 1]} ADF_0^{r_2} \quad (2)$$

where $ADF_0^{r_2}$ is the ADF statistic for a sample between 0 and r_2 . The asymptotic critical values for this test are computed using the Monte Carlo simulations (Phillips et al., 2015). A big advantage of the PSY tests is that it allows identification of multiple bubbles. By contrast, other tests focus on identification of a single speculative bubble.⁶ The test is applied to each country separately. As a threshold, we use the p -value corresponding to 0.99.

The test is applied to the combined price-to-rent ratio using the package *psymonitor*, which implements the Philips-Shi-Yu test in the programming language **R** (Phillips et al., 2019). In addition, we impose two further restrictions. First, since the test also identifies “negative bubbles” characterized by decreasing price-to-rent ratio, we speak about speculative bubbles

⁶See, for example, Homm and Breitung (2012) and Phillips et al. (2011).

only when the price-to-rent ratio is increasing. Second, we impose the minimum duration of the bubbles of 12 quarters. The resulting chronologies are shown in Figure 2.

4.2. *Ad hoc approach*

As a second approach and robustness check, we use an *ad hoc* method of dating the speculative price bubbles. We take advantage of the approach suggested by [Goodhart and Hofmann \(2008\)](#), as it is widely used in the literature and is applicable to quarterly data. In fact, it rather identifies housing price booms, not bubbles. In other words, it focuses on periods of strongly increasing house prices that are not necessarily decoupled from fundamental values.

As input, the approach uses the real house price indices and takes the following three steps. In the first step, we apply the Hodrick-Prescott filter with $\lambda = 100,000$ to the real house price index in order to decompose it into the trend and cyclical components. Second, the potential booms are identified as periods when the relative deviation of the cycle from the trend exceeds 5%. In the third step, the minimum duration restriction is imposed: all potential boom phases are removed, if they are shorter than 12 quarters. Figure 3 depicts the housing boom dates obtained using this approach. As a rule, the boom episodes are longer and take place more often than the speculative bubble periods.

4.3. *Narrative approach*

Third, and finally, we conducted a qualitative, narrative research into the bubble and housing boom periods identified by the above two approaches to give additional credence to the quantitative identification strategy. We conducted a systematic literature search of the housing historiography in the respective countries to validate that bubbles or booms identified in the data correspond to real housing events and are not merely data residuals. The narrative are presented in Appendix 7.

5. Estimation results

The probability of a speculative house price bubble as a result of a joint action of various external determinants (such as real GDP, real interest rate, and population growth)⁷ can be

⁷See Table A5 for data description.

Figure 2: Explosive-root chronologies of speculative price bubbles, 1870–2020

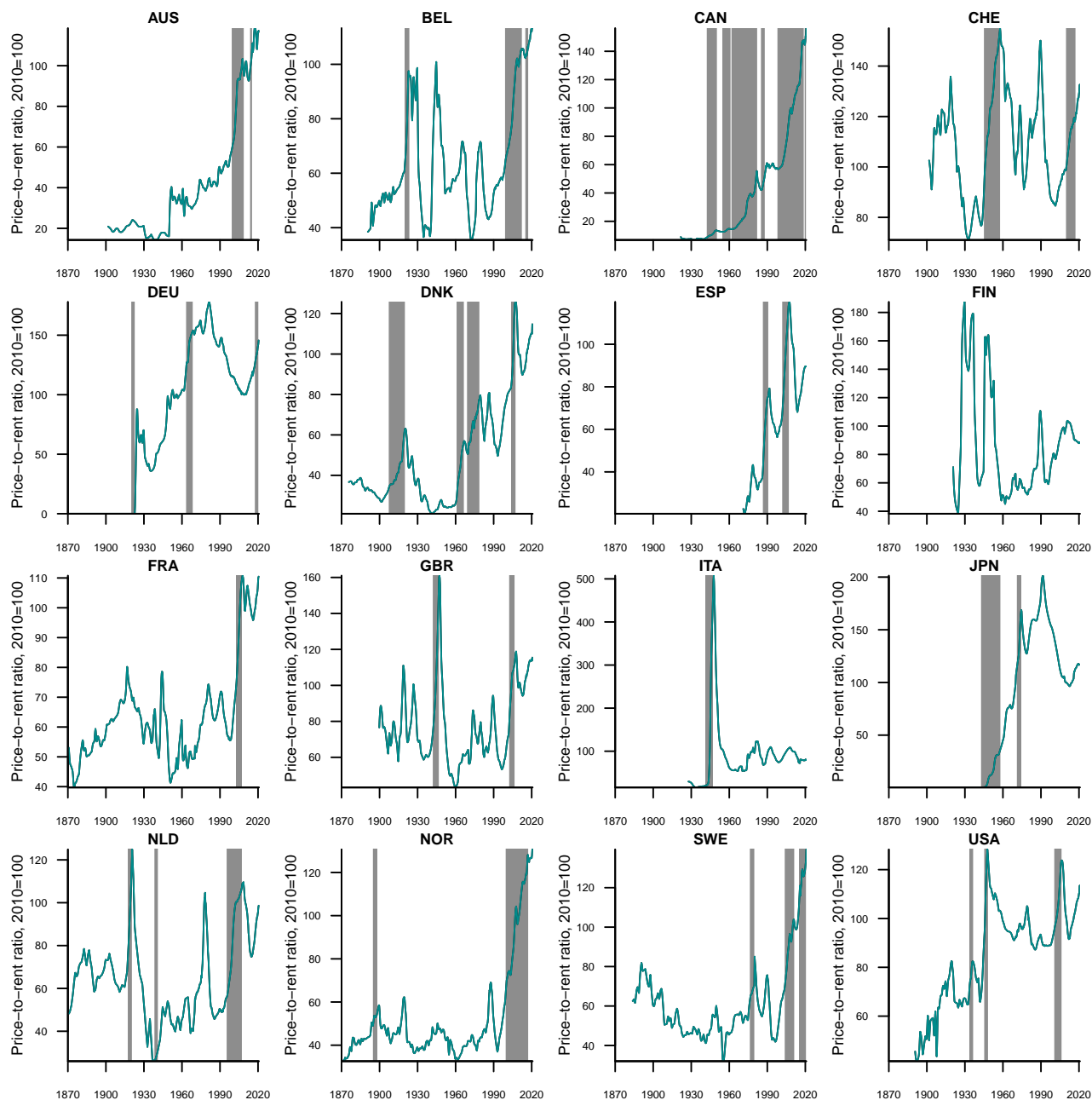
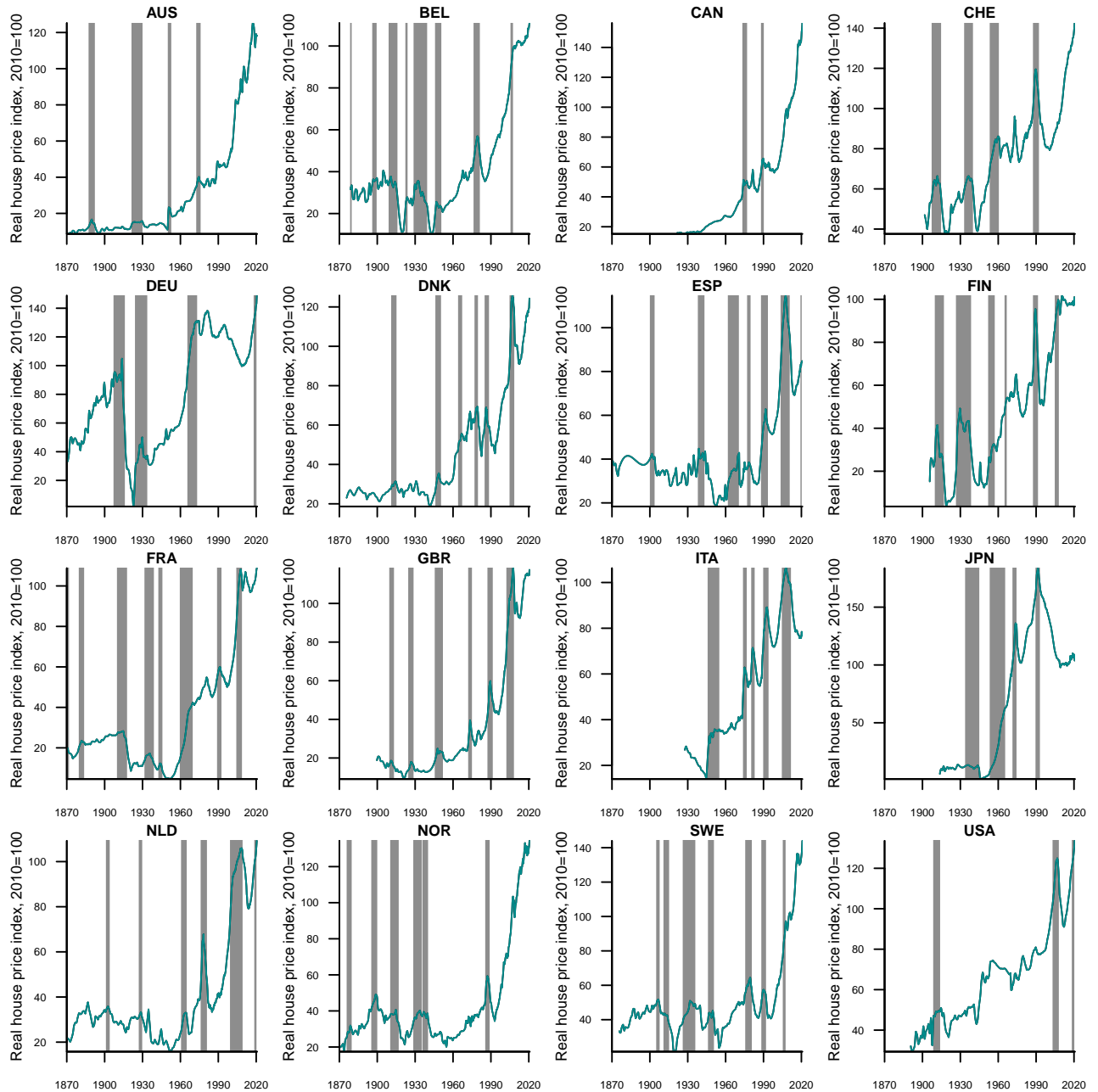


Figure 3: Ad hoc chronologies of speculative price bubbles, 1870–2020



estimated using the panel logit model. Logit models are widely used for the identification and prediction of economic recessions, currency crises, and speculative bubbles in different asset markets.⁸ These models allow for determining the statistical significance and the sign of the coefficients of the relevant variables and, hence, to identify under what conditions the buildup of speculative price bubbles is likely. Since speculative bubbles are relatively rare events, the logit models are more appropriate in such a context than the probit models (Kumar et al., 2003). The panel logit model with fixed effects is formulated as follows:

$$\Pr(B_{it} = 1|X_{it}) = \frac{1}{1 + \exp(-(\alpha_i + X_{it}\beta))} \quad (3)$$

where $Pr(\cdot)$ is the conditional probability of a speculative price bubble, B_{it} is a binary variable (1 corresponds to the speculative bubble period, while 0 corresponds to the non-bubble period). This can either be a speculative bubble chronology obtained using the PSY test or the housing boom chronology. α_i is a country-specific fixed effect that accounts for the specific characteristic of the corresponding country that remains constant over time. X_{it} is a vector of explanatory variables and $i = 1, \dots, N$; $t = 1, \dots, T$; N is the number of countries and T is the number of periods. In order to account for endogeneity, all time-variant variables are included as lagged variables. Given that we deal with annual data, only one lag is used (Wooldridge, 2012, p. 658). The panel logit model with fixed effects has two central advantages: It accounts for the unobservable heterogeneity (the omitted variables or variables that are difficult to measure and no restrictions of the correlation between explanatory variables) and reduces the omitted variable bias. The model is estimated using the **R**-package *bife* (Stammann et al., 2016).

Table 1 reports the results for the panel logit with fixed effects estimated for the speculative bubble chronology. It covers the longest period and thus has a restricted set of variables: while GDP exerts no significant and interest rates a significantly negative effect on bubble likelihood, the regulation of the rental and ownership sector is more complex. The introduction of housing allowances as demand-side subsidies significantly increases price booms, whereas the rent control effect is largely insignificant and, if significant, positive in the long-run analysis.

⁸See, e.g., Herwartz and Kholodilin (2014); Xiaoli L et al. (2014); Jordà et al. (2015); Caspi (2016); Kholodilin and Michelsen (2019).

Upon closer inspection of the war-unaffected sample starting in 1950 (Table 2), this effect seems to be entirely driven by the pre-1950 period of high rent control, when rent control may have reduced the denominator of the price-to-rent ratios and, hence, increased the bubble likelihood, offsetting the negative effect from lowering expectation of future rental revenues. The explanation might be that rent control was expected to remain temporary and, thus, real house prices did not fall to the same extent as real rents. The increase in the price-to-rent ratio during this period might thus indicate more of a crisis than a housing bubble. In the post-1950 period, by contrast, the situation seems to be reversed, where the expectation effect prevails over the price-to-rent-ratio effect. The general effect of homeowner-biased taxation systems (or high scores on the neutrality index), in turn, is one of fueling the bubble, but the decomposition of the index into its distinct items in Model 3 and Model 5 shows that this is mainly driven by exempting homeowners from imputed rent and full mortgage interest payments. The VAT exemption, which may incentivize housing construction generally, rather takes the air out of the bubble.

The next specification in Table 2 includes more explanatory variables, but covers a substantially shorter period (after World War II, WWII). While mortgage indebtedness adds to the effects of lower interest rates in increasing bubble likelihood, it is government debt that has the opposite effect by potentially crowding out private demand via capital markets. This also implies that austerity programs may add to more investor demand for private housing and fuel bubble activity. Rather than deflating house price increases, new housing construction, private or public, rather seems to positively affect prices in the short run by further fueling speculation. While most other effects behave similarly — with population and GDP growth driving bubble activity significantly — the capital gains tax exemption for homeowners becomes significantly positive — privileging housing over other capital investments — making the total effect of owner taxation bias ambiguous. Introducing stricter capital gains taxation would lower the risk of strong house price growth.

As robustness check, we present the same long-run and short-run estimations for the housing market boom chronology based on the [Goodhart and Hofmann \(2008\)](#) approach (Tables A6 and A7 in the Appendix), where rent prices are not taken into account. Generally, the results point in the same direction, though at lower significance levels, where the ownership bias of housing

Table 1: Estimation results of models with speculative bubble chronologies based on the PSY-test, 1902–2019

	Model 1	Model 2	Model 3	Model 4
Real GDP growth $_{t-1}$	-0.015 (0.015)	-0.012 (0.015)	0.025 (0.019)	0.028 (0.019)
Population growth $_{t-1}$	0.634*** (0.133)	0.640*** (0.138)	0.801*** (0.185)	0.892*** (0.192)
Long-term interest rate $_{t-1}$	-0.095*** (0.021)	-0.097*** (0.022)	-0.052* (0.028)	-0.060** (0.029)
Govt debt-to-GDP ratio $_{t-1}$			-0.969*** (0.293)	-1.135*** (0.303)
Mortgage debt-to-GDP ratio $_{t-1}$			2.700*** (0.489)	2.195*** (0.528)
New construction $_{t-1}$			-0.425*** (0.145)	-0.583*** (0.147)
Rent control $_{t-1}$	0.813*** (0.229)	0.943*** (0.241)	1.551*** (0.300)	1.666*** (0.316)
Housing allowance introduction $_{t-1}$	1.489*** (0.167)	1.300*** (0.191)	1.497*** (0.241)	1.506*** (0.255)
Owner tax bias $_{t-1}$	-0.539 (0.439)		-1.074** (0.536)	
Imputed rent tax exemption $_{t-1}$		0.342 (0.223)		0.269 (0.276)
Mortgage interest deduction $_{t-1}$		0.930*** (0.296)		0.807** (0.375)
VAT exemption $_{t-1}$		-0.554*** (0.180)		-0.836*** (0.228)
Capital gains tax exemption $_{t-1}$		-0.054 (0.264)		-0.364 (0.332)
Log Likelihood	-828.884	-817.506	-633.810	-623.737
Number of observations	1713	1713	1430	1430

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

Table 2: Estimation results of models with speculative bubble chronologies based on the PSY-test, 1950–2018

	Model 1	Model 2	Model 3	Model 4
Real GDP growth $_{t-1}$	0.091*** (0.033)	0.110*** (0.033)	0.085** (0.041)	0.090** (0.041)
Population growth $_{t-1}$	1.037*** (0.179)	1.099*** (0.185)	0.908*** (0.225)	0.921*** (0.229)
Long-term interest rate $_{t-1}$	-0.050** (0.024)	-0.033 (0.026)	-0.055* (0.032)	-0.039 (0.033)
Govt debt-to-GDP-ratio $_{t-1}$			-3.612*** (0.558)	-3.821*** (0.580)
Mortgage debt-to-GDP ratio $_{t-1}$			3.257*** (0.606)	2.913*** (0.640)
New construction $_{t-1}$			0.393 (0.243)	0.409 (0.252)
Rent control $_{t-1}$	-1.623*** (0.408)	-1.114** (0.434)	-1.826*** (0.470)	-1.591*** (0.489)
Housing allowance introduction $_{t-1}$	1.417*** (0.250)	1.298*** (0.257)	1.239*** (0.303)	1.170*** (0.310)
Owner tax bias $_{t-1}$	0.175 (0.555)		-0.540 (0.682)	
Imputed rent tax exemption $_{t-1}$		0.768*** (0.293)		0.465 (0.339)
Mortgage interest deduction $_{t-1}$		0.596 (0.377)		-0.209 (0.458)
VAT exemption $_{t-1}$		-0.633*** (0.237)		-0.674** (0.282)
Capital gains tax exemption $_{t-1}$		0.203 (0.389)		0.394 (0.447)
Log Likelihood	-573.170	-565.639	-461.838	-458.378
Number of observations	1226	1226	1105	1105

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 3: Estimation results of models with speculative bubble chronologies based on the PSY-test (pooled models), 1970–2012

	Model 1	Model 2
Intercept	-7.300*** (1.616)	-1.762 (1.859)
Real GDP growth $_{t-1}$	0.126** (0.050)	0.132** (0.053)
Population growth $_{t-1}$	2.076*** (0.340)	2.369*** (0.384)
Long-term interest rate $_{t-1}$	-0.106*** (0.040)	-0.159*** (0.044)
Govt debt-to-GDP ratio $_{t-1}$	-0.639 (0.451)	-3.117*** (0.653)
Mortgage debt-to-GDP ratio $_{t-1}$	1.749*** (0.535)	1.665*** (0.609)
New construction $_{t-1}$	0.601** (0.296)	0.546* (0.323)
Rent control $_{t-1}$	-1.805*** (0.530)	-1.418** (0.587)
Housing allowance introduction $_{t-1}$	0.755*** (0.281)	1.496*** (0.343)
Full mortgage recourse $_t$	-1.083* (0.615)	-1.957*** (0.734)
Maximum LTV $_t$	0.042*** (0.008)	-0.015 (0.011)
Retail mortgages $_t$	1.896*** (0.495)	3.531*** (0.625)
Mortgage bonds $_t$	3.840*** (0.730)	5.950*** (0.888)
MBS $_t$	-0.801 (0.803)	0.939 (0.943)
Owner tax bias $_{t-1}$	-0.595 (0.629)	
Imputed rent tax exemption $_{t-1}$		-0.501 (0.319)
Mortgage interest deduction $_{t-1}$		-0.389 (0.338)
VAT exemption $_{t-1}$		-1.521*** (0.290)
Capital gains tax exemption $_{t-1}$		2.258*** (0.352)
AIC	706.389	642.413
BIC	774.677	724.359
Log Likelihood	-338.194	-303.207
Number of observations	701	701

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

taxation systems remains an ambiguous variable.

6. Discussion

In the following, we discuss the significance of governmental interventions for housing booms by looking qualitatively at three exemplary regulations — rent control, homeownership taxation, and credit regulation — in two exemplary periods, the earlier 1914–1960s with low boom likelihood and the later period from the 1960s up the 2010s, during which the majority of booms and bubbles occurred. In our brief historical case studies, we first focus on the two price-conservative tenant countries *par excellence*, Germany and Switzerland, and show how rent regulation, housing subsidies, and rather conservative credit regulations and homeownership taxation restrained real house prices and the formation of bubbles. For the post-1960 period, by contrast, we focus on the US mortgage crisis as prime example for how regulations made the biggest house price bubble possible in 2001–2007.

6.1. Case 1: Price-conservative tenant countries

The impact of interventions between 1914 and the 1960s is well illustrated by the examples of Germany and Switzerland. The two neighboring countries are well suited for comparison, as only Germany was directly involved in the wars, but both countries experienced periods of precarious housing shortages. House prices fell sharply in both countries during the crises — in Germany, real prices remained at low levels for decades, while in Switzerland they fell sharply during each of the two wars but subsequently recovered. In Switzerland, it took until the 1950s and in Germany until the 1960s for them to return to their pre-WWI levels (see Figure 3). Germany and Switzerland were unequally affected by the wars and Switzerland returned temporarily to the liberal housing market in the interwar period. However, in both countries the housing markets were strongly influenced by governmental interventions, and the housing question was considered as “political issue No. 1,” as Swiss Federal Councilor Ernst Brugger has put it in 1970 (Müller, 2022): Rent control and construction subsidies lowered house prices whereas rather tenure neutral homeowner taxation and credit controls deflated the likelihood of bubbles.

From 1914 to the 1960s, both homeownership taxation and credit controls tended to have rather moderate effects on house prices. The introduction of taxes, like taxes on imputed rent

in 1920 (Germany) and 1934 (Switzerland) prevented the emergence of an “hidden homeownership welfare state” (Kholodilin et al., 2023), as it developed in countries like Ireland (Norris, 2016) and the USA (Howard, 1999). Furthermore, as loan-to-value ratios were often limited to homebuyers, mortgage debt growth was reduced to a certain extent, with speculative, highly leveraged, transactions discouraged (Sattler, 2022; Kohl, 2017; Fischer, 1955). Tenant protection and rent control, along with construction subsidies, were among the key housing policy measures of those years. Whereas in countries like the USA home ownership was strongly promoted, housing policy was relatively tenure neutral (Kornemann, 1996; von Beyme, 1999; Kurz, 1993). The subsidies strongly benefited the (profit and non-profit) rental housing market. Simultaneously, rental markets were subject to substantial regulation. Rent control caps the rent increases or, in its strict form, even freezes rents. This typically leads to lower rent increases of the regulated dwellings, albeit the rents for non-regulated dwellings can increase at a stronger pace. However, as a rule, in the beginning, the uncontrolled sector is very small compared to the controlled one. Typically, newly built and sometimes luxury dwellings are exempted from rent control and their proportion in the total housing stock is tiny.

As in many other countries, in both countries, rent control was first introduced in the wake of World War I (WWI), together with other interventions in the housing market. After hitting highs in the early 1910s, housing construction already fell before 1914, subsequently collapsing during the war (Wischermann, 1997; Saitzew, 1920). War and crisis lowered investors’ expectations, with rent control making investment even less attractive, which resulted in housing shortages and precarious housing conditions. In Germany, there was a consensus among almost all political parties that tenants needed to be protected. Between 1920 and 1923, a series of laws were passed in the Weimar Republic that shaped rental policy for the decades to come. Strict rent control and inflation led to a sharp reduction in the rent burden for tenants (Führer, 1995b). In neutral Switzerland, rent control was weaker, but a severe housing shortage by the end of the war forced the corporative-liberal government to introduce housing subsidies for the first time (Zitelmann, 2018).

Both countries witnessed a collapse in real house prices, but housing markets developed in very different directions during the interwar period. In general, in the countries surveyed in this article, the interwar years were characterized by an upswing in the 1920s and the

downturn of the Great Depression. In Germany, recovery was slow, coming to an end after the outbreak of the Great Depression. Low returns, high construction costs, and high interest rates, as well as rent control (temporarily relaxed from 1924), kept investors on the sidelines, with new construction strongly driven by subsidies (Führer, 1995a). As a result, real house prices remained far below their 1914 levels. In Switzerland, the recovery was stronger and resulted in a speculative boom. Investing in real estate was much more profitable than in Germany. Interventions in the rental market were lifted by the mid-1920s and the need for shelter, a liquid capital market, rising rents and high profitability made investing in residential buildings attractive, resulting in a flood of domestic and foreign capitals into real estate assets (Christen, 1964). Although the Builders' Association warned of a real estate crisis in 1927, the housing bubble did not reach its peak until 1932 and construction remained relatively high until it crashed after 1934, with real house prices again climbing to pre-WWI levels (Müller, 2022). Such a short-lived boom could also be observed in numerous other countries — both in continental European and in Anglo-Saxon countries. Alongside economic recovery and (partial) deregulation of rent control a boom — often speculative — developed, which collapsed during the Great Depression.

The short rise and subsequent fall in the price-to-rent ratio in the war and interwar period in many countries can be explained by house prices not falling to the same extent as regulated rents, as a recovery and deregulation were expected. The expectation of rising prices in the future seems to have prevented house prices from falling to the extent that we would expect as a result of rent control. This may explain the surprising pre-1950 result in section 5 of rent control increasing bubble likelihood, as estimated by our model.

During WWII, the housing situation worsened. Nazi Germany had already frozen rents in 1936 and Switzerland had reintroduced rent control in the wake of the devaluation of the Swiss franc in 1936. Subsequently, the outbreak of WWII led to stronger regulation (Schulz, 1986; Zimmermann, 1997). While house prices in Germany remained at low levels, they collapsed in Switzerland. Expected returns fell as the war endured and construction costs rose. Alongside rent control, material and labor shortages inhibited new construction in Switzerland, even though it was not directly involved in the military conflict. To stimulate new construction, the federal government introduced a housing construction subsidy program in 1942 for the second

time in its history (Müller, 2021).

The situation remained precarious after the war. Rent control and tenant protection were continued, whereas subsidy programs were intended to address the housing shortage (although in Switzerland subsidies were already strongly reduced in 1950). With the beginning postwar boom, house prices began to rise again, but pre-WWI levels were not reached until the 1950s in Switzerland and not even until the 1960s in Germany. As shown in section 5, the slow recovery of house prices post-WWII was correlated with rent control. Rent controls slowed down price increases. But rising construction costs and land prices as well as economic growth drove up the prices of new dwellings. With rents for new, non-subsidized dwellings being deregulated in the early 1950s, the gap between rents of the old and the new stock grew strongly (Hausmann, 2016). As new housing became a larger share of the stock, eventually the old stock was also deregulated; ultimately prices rose rapidly. This effect is particularly evident in Germany, where prices increased dramatically after deregulation in the 1960s (Schulz, 1993; Kühne-Büning et al., 1999). Coupled with a prospering economy, rising incomes, population growth, and a persistent housing shortage, deregulation led to rent and house price increases far above the rate of inflation, giving rise to a controversial public debate about speculative housing (Führer, 2016; Müller, 2022). Even in other countries, house prices increased significantly in parallel with (partial) liberalization of the housing markets; for instance, in France from 1948, in Australia from 1949, and in Norway from 1954 (Friggit, 2009; Stapledon, 2007; Eitrheim and Erlandsen, 2005). However, our results in section 5 suggest that second generation rent control, which replaced stricter controls, have prevented house prices from rising even more sharply post-1950. The case of Germany is furthermore well suited to illustrate on how strict price controls may reduce the risk of bubbles in the short run but can increase it in the long run through effects of liberalization. Deregulation fueled price increases. Strict rent control was highly effective, but the time-limited design of price controls and the exclusion of certain categories entailed risks in the long run, as it led to a divided housing market, but held out the prospect of freeing up rents of the old stock in the long term. When deregulation was finally adopted, the prices of the “old” apartments quickly adjusted to the level of the free sector in anticipation of rising rental income, which greatly increased the risk of exploding prices and speculative buyers in the short term.

6.2. Case 2: Price-exuberant homeownership country

The US subprime mortgage crisis was probably the biggest housing wealth destruction in history (Schwartz, 2009). Between 1950 and 1970, home prices had remained remarkably stable, Glaeser (2013) describing the situation as a “bubble that didn’t happen.” Starting in the 1980s, however, the United States had already experienced a series of boom-bust cycles characterized by high volatility, leading to the Savings and Loans crisis in the early 1980s (Mason, 2004) and a house price bust in the early 1990s (Wheelock, 2006), but the subprime mortgage crisis of the 2000s was still unprecedented (Nicolaidis and Wiese, 2017). Whereas the bubbles that emerged in California in the 1970s and that occurred in the Northeast, particularly Greater Boston, and California in the 1980s were still regional in scope (Shiller, 2015), the bursting of the bubble in 2006 occurred throughout the United States, with global consequences.

The regulatory environment in rent and mortgage regulation as well as homeowner policies have all been important contributory factors for the perfect storm. In the US, nationwide rent control is rather an exception (Brown, 2009). It was applied during and shortly after WWII and in the early 1970s in reaction to high inflation. Further, over the later 20th century, more and more states even preempted their cities from implementing local rent control, with some of the traditionally rent-controlled cities like Boston lifting their regulations (Sims, 2007). Thus, the run-up to the burst of the housing bubble in 2008 was one of the least rent regulated periods in US history.

Simultaneously, both political parties had started to implement a homeownership-only housing regime by loosening credit restrictions (higher LTVs and longer maturation periods) and expanding credit supply through government guarantees for private mortgages including mortgage backed securities (MBS). MBS were probably the most crucial financial innovation associated with the 2006 house price crash, as they made foreign capital — including from credit conservative countries — available to lower-income US households (Hellwig, 2009). This explains why the credit boom could be sustained despite rising US government debt. The political “infatuation with homeownership” (Norberg, 2009) of governments, also reflected in liberal housing capital gains and imputed-rent taxation, was often seen as an important precondition for the “political bubble” (McCarty et al., 2013). Some of the worst foreclosure and price crash incidents occurred in zip-codes where subprime mortgage had been given out (Mian and Sufi,

2016). As mortgages were given out to household with low incomes and little real income growth in sight, it was only the government sustained expectation that prices would grow that still made investment rational. Consequently, the price boom was accompanied by a building boom peaking at more than two million units in 2006.

7. Conclusion

The trend in real house prices over the 20th and early 21st centuries is described as a hockey stick pattern (Knoll et al., 2017), where real prices have been surprisingly constant from the late 19th to the mid-20th-century until they exploded in the later 20th century. Yet, as local long-run studies suggest, real house prices tend to display cycles with episodes of rising and falling prices, with rises in house prices in the second half of the 19th century comparable to those since the 1960s and with rather weak growth in the long run (Eichholtz, 1997; Monnery, 2011; Edvinsson et al., 2021). Both periods saw periods of sharp and fast-rising house prices in conjunction with speculative bubbles as well as severe downturns after the bubble burst. Viewed from this perspective, the period of stagnating prices from the end of the 19th century through the 1960s represented a long period of crisis, interrupting two periods of booming house prices. Taking a closer look at the period between WWI and the 1960s further reveals that the development was not constant, but has rather temporally been characterized by sharp declines, as well as a U-shape in many countries — particularly pronounced in continental European countries such as Germany and France. Overall, the evolution of real house prices since the beginning of the 20th century, with its downward trend since WWI and its sharp increase since the 1960s, is reminiscent of the trend lines of inequality in many countries. Not coincidentally, research in the 2010s argues that a large part of the rising inequality since the 1970s is due to rising property values (Piketty and Zucman, 2014; Rognlie, 2014).

Research has put forward various reasons for house price trends, e.g., demographics and economy growth, and the stagnation of house prices from WWI to the 1960s is to be viewed within the context of the crisis of the two world wars and the Great Depression. However, as our results show in line with other studies (Eichholtz, 1997; Kholodilin and Kohl, 2023), the trend is also strongly correlated with government interventions and regulations. The introduction of tenant protection and rent control since 1914 have typically lowered real house prices. In

contrast, austerity policies, rental and credit liberalization policies, as well as certain homeowner subsidies have increased the risk of price excesses since the second half of the 20th century.

The recurrence of housing booms and bubbles are consequential, at times catastrophic, events for economies and societies. These are difficult to understand from a pure rational-expectation model. This study contributes to existing literature on house prices by looking more systematically into the effects of different kinds of housing regulation on house prices in the long run. Using different definitions of house price booms and bubbles, we find that the liberalization of rent and credit regulation were as much an enabling condition for house price growth as was the promotion of certain kinds of homeownership subsidies. These governmental interventions may have made the expectation of infinitely growing house prices more likely and, hence, may explain the long periods during which house prices and housing construction were able to grow to new records. In longer historical perspective, volatile housing markets may rather be the norm with the rent-controlled period between 1914 and 1960 rather being an exceptional time with a low likelihood of extreme house price growth.

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Appendix

Table A1: Empirical studies on effects of governmental regulations on housing prices

Study	Place and period	Type of data	Method
Ahern and Giacometti (2022)	St. Paul (Minnesota) and 5 surrounding counties, 2018–2022	micro: 150,000 real estate transactions	difference-in-differences regression
Autor et al. (2014)	Cambridge (Massachusetts), 1995	micro: parcels of land	cross-sectional regression
Braakmann and McDonald (2020)	England, 2009–2013	micro: property data from HM Land Registry, pre-reform proportion of vacant dwellings per local authority from the Department for Communities and Local Government and the pre-reform proportions of unemployed and public sector workers and recipients of other benefits	difference-in-differences
Chowdhury and Mallik (2004)	Australia, 1986–2003	macro: Australian Bureau of Statistics	error correction model
Clark and Heskin (1982)	Los Angeles, 1978–1980	micro: a sample of 4,094 tenants selected using random digit-dialing techniques	contingency analysis
Gonçalves (2020)	Lisbon and Porto, 2015–2019	micro: data on properties from National Short-Term Rental Registry, administrative data from Confidencial Imobiliário	difference-in differences, event-study designs
Guy et al. (1985)	Fairfax County (Virginia), 1972–1980	micro: data on townhouse clusters	linear regression

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Study	Place and period	Type of data	Method
Hirsch (1988)	9 cities in Los Angeles county (California), 1976–1981	micro: pairs of sale and resale data of identical properties from the roll of the Assessor of Los Angeles County	linear regression
Kim et al. (2017)	Anna Maria Island (Florida), 1998–2015	parcel identification numbers from Manatee County’s GIS, public records and information about residential building characteristics from Manatee County’s property database, property-appraisal data from the Manatee County Tax Collector database	panel-data model
Lee et al. (1999)	Philadelphia, 1989–1991	micro: HUD, Philadelphia Planning Commission, Board of Revision of Taxes in Philadelphia	linear regression
Malpezzi and Ball (1993)	51 countries, 1985	macro: country-level data	linear regression
Marks (1984)	Vancouver, 1978	micro: 3885 apartments in the City of Vancouver (“Vancouver proper”)	hedonic regression
Mense et al. (2018)	German municipalities, 2011–2016; Bavarian municipalities in the years 2010–2016; German municipalities, 2008–2016	micro: Internet advertisements; macro: sales of developed vacant plots of land, Demolition and Conversion Statistics	difference-in-differences
Rabiega et al. (1984)	Portland, 1963–1978	micro: property data from Housing Authority of Portland	linear regression

... continued

Study	Place and period	Type of data	Method
Sagner and Voigtländer (2022)	Berlin, 2016–2020	micro: rental and purchase asking price data on a dwelling level by Value AG	difference-in-differences regression
Shulman (1981)	Santa Monica (California), 1970–1978	macro: median prices	descriptive analysis
Sternlieb and Hughes (1980)	Fort Lee, 1970–1977	macro: valuations by land-use category from Fort Lee Assessors Office	descriptive analysis
St. John (1990)	Alameda county (California), 1970–1988	micro: apartment building sales	hedonic regression
Vandrei (2018)	Land Brandenburg, 2011–2017	micro: transaction sales prices from Superior Property Valuation Committee of Brandenburg	regression discontinuity design

Data description

Table A2: Availability of house price data from various sources

Country	Nominal				Real			
	BIS	OECD	Dallas	Macrohistory	BIS	OECD	Dallas	Macrohistory
ARE	2003-2021				2003-2021			
AUS	1970-2021	1970-2021	1975-2021	1870-2016	1970-2021	1970-2021	1975-2021	1870-2016
AUT	2000-2021	2000-2021		1986-2015	2000-2021	2000-2021		
BEL	1970-2021	1970-2021	1975-2021	1878-2016	1970-2021	1970-2021	1975-2021	1878-2016
BGR	2005-2021				2005-2021			
BRA	2001-2021	2008-2021			2001-2021	2008-2021		
CAN	1970-2021	1970-2021	1975-2021	1921-2016	1970-2021	1970-2021	1975-2021	1921-2016
CHE	1970-2021	1970-2021	1975-2021	1901-2016	1970-2021	1970-2021	1975-2021	1901-2016
CHL	2002-2020	2002-2020			2002-2020	2002-2020		
CHN	2005-2021	2010-2021			2005-2021	2010-2021		
COL	1988-2021	1988-2020	1975-2021		1988-2021	1988-2020	1975-2021	
CYP	2002-2020				2002-2020			
CZE	2008-2021	2008-2021			2008-2021	2008-2021		
DEU	1970-2021	1970-2021	1975-2021	1870-2016	1970-2021	1970-2021	1975-2021	1870-2016
DNK	1970-2021	1970-2021	1975-2021	1875-2016	1970-2021	1970-2021	1975-2021	1875-2016
ESP	1971-2021	1971-2021	1975-2021	1971-2016	1971-2021	1971-2021	1975-2021	1870-2016
EST	2005-2021	2005-2021			2005-2021	2005-2021		
FIN	1970-2021	1970-2021	1975-2021	1905-2016	1970-2021	1970-2021	1975-2021	1905-2016
FRA	1970-2021	1970-2021	1975-2021	1870-2016	1970-2021	1970-2021	1975-2021	1870-2016
GBR	1968-2021	1970-2021	1975-2021	1899-2016	1968-2021	1970-2021	1975-2021	1899-2016
GRC	2006-2021	1997-2021			2006-2021	1997-2021		
HKG	1979-2021				1979-2021			
HRV	2002-2021		1975-2021		2002-2021		1975-2021	
HUN	2007-2021	2007-2021			2007-2021	2007-2021		
ICL				1960-2016				1960-2016
IDN	2002-2021	2002-2021			2002-2021	2002-2021		
IND	2009-2021	2009-2021			2009-2021	2009-2021		
IRL	1970-2021	1970-2021	1975-2021	1970-2017	1970-2021	1970-2021	1975-2021	
ISL	2000-2021	2000-2021			2000-2021	2000-2021		
ISR	1994-2021	1994-2021	1975-2021		1994-2021	1994-2021	1975-2021	
ITA	1927-2021	1970-2021	1975-2021	1927-2016	1947-2021	1970-2021	1975-2021	1927-2016
JPN	1955-2021	1970-2021	1975-2021	1913-2016	1955-2021	1970-2021	1975-2021	1913-2016
KOR	1975-2021	1986-2021	1975-2021		1975-2021	1986-2021	1975-2021	
LTU	1998-2021	2006-2021			1998-2021	2006-2021		
LUX	2007-2021	2007-2021	1975-2021		2007-2021	2007-2021	1975-2021	
LVA	2006-2021	2006-2021			2006-2021	2006-2021		
MAR	2005-2021				2005-2021			
MEX	2005-2021	2005-2021			2005-2021	2005-2021		
MKD	2000-2021				2000-2021			
MLT	2005-2021				2005-2021			
MYS	1988-2021				1988-2021			
NLD	1970-2021	1970-2021	1975-2021	1870-2016	1970-2021	1970-2021	1975-2021	1870-2016
NOR	1970-2021	1970-2021	1975-2021	1870-2016	1970-2021	1970-2021	1975-2021	1870-2016
NZL	1970-2021	1970-2020	1975-2021	1970-2015	1970-2021	1970-2020	1975-2021	
PER	1998-2021				1998-2021			
PHL	2008-2021				2008-2021			
POL	2010-2021	2005-2021			2010-2021	2005-2021		
PRT	2008-2021	1988-2021		1930-2014	2008-2021	1988-2021		1930-2014
ROU	2009-2021				2009-2021			
RUS	2001-2021	2001-2021			2001-2021	2001-2021		
SAU		2014-2021						
SGP	1998-2021				1998-2021			
SRB	2000-2020				2000-2020			
SVK	2006-2021	2005-2021			2006-2021	2005-2021		
SVN	2007-2021	2007-2021	1975-2021		2007-2021	2007-2021	1975-2021	
SWE	1970-2021	1970-2021	1975-2021	1875-2016	1970-2021	1970-2021	1975-2021	1875-2016
THA	1991-2021				1991-2021			
TUR	2010-2021	2010-2021			2010-2021	2010-2021		
USA		1970-2021	1975-2021	1890-2016		1970-2021	1975-2021	1890-2016
ZAF		1970-2021	1975-2021			1970-2021	1975-2021	

Table A3: Laws introducing housing allowances

Country	Date of law	Title of law
Australia	1958-09-29	Act to amend the Social Services Act (Social Services Act 1958) (No. 44 of 1958)
Belgium	1992-07-01	Besluit van de Vlaamse Regering van 11 december 1991 tot instelling van individuele huursubsidies en een installatiepremie bij het betrekken van een gezonde of aangepaste huurwoning (Belgisch Staatsblad 17/03/1992)
Belgium	1999-01-21	Arrêté du Gouvernement wallon relatif à l'octroi d'allocations de déménagement, de loyer et d'installation (ADeL) (M.B. du 25/02/1999, p. 5629)
Canada	2022-11-17	Act respecting benefits in relation to rental housing (Rental Housing Benefit Act) (Statutes of Canada, 2022, c. 14, s. 3)
Denmark	1967-03-08	L 79 Lov om boligsikring (Samling 1966-67 (2. samling) lovforslag)
Finland	1961-06-15	Laki lapsiperheiden asumistuesta 586/1961
Finland	1975-06-04	Asumistukilaki 408/1975
France	1948-09-02	Loi n° 48-1360 du 1er septembre 1948 réglant les rapports entre bailleurs et locataires ou occupants de locaux d'habitation ou à usage professionnel (Journal officiel de la République française, 2 septembre 1948)
Germany	1963-07-29	Gesetz über Wohnbeihilfen vom 29. Juli 1963 (Bundesgesetzblatt Teil I 1963, 508)
Ireland	1998-06-15	Social Welfare (Rent Allowance) Regulations (S.I. No. 188/1998)
Italy	1998-12-09	Legge 9 dicembre 1998, n. 431: Disciplina delle locazioni e del rilascio degli immobili adibiti ad uso abitativo (Supplemento ordinario alla "Gazzeta Ufficiale", n. 292 del 15 dicembre 1998)
Japan	1971-01-04	Jūkyo teate ni kansuru kisoku
Netherlands	1970-07-01	Beschikking aanvullende huursubsidie van 1 Juli 1970 (Stcrt. 1970, 105) — Oral consultation with the Standing Committee on Public Housing on May 20, 1970
Netherlands	1975-07-01	Beschikking individuele huursubsidie van 1 Juli 1975 (Stcrt. 1975, 63)
Netherlands	1986-07-01	Wet individuele huursubsidie van 2 mei 1986 (Staatsblad van het Koninkrijk der Nederlanden 1986, 265)
Netherlands	1997-04-24	Huursubsidiewet (Staatsblad van het Koninkrijk der Nederlanden 1997, 197, 15-05-1997)
New Zealand	1975-10-10	Social Security Amendment Act 1975 (1975 No 123)
New Zealand	1993-07-01	Social Security Amendment Act (No 3) 1993 (Public Act 1993 No 57)
Norway	1947-06-15	Husleiestøtte
Norway	1973-01-30	Om boligspørsmål (Meldingar til Stortinget 76 1971-1972)

... continuation

Country	Date of law	Title of law
Portugal	2013-01-30	Decreto-Lei n.º 266-C/2012 de 31 de dezembro, estabelece o regime do subsídio de renda a atribuir aos arrendatários com contratos de arrendamento para habitação, celebrados antes de 18 de novembro de 1990, em processo de atualização de renda, e o regime de determinação do rendimento anual bruto corrigido (Diário da República, 1.ª série — N.º 252 — 31 de dezembro de 2012)
Portugal	2015-08-10	Decreto-Lei n.o 156/2015, estabelece o regime do subsídio de renda (Diário da República n.º 154/2015, Série I de 2015-08-10, páginas 5680–5686)
Spain	1978-10-31	Real Decreto-ley 31/1978, de 31 de octubre, sobre política de viviendas de protección oficial («BOE» núm. 267, de 8 de noviembre de 1978)
Sweden	1948-04-02	Kungl. Maj:ts proposition nr 231
Switzerland		
United Kingdom	1967-05-10	Housing Subsidies Act (Ch. 29. 1. Elizabeth II)
United Kingdom	1973-03-30	Rent Rebate and Rent Allowance Schemes (England and Wales) Regulations 1973 (Statutory Instruments)
United Kingdom	1983-04-01	Social Security and Housing Benefits Act 1982 (Elizabeth II, 1982. Chapter 24)
USA	1974-08-22	Housing and Community Development Act of 1974 (12 U.S.C. 1706e)

Table A4: Multi-country studies on speculative house price bubbles

Study	Period	Countries	Source	Variables	Results
Engsted et al. (2016)	1970–2013	18	OECD	price-to-rent ratio	co-explosivity
Pavlidis et al. (2016)	1975–2013	22	FRB	real price and price-to-income ratios	dating of speculative bubbles
Vogiazas and Alexiou (2017)	2002–2015	7	BIS	real price and loans-to-GDP ratio	dating of speculative bubbles
Gómez-González et al. (2018)	1970–2015	20	OECD	price-to-rent ratio	international migration of bubbles

Note: BIS = Bank of International Settlements; FRB = International House Price Database of the Federal Reserve Bank Dallas; OECD = Organization for Economic Cooperation and Development.

Table [A5](#) provides the definitions and sources of the variables used in the analysis.

Table A5: Dependent and explanatory variables

Variable	Definition	Source	Period
Chron_PSY	Binary variable of speculative bubbles (1, if bubble, and 0, otherwise)	own calculations	1883–2021
TMortg	Mortgage loans for non-financial private sector; nominal, local currency	Macrohistory	1870–2016
LTIR	Long-term interest rate, % per year	OECD and Macrohistory	1870–2016
GDP	GDP, local currency	Macrohistory	1870–2016
GDP_PC	Real GDP per capita, 2011 US dollar	Maddison	1910–2016
RGDP_growth	Growth rate of real per-capita GDP, % $\left(100 \times \log \frac{GDP_PC_t}{GDP_PC_{t-1}}\right)$	own calculations	1901–2020
Pop_growth	Population growth rate, %	World Bank WDI and Maddison	1901–2020
Debt2GDP	Government debt-to-GDP ratio, %	IMF and Reinhart and Rogoff (2010)	1820–2016
Mort2GDP	Mortgage loans-to-GDP ratio, % (TMortg/GDP)	own calculations	1870–2016
New_const	Housing completions by 1000 inhabitants	Kohl (2021)	1899–2016
Rent_laws	Index of intensity of rent control (1, if very strict rent control, and 0, otherwise)	Kholodilin (2020)	1900–2021

... continues

Variable	Definition	Source	Period
Hous_allow_intro	Binary variable for existence of housing allowances (1, if housing allowances are available, and 0, otherwise)	own calculations	1900–2021
Tax_index	Composite index of tax treatment of homeowners (1, if tax treatment is very favorable for homeowners, and 0, otherwise)	Kholodilin et al. (2023)	1901–2020
TI_imprest	Binary variable for existence of imputed rent tax (1, if tax does not exist, and 0, otherwise)	Kholodilin et al. (2023)	1901–2020
TI_deduct	Binary variable for existence of mortgage interest deduction (1, if deduction exists, and 0, otherwise)	Kholodilin et al. (2023)	1901–2020
TI_VAT	Binary variable for existence of VAT on new housing (1, if tax does not exist, and 0, otherwise)	Kholodilin et al. (2023)	1901–2020
TI_capgain	Binary variable for existence of capital gains tax (1, if tax does not exist, and 0, otherwise)	Kholodilin et al. (2023)	1901–2020
fullrecourse	Degree of lender recourse on mortgages (1, if full recourse on mortgages, and 0, otherwise)	Cerutti et al. (2017)	1970–2012
MaxLTV	Upper limit of LTV, %	Cerutti et al. (2017)	1970–2012
fretail	Funding model (1, if primary funding source of banks' mortgages are retail deposits, and 0, otherwise)	Cerutti et al. (2017)	1970–2012
fmortbonds	Funding model (1, if primary funding source of banks' mortgages are mortgage bonds (covered bonds), and 0, otherwise)	Cerutti et al. (2017)	1970–2012
fsecurity	Funding model (1, if primary funding source is through securitization, and 0, otherwise)	Cerutti et al. (2017)	1970–2012
fwholesale	Funding model (1, if primary funding source is through wholesale, and 0, otherwise)	Cerutti et al. (2017)	1970–2012
fother	Funding model (1, if primary funding source is through wholesale, and 0, otherwise)	Cerutti et al. (2017)	1970–2012

Note: IMF = International Monetary Fund Data (<https://www.imf.org/en/Data>); Macrohistory = Jorda-Schularick-Taylor Macrohistory Database (<http://www.macrohistory.net/data/>); Maddison = Maddison Historical Statistics (<https://www.rug.nl/ggdc/historicaldevelopment/maddison/>); OECD = Organization for Economic Cooperation and Development Housing prices data (<https://data.oecd.org/price/housing-prices.htm>).

Robustness regressions

Table A6: Estimation results of models with speculative bubble chronologies based on the [Goodhart and Hofmann \(2008\)](#) approach, 1902–2018

	Model 1	Model 2	Model 3	Model 4
Real GDP growth $_{t-1}$	0.017 (0.013)	0.019 (0.013)	0.025 (0.018)	0.030 (0.018)
Population growth $_{t-1}$	0.272** (0.130)	0.338** (0.133)	0.276 (0.186)	0.367* (0.194)
Long-term interest rate $_{t-1}$	0.071*** (0.020)	0.068*** (0.021)	0.052** (0.025)	0.067*** (0.026)
Govt debt-to-GDP ratio $_{t-1}$			-0.630*** (0.232)	-0.691*** (0.230)
Mortgage debt-to-GDP ratio $_{t-1}$			1.089** (0.464)	1.269** (0.503)
New construction $_{t-1}$			0.188 (0.129)	0.214 (0.133)
Rent control $_{t-1}$	-0.393** (0.190)	-0.479** (0.197)	-0.121 (0.237)	-0.335 (0.250)
Housing allowance introduction $_{t-1}$	-0.564*** (0.141)	-0.330* (0.170)	-0.559*** (0.201)	-0.582*** (0.211)
Owner tax bias $_{t-1}$	-0.496 (0.414)		-0.850* (0.506)	
Imputed rent tax exemption $_{t-1}$		-0.667*** (0.204)		-0.514** (0.238)
Mortgage interest deduction $_{t-1}$		-0.035 (0.251)		-0.152 (0.303)
VAT exemption $_{t-1}$		-0.360** (0.178)		-0.457** (0.205)
Capital gains tax exemption $_{t-1}$		0.722*** (0.232)		0.911*** (0.318)
Log Likelihood	-881.005	-870.765	-730.663	-722.834
Number of observations	1637	1637	1402	1402

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

Table A7: Estimation results of models with speculative bubble chronologies based on the [Goodhart and Hofmann \(2008\)](#) approach, 1950–2018

	Model 1	Model 2	Model 3	Model 4
Real GDP growth $_{t-1}$	0.120*** (0.034)	0.123*** (0.034)	0.129*** (0.038)	0.130*** (0.038)
Population growth $_{t-1}$	1.018*** (0.213)	1.064*** (0.216)	0.771*** (0.241)	0.795*** (0.247)
Long-term interest rate $_{t-1}$	0.111*** (0.025)	0.119*** (0.027)	0.097*** (0.029)	0.108*** (0.031)
Govt debt-to-GDP ratio $_{t-1}$			-0.963** (0.406)	-0.963** (0.409)
Mortgage debt-to-GDP ratio $_{t-1}$			1.667*** (0.569)	1.660*** (0.612)
New construction $_{t-1}$			0.513** (0.209)	0.512** (0.221)
Rent control $_{t-1}$	-0.159 (0.384)	-0.172 (0.432)	-0.332 (0.413)	-0.496 (0.452)
Housing allowance introduction $_{t-1}$	0.536** (0.236)	0.385 (0.258)	0.282 (0.262)	0.142 (0.276)
Owner tax bias $_{t-1}$	-0.284 (0.605)		-0.295 (0.636)	
Imputed rent tax exemption $_{t-1}$		-0.012 (0.277)		-0.101 (0.302)
Mortgage interest deduction $_{t-1}$		0.189 (0.375)		-0.008 (0.404)
VAT exemption $_{t-1}$		-0.428* (0.258)		-0.305 (0.282)
Capital gains tax exemption $_{t-1}$		0.578 (0.400)		0.695* (0.416)
Log Likelihood	-535.241	-533.282	-510.544	-508.576
Number of observations	1104	1104	1071	1071

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

Table A8: Estimation results of models with speculative bubble chronologies based on the [Goodhart and Hofmann \(2008\)](#) approach (pooled model), financial regulations, 1970–2012

	Model 1	Model 2
Intercept	−7.717*** (1.383)	−4.836*** (1.616)
RGDP_growth _{t−1}	0.114** (0.047)	0.114** (0.048)
Pop_growth _{t−1}	0.649** (0.278)	0.851*** (0.309)
LTIR _{t−1}	0.107*** (0.034)	0.085** (0.036)
Debt2GDP _{t−1}	0.198 (0.420)	−0.632 (0.529)
Mort2GDP _{t−1}	1.447*** (0.510)	1.132** (0.548)
New_const _{t−1}	0.547** (0.270)	0.527* (0.285)
Rent_laws _{t−1}	−0.208 (0.469)	−0.102 (0.502)
Hous_allow_intro _{t−1}	0.424* (0.240)	0.638** (0.274)
fullrecourse	−0.611 (0.678)	−1.273 (0.791)
MaxLTV	0.022*** (0.007)	−0.007 (0.010)
fretail	1.996*** (0.570)	2.397*** (0.629)
fmortbonds	2.036*** (0.735)	2.569*** (0.797)
Tax_index _{t−1}	0.151 (0.562)	
TI_imprent _{t−1}		0.082 (0.277)
TI_deduct _{t−1}		0.571* (0.333)
TI_VAT _{t−1}		−0.612** (0.240)
TI_capgain _{t−1}		1.011*** (0.316)
AIC	752.338	742.099
BIC	815.688	819.025
Log Likelihood	−362.169	−354.050
Number of observations	682	682

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

Narrative bubble and boom chronologies

Australia

Australia's economy and population grew strongly between 1850 and 1890, leading to high demand for housing. In the 1880s, due to the need for new dwellings, housing prices and rents rose sharply, thus fueling a speculative housing construction boom. In Melbourne, house prices rose strongly until 1889 and crashed thereafter due to land speculation (Cannon, 1966; Davison, 1978). In Sydney, the boom-bust cycle was less pronounced, but prices collapsed as well after 1892 (Stapledon, 2012).

In the following years, housing markets recovered, until WWI put an end to the upturn, as rent control and interrupted immigration made investments in real estate less attractive. After the war, housing markets recovered again and, in the 1920s, new construction increased strongly until the end of the decade. The boom occurred mainly in the growing urban areas and, as the example of Sydney shows, was fueled by speculative behavior. Housing construction declined even before the Great Depression. After 1929, the speculative boom crashed. Poverty increased and housing prices fell, although not as strongly as in the 1890s (Berry, 1984; Stapledon, 2012).

During WWII, as in other nations, interventions in the housing market were introduced in Australia. Rents were regulated from 1939, with house and land prices controlled between 1942 and 1949, which caused real prices to decline and the emergence of a black market. Rent control was reduced only gradually from 1952 until the 1960s, but the lifting of house price controls in 1949 led to a sharp rise in house prices in 1950 already. In the early 1950s, the prices of rental apartments rose at slower rates than those of detached homes and the share of rental housing declined, while the ownership rate increased — most probably effects of rent control (Berry, 1999; Stapledon, 2007).

The postwar period saw growth in the Australian economy and an improvement in living standards. In 1950, real house prices exceeded 1890 levels for the first time. Post-1950, rental and house prices rose steadily and strongly, interrupted only temporarily by those crises occurring during the 1970s, 1980s, 1990s, and the 2000s. According to Stapledon (2012), rising house prices were strongly correlated with rising land prices. While high volumes of developed land lots in the 1880s-boom and the transportation revolution kept land prices low throughout the first half of the 20th century, beginning in the 1940s, governmental regulations that restricted

land supply and high-density development had the opposite effect.

The population grew by about 50% between WWII and the early 1970s, with particularly strong growth in the Sydney and Melbourne metropolitan areas. This development was characterized by suburbanization and suburban homeownership. Due to the economic upswing and population growth, private investment flowed strongly into housing construction, further facilitated by mortgage lending from financial institutions (Ryan-Collins and Murray, 2023). In Sydney, house prices more than doubled between 1950 and 1974, and in Melbourne they rose by about half (Stapledon, 2012).

In 1973–1974, Australia entered a deep recession. This led to a decline in new construction activity and a fall in house prices, but house prices reached new (regional) peaks at the beginning and the end of the 1980s. Since 1996, real prices have risen strongly. The financial crisis did not lead to a significant slowdown in price increases in Australia in the long run and the price boom developed into “the biggest housing cycle since 1880” (Stapledon, 2012, p. 311).

Most existing econometric studies locate speculative boom periods in the early 2000s, when capital gains taxes were reformed (Shi et al., 2016; Abelson and Chung, 2005), and again in the mid-2010s (Shi et al., 2020), also driven by mortgage and unemployment rates (Wang et al., 2019), with bubble likelihood higher in the capital cities. The Australian case is special in that, fueled by financial liberalization (Ryan-Collins and Murray, 2023), neither the Global Financial Crisis nor the post-COVID-19 interest-rate shock have brought national price trends down.

Belgium

At the end of the 19th and beginning of the 20th century, investment in housing and working-class dwellings increased. This was due to an increasing number of families, temporarily rising real wages, falling interest rates, and rising rents. The housing boom ended in the years before WWI, when the number of family formations slowed down and conditions for investors tended to decline (Buyst, 1992).

Belgium was hit hard by WWI and the housing conditions worsened strongly during the war. Destruction and a very low level of new building activity led to an acute housing shortage. Rent control was introduced in 1919, followed by housing subsidies in 1920 to stimulate new construction (Bettendorf and Buyst, 1997). Private investors remained on the sidelines due to the regulations and uncertainty. At the same time, as a result of severe inflation, the value

of residential buildings fell sharply in real terms. However, real house prices did not fall as strongly as real rents — most probably in anticipation of the subsequent liberalization of rent controls. As a result, there was a sharp rise in the price-to-rent ratio. After the end of the monetary crisis of 1926, and strong deregulation of rent controls, rents rose sharply and investor activity suddenly revived. New construction reached a new peak in 1929 and real house prices rose strongly (Buyst, 1989). New construction activity remained high even during the Great Depression. Due to a lack of investment alternatives and due to high rents, (speculative) investments in housing remained attractive. It was not until the mid-1930s, due the banking crisis and the threat of war, that investment fell sharply (Buyst, 1992).

Real house prices fell sharply during WWII. Occupied Belgium suffered from wartime destruction: the number of newly constructed dwellings fell significantly and a rent freeze was reintroduced, albeit not as strictly as after WWI. Private construction activity regained momentum by the end of the 1940s, with new construction activity increasing considerably in the following decades (Buyst, 1992). As had been the case since the 19th century (Mougenot, 1988), ideology, housing policy, and market forces sought to increase single-family home construction and homeownership. Overall, real house prices tended to rise significantly in the post-war period, interrupted by periods of crisis in which new construction activity and house prices fell temporarily. Real house prices continued to rise sharply even after the oil price shock of 1973, but were hit hard after the second oil price shock of 1979. Changes in the household structure in conjunction with housing policy and the economic crisis led to a severe housing crisis in the 1980s (De Decker, 2002). New construction activity plummeted and real house prices fell dramatically.

The Belgian housing market experienced another boom that began at the turn of the century and came to an end in 2013. Between 1999 and 2013, the average price of a single-family home increased by 150%, while building land prices increased by more than 200%. In contrast, construction and consumer prices rose by only about 25–30% over the same period. Brussels recorded the strongest increase of all the regions in Belgium. Overall, the Belgian housing market was overvalued by 28%, taking into account the relatively low interest rates. In addition, the loan-to-value ratio was over 90% in 2013, while default rates were very low (Zwart, 2015).

There was only a short break between the earlier real estate boom and the latest one,

which started in 2015 and will end in 2021. The boom varied in the three regions of Flanders, Wallonia, and Brussels, but there was a sharp rise in property prices in all regions. The differences between the regions are due to different income levels and prices for building land. Reasons for the boom were the housing premium introduced in 2005, which included an increase in tax incentives for home ownership, and the shift of responsibilities from the national to the regional level in tax policy related to tax incentives for housing loans. In 2019, house prices increased by 4%, and in 2020 by 4.2%, although the number of sales transactions decreased due to the onset of the COVID-19 pandemic. Around the same time, the Belgian housing market saw a 15–20% increase in the price-to-income ratio. The loan-to-value ratio declined due to mortgage payment suspensions resulting from the COVID-19 crisis. In 2021, the increase in housing prices weakened ([Gompel, 2021](#)).

Canada

Between 1851 and 1921, Canada developed from a rural to an urban country, with urban centers growing strongly and with 47% of the population living in urban areas in 1921. The development was marked by construction cycles, housing crises, speculative building, and unplanned suburbanization ([Harris, 1987](#); [Goheen, 1980](#)). Fueled by economic growth and the construction of the railroad, Montreal experienced a building boom from the mid-1860s that collapsed in 1875. In the 1880s, inner migration to the cities, stimulated by protective policies to promote industrialization, led to speculative building booms in the urban and suburban areas ([Burley, 1988](#)). This coincided with the first speculative large building companies ([Doucet and Weaver, 1991](#)). The boom ended by the end of the decade. Following the depression of the early 1890s, which brought construction to a halt, a new boom-bust cycle started in the late 1890s, likely tied to the expansion of the wheat economy and the spread of the streetcar ([Buckley, 1952](#)).

As a result, there was a speculative boom of subdivisions in the suburbs of cities like Toronto, which produced an oversupply of land, peaking around 1912 and declining during WWI ([Harris, 2004](#)). This led to the first limited and temporary government interventions in the housing market. After the war, new construction began to rise again, reaching a new peak in 1929 ([Buckley, 1952](#)). The short-lived boom ended with the outbreak of the Great Depression. House construction fell by a third until 1933. Available data suggest that house

prices were relatively stable in the 1920s, but declined together with rent prices (in nominal terms) in the aftermath of the Great Depression. Federal government interventions in the housing market were both late and reluctant, and interventions remained limited when the first major national housing legislation, the Dominion Housing Act was introduced in 1935, respectively the National Housing Act in 1938 (Oberlander et al., 1993).

During WWII, immigration into the cities due to the booming war economy led to a severe housing shortage and, by the end of the war, the housing situation worsened. The government introduced the new Housing Act of 1944 and in 1946 the Central Mortgage and Housing Corporation (from 1979 Canada Mortgage and Housing Corporation) was established (Oberlander et al., 1993). Due to the rapid population growth and the economic recovery, real house prices began to rise during the war.

The population continued to grow in the postwar period and construction activity increased. The government implemented social housing policies and intervened more strongly in favor of social housing and urban renewal from the 1960s onward. However, in general, post war housing policy was strongly market- and home-owning oriented (Suttor, 2016). Development in the post-war housing market was characterized by two divergent trends. On the one hand, population growth, rising incomes, urbanization, and increasing quality led to rising house prices. On the other hand, real rental prices fell, resulting in a sharp rise in the price-to-rent ratio. The strong increase in real house prices and the price-to-rent ratio was interrupted only by the recessions of the early 1960s, the mid-1970s, the 1980s, and the early 1990s (Miron and Clayton, 1987).

Since 1998, real house prices have risen sharply. The housing bubble has been encouraged by government policies and stimulated by easier access to mortgage credit and lower lending standards. The Global Financial Crisis 2008–2009 led only to a slight and short-term decline in house prices due to more conservative lending regulation (Walks, 2014), with real house prices reaching a new all-time high in the early 2020s before starting a strong decline in 2022 (Colmar, 2023).

Denmark

Political and economic changes between 1849 and 1915, characterized by industrialization, which was strongly based on agriculture, liberalization, and railroad construction, gave rise to rapid urbanization (Larsson and Thomassen, 2003). Yet Denmark was facing a severe housing

crisis prior to WWI and, after the outbreak of WWI, a housing shortage developed. As a result of sharply rising rents, a rent freeze was introduced in 1916 ([Whitehead et al., 2012](#)). Subsequently, real house prices fell, although they were not affected as much as real rents, which caused the price-to-rent ratio to rise sharply until 1921. After the war, the rent freeze was gradually relaxed until 1931, with new housing construction increasing and real house prices recovering until they fell again during the Great Depression.

In the wake of WWII, rent control and other housing regulations were reintroduced. New construction collapsed and a housing shortage occurred. Real house prices fell sharply during these years ([Vestergaard, 2007](#)).

The Danish economy recovered swiftly after the war. In the postwar years, the number of new buildings increased due to state subsidies for social housing, but rent control remained in place. Real house prices reached new all-time peaks, then fell in the early 1950s and remained stable for almost a decade. The 1960s and 1970s saw a sharp increase in new construction, particularly of single-family homes. Negative real interest rates and legislation that favored homeowners, together with inflation and sharply rising house prices, made the single-family home an important investment for broad sections of the population. The housing boom, which was highly speculative, as our data suggest, came to an end in the mid-1970s during the economic crisis ([Vestergaard, 2007](#)). Towards the end of the 1970s, house prices boomed again briefly before collapsing strongly in real terms.

The Danish economy and housing market experienced another boom in the mid-1980s. Devaluation and inflation expectations were lowered in the 1980s following the shift to a consistent fixed exchange rate policy in 1982 and the abolition of the automatic cost-of-living adjustment. However, the resulting decline in interest rates also fostered a strong boom with overheating of the economy. Home prices increased by 20–25% during the boom. Another reason for the rise in the housing market was very high credit growth, as deposit and mortgage banks lent to poor customers ([Abildgren, 2018](#)). The bursting of the Danish real estate bubble in the mid-1980s was intertwined with the country's financial crisis. The bubble began in 1986, and Denmark faced high unemployment rates and a higher number of forced sales throughout the bubble period. Real estate prices fell by about 25%. To prevent a further downturn and future crises, the Danish government introduced tax reforms in 1987 to reduce the tax value of interest

deductibility. As a result, the real interest rate became positive, which created incentives for people to save. The bust ended in 1989 (Abildgren, 2018).

Several factors were responsible for the boom in the first decade of the 21st century. On the one hand, household disposable income increased significantly, while interest rates were relatively low. On the other hand, property taxes were frozen in 2001 and deferred amortization mortgage loans were introduced in 2003. Both factors led to a 15–20% increase in real estate prices, especially in the capital Copenhagen. The boom ended in 2007 (Abildgren, 2018). However, although house prices have fallen sharply post-2007, they have subsequently recovered, by 2023 prices had climbed to new record highs.

Finland

Finland was still an agrarian country at the end of the 19th century. The degree of urbanization was low from an international perspective, but speculative building and economic cycles were common in Finland's cities (Juntto, 1992; Kotavaara et al., 2011). During WWI, housing production declined and, in the early 1920s, a severe housing crisis occurred (Ruonavaara, 1999).

Between 1920 and 1928, national housing construction increased steadily. When the state introduced a government credit system that granted loans to self-builders, the construction cost index rose by 30%. At the same time, the price indexes for housing services and purchases increased by 60 and 15%, respectively (Ruonavaara, 1999). Another indicator of the booming housing market was the constant increase in the ratio of housing capital to GDP, which rose from 5.7 in 1911 to 10.6 in 1920 but declined thereafter. Housing investment also increased by 60% by 1925 and through 1928 there was an increase in financial speculation.

The housing boom came to an end during the Great Depression. The collapse of the Finnish housing market was linked to the country's banking collapse and an economic recession at the beginning of the Great Depression in 1930. Several banks went bankrupt or had to merge with other institutions. To prevent further speculation in the housing market, the government introduced a new lending policy, overseen by a parastatal mortgage bank that lent only to non-speculators, but lost its importance in the wake of the Great Depression. The ratio of housing capital to GDP fell from 6.0 in 1926 to 5.0 in 1929 (Herrala, 1999).

During WWII, new construction collapsed, housing markets were again subject to rent

regulations (Kettunen and Ruonavaara, 2021), and real housing prices fell significantly.

Real house prices remained at low levels until the 1950s. Rent regulations were continued after the war and partially removed in 1961, but reintroduced in 1968 (Kettunen and Ruonavaara, 2021). Following WWII, the vast majority of the population still lived in the countryside. However, in the 1960s, a late but strong urbanization set in, with large and high-rise residential buildings being built on the outskirts of the cities (Vaattovaara et al., 2018) and (prefabricated) wooden one-family houses in new settlements (Korvenmaa, 1990). Real house prices increased strongly during these years, until collapsing in the 1970s.

During the 1980s and 1990s, Finland experienced a new boom-bust cycle. Before 1986, the Finnish central bank monitored bank deposit and lending rates, imposing the requirement that before one could take out a mortgage, homebuyers had to deposit 20–50% of the purchase price into a bank account. In 1986, the Finnish government decided to liberalize the financial markets. As an immediate result, the country experienced a credit boom, which led to rapid economic growth, high employment levels, an increase in consumption, falling saving rates, and a rapid increase in real estate prices. The Bank of Finland no longer provided guidelines for pre-saving, which led to mortgages being linked to market interest rates and even 100% loans becoming possible. As a result, the number of first-time buyers tripled in 1988 and housing construction boomed. The stock of home loans also increased by 24% in 1988 and 16% in 1989 (Tähtinen and Laanti, 2016). The real estate bubble in the early 1990s began to burst in 1991. During the recession, Finnish GDP fell by 12% and unemployment rose from 3.2% in 1990 to 16.4% in 1994. The banking crisis spurred the collapse of the overheated housing market, with house prices plummeting by almost 50%, combined with a collapse of the housing sector. After the collapse, banks changed their lending policies and the government began to reform the tax system to stop the recession and prevent future bubbles (Tähtinen and Laanti, 2016). After the burst of the bubble, house prices began to rise again. In the wake of the Global Financial Crisis 2008–2009, prices dropped slightly, but were still very high in historical perspective.

France

The available data on Paris indicate that house prices fluctuated strongly in cyclical terms in the 19th century. In 1914, real prices were significantly higher than at the beginning of the 20th century and had risen much more strongly than in previous centuries. After 1850, France

had experienced a boom under Napoleon III, which led to rising house prices ([Harvey, 2004](#)). Defeat following the Franco-Prussian War in 1871 and the issuance of government bonds led to a short-term slump in house prices. However, industrialization caused prices in Paris to rise sharply again thereafter until the beginning of the 20th century ([Monnery, 2011](#)).

During WWI, house prices in Paris collapsed by two-thirds in real terms due to the war and the rent freeze introduced during wartime. Price controls were maintained after 1918, with regulations often being modified. During the Great Depression, real house prices recovered as investors viewed real estate as a “safe haven.” By the mid-1930s, however, house prices began to fall again following rent reductions imposed by the government and deflationary policies ([Friggit, 2009](#)).

Surprisingly, real house prices rose after the outbreak of WWII — a development that French economist Jacques Friggit attributes to a lack of consumption opportunities and higher savings rates ([Friggit, 2009, 2018](#)). However, by the end of the war, warfare, destruction, and rent control led to a collapse in housing wealth, and by 1950 the real value of Parisian dwellings had fallen to less than one-tenth of their pre-1914 level. Relative to 1939, real house prices in France had fallen by four-fifths, and investors were consequently reluctant to invest in residential real estate ([Monnery, 2011](#)).

House prices recovered after the war. As a result of the deregulation beginning in 1948 and the economic boom, real house prices rose strongly from the 1950s until 1965. In the mid-1960s, house prices in Paris returned to pre-1914 levels for the first time. After 1965, prices rose at a slower pace. In the years up to 2000, house prices grew at about the same rate as household disposable income in the long run, but in the short run, trends were characterized by boom/bust episodes. Although the crisis of the mid-1970s did not cause prices to fall, prices declined during the crises of the early 1980s and 1990s. The boom at the end of the 1980s and the slump in the early 1990s were particularly pronounced in the Paris metropolitan area ([Friggit, 2009](#)).

In the 2000s, house prices rose rapidly and at a much stronger rate than household incomes. During the Great Recession of 2008–2009, house prices fell, although in Paris they recovered quickly and continued to rise strongly, contrary to France as a whole.

Germany

In the 19th century, German urban housing markets were characterized by pronounced business cycles. Periods of high construction activity and rising vacancy rates, often driven by speculation, alternated with periods of declining construction activity and falling vacancy rates. Cities did not always exhibit the same rhythms, but there was often a certain degree of simultaneity (Wischermann, 1997; Wellenreuther, 1989).

During WWI, new construction activity collapsed (Führer, 1995b). Real house prices fell sharply until the early 1920s, with the housing stock largely devalued. It took until the 1960s for real house prices to return to 1914 levels. WWI, the postwar crisis, and the Great Depression caused profound disruptions in the housing market. Housing shortage prevailed and between 1920 and 1923, vigorous rental housing market regulations were introduced. Low returns, high construction costs, high interest rates, and rent control lowered investor's expectations and investments, with new housing construction strongly driven by subsidies. The slow recovery in the 1920s ended with the Great Depression, when real house prices fell again (Führer, 1995a).

The disaster of WWII worsened the housing situation. A rent freeze had already been reimposed in 1936 and regulations were tightened during the war (Kholodilin et al., 2017). War and destruction led to disastrous housing conditions and a major housing shortage. After the war, there was a lack of millions of housing units, with a large part of the remaining stock damaged (Führer, 1995b).

Due to the housing shortage, tenant protection and rent control were maintained after the war, while housing construction was heavily subsidized. The economic boom beginning in the 1950s was accompanied by a housing boom. The housing stock doubled between 1949 and 1972. From 1960, rent control and tenant protection was strongly liberalized. Deregulation, population growth, and the economic boom caused rents and real house prices to rise strongly in the 1960s, further fueled by speculation. Due to tight housing markets and widespread public critique, tenant protection legislation was re-adopted in 1971 (Kühne-Büning et al., 1999; Führer, 2016). New construction collapsed after the oil price crisis, but the bust that followed the price boom was rather modest, with comparatively moderate falls in real house prices.

Throughout the following years, real house prices remained rather stable in international perspective. While numerous countries experienced a real estate boom in the 1990s, real prices

fell in Germany after the reunification. This may be explained by housing oversupply and credit lending, which was not increased as much as in other countries ([Baldenius et al., 2020](#)). Since the 2010s, however, real house prices have risen sharply, especially in the major cities.

Great Britain

At the onset of the 20th century, house prices initially maintained high levels inherited from the foregone century but soon started to decline. Prices significantly dropped when the People's Budget of 1909 was proposed, which introduced social measures that needed to be financed through taxation of land and income. The richest one percent of people at the time owned 67% of property, making the members of the House of Lords one of the groups most affected by this tax burden — they vetoed the budget and caused a constitutional crisis ([Monnery, 2011](#)).

During WWI, construction costs increased threefold and housing prices rose to 75% over prewar values by 1919. By 1920, nominal prices had risen due to postwar inflation, but real prices almost halved since the start of the century. This decrease in real prices was linked to the death toll of the war, the 1918–1920 influenza pandemic, and incipient government housing supply-side policies. Simultaneously, the tax burden on middle-class incomes was increased as investments to rebuild the economy needed financing ([Monnery, 2011](#)).

While nominal prices fell due to deflationary forces, real housing prices actually recovered to reach pre-WWI levels. As during the Great Depression, the cost for building, mainly wages, fell and exports decreased. Meanwhile, more businesses turned to construction as a source of income. While 1.5 million houses were built with state assistance across England and Wales in the 1920s, the figure nearly doubled in the following decade. The building society movement, which financed about 75% of new houses built in the 1930s, experienced rapid growth during this decade. Mortgages started to take on a form comparable to the contemporary model, which opened up opportunities for middle-class families and some skilled workers to buy a house by financing it. Despite the construction boom, house prices neither increased nor crashed. The construction sector played a sizeable role in getting the country through the Great Depression through the jobs it provided ([Monnery, 2011](#)).

At the beginning of WWII, house prices initially dipped. While there was little construction during the war, the blitzkrieg warfare of Nazi Germany destroyed or damaged a lot of houses. Thus, a housing shortage ensued and real house prices increased again halfway through the

war. After the war, housing was not prioritized by the Ministry of Health. Through the 1950s until 1970s, many houses were built by the state as well as by the private sector. By the early 1950s, nominal house prices reached a new record and real prices also rose. House prices were experiencing a postwar boom, which was going to last for several decades after a slight dip in the early 1950s ([Monnery, 2011](#)).

Another real estate boom took place between 1999 and 2008. There were several reasons for the sharp rise in real house prices. Demographic changes due to higher immigration to the UK drove the growing demand for houses and the total number of households. Supply was too slow to meet high demand as the UK faced limited construction. Banks supported investors' general belief that house prices would rise by easing deposit requirements and making mortgage costs more bearable through low interest rates and rising incomes. As a result, mortgage debt rose sharply. In 1999, outstanding mortgages were 50% of GDP, rising to 90% of GDP in 2007; at the same time, the loan-to-income ratio in the UK increased from twofold to threefold by the early 2000s. The combination of available mortgages, which allowed loans of up to 125% of property value, alongside low real and nominal interest rates was another driver of the housing boom. Mortgage rates, which were around 8% in the 1990s, made it possible to borrow 95% of a home's value at an interest rate of less than 4% during the boom. Additionally, new financial products, such as mortgage-backed securities and collateralized debt obligations, were created to generate new avenues for investment and profit, while more funds would be made available for lending. With these, the original lenders were enabled to offload much of the risk of borrowing and more lending was facilitated, "as loans could be recycled providing capital for further loans" ([Bone and O'Reilly, 2010](#)).

When the US sub-prime fallout and Northern Rock crisis hit, the far greater risk of these lax lending practices became visible. Northern Rock was no longer able to sell its own securitized loans and, with the collapse of the US subprime market, it struggled to secure ongoing funding. Panicking depositors withdrew over £1 billion in mere days when the UK government decided to partially nationalize Northern Rock. The housing market was deeply affected. Between January 2008 and January 2009, house prices fell by over 11%. Gross new mortgage lending decreased by around 30% in 2008, while the total number of residential real estate transactions fell by 56% and housing starts by 44%. The bankruptcy of Lehman Brothers, which triggered

the financial crisis, caused tightening credit conditions and a further fall in asset prices. Apart from Northern Rock, a host of other mortgage lenders in the UK were partially nationalized by the government or merged with other institutions to avoid bankruptcy. Average incomes saw a decline of growth from 4% in mid-2008 to almost 1% in 2009, which marked the end of the crisis and the beginning of the recovery of the UK housing market ([Whitehead and Scanlon, 2012](#)).

Italy

During the 1880s, a boom that was closely linked to the growth of the construction industry and building speculation occurred. The building boom began in the large cities of Florence and Milan between 1865 and 1870, accelerating through 1880. Around the same time, and starting in 1883, building speculation took off. On the one hand, the construction industry in Rome experienced a strong boom and, on the other hand, a restoration law was passed in Naples after the cholera epidemic. Speculation led to high profits being made on the purchase of building land, even if high interest rates had to be paid. An influential player in this process was Banca Tiberina, whose collapse triggered a banking crisis in the country ([Bartoletto et al., 2018](#)).

After WWI, Italy faced a severe scarcity in housing supply and large parts of the population faced poverty. People decided to occupy land in the countryside as well as empty houses. In response, the government prolonged its rent freeze, originally enacted during the war, until 1920 while also trying to stimulate new construction for low-income families through tax incentives. After the fascist regime came to power in 1922, it liberalized rent control in 1923, including exemptions for the newly built dwellings. While, in 1927, in response to the dire economic situation, the regime enforced decreases of rent prices by law, it simultaneously also decreased property taxes. A law passed in 1928 guaranteed tax exemptions for dwellings built within a certain time frame. A new market emerged as these measures helped a new class of real estate developers, constructors, and rentiers ([Di Feliciano and Aalbers, 2018](#)).

The fascist regime regarded the construction sector as the driving sector of the economy and, hence, it enabled massive liberalization of said sector. This aided in the massive expansion of related real estate and financial activity. Consequently, construction increased alongside land credit and mortgages for urban properties. By 1931, homeownership had massively increased. During this period of autarky, homeownership was promoted as a means to stimulate the econ-

omy, thus igniting a transition of the housing market toward homeownership as the preferred form of tenure (Di Feliciantonio and Aalbers, 2018).

Between 1927 and 1934, house prices in Italy's main cities fell by 35–40% in nominal terms. It took another 7 years for house prices to recover and reach pre-1927 levels, with new buildings recovering somewhat faster than older buildings. The decline in house prices is linked in time to a decline in land prices (Cannari et al., 2016). Between 1950 and the 1970s, real prices saw a slow, but steady increase until they started to skyrocket in 1974 (and collapsed again in 1975), as households fled into real estate given inflation uncertainty and new supply declined (Marzano et al., 2023).

The largest increase in Italian house prices to date began in the 1970s and ended in the 2010s (Marzano et al., 2023), with particular boom periods between 1974 and 1982, between 1987 and 1992, and between 1999 and 2007, as well as bust periods between 1982 and 1986 and between 1993 and 1999 (Agnello and Schuknecht, 2011). During this cycle, house prices tripled, which is also reflected in the ratio of the country's wealth to GDP. Two-thirds of the increase in household wealth relative to GDP can be attributed to the sharp rise in real house prices, which, in turn, is closely linked to the rise in construction land prices. Some factors behind the price increase were demographic pressures and urbanization, which led to higher demand for housing in central areas. In 1978, the government introduced a second-generation rent act, which introduced rent control that only allowed for a 75% inflation correction during leases and made rent conditional on the quality of the dwelling (Iannello, 2022). This made investments in rental housing less attractive, causing a reduction in the supply of rental housing. Thus, new construction of rental houses not only stagnated, but some of the stock was even transformed into owner-occupied real estate (Voigtländer, 2009). The year after the new rent act was put in place, house prices began to take off, which was caused by rising demand and a decrease in the supply of new housing. High interest rates in the 1980s caused investors to stay away from new construction. The construction of public housing in this period was largely sidelined and a lack of planning led to a misallocation of resources in the real estate market (Cannari et al. (2016); van Hees (1991)). Still, compared to similar countries in the region, like Spain, Italy did not witness a comparable bubble and burst in 2008 due to its less liberalized and internationalized mortgage system (Bulbarelli, 2016).

Japan

From the late 19th century until 1945 real housing prices largely stagnated in Japan (Knoll et al., 2017). After WWII, Japan faced a mix of a volatile economy, a growing middle-class, increasing urbanization, and a resulting surge in new housing construction alongside steadily rising house and land prices. Next to these socio-economic changes, the Japanese government changed its housing policy and encouraged homeownership through the introduction of the Government Housing Loan Corporation in 1950, the Public Housing Law in 1951, and the Japan Housing Corporation Law in 1955, all with the intention to strengthen the country's middle class (Hirayama and Ronald, 2007).

The steady rise of residential land prices of 2% annually transformed into price inflation between 1985 and 1990. This occurred in many major cities like Tokyo, Osaka, and Nagoya, reflecting the Japanese Bubble Economy (Okina et al., 2001; Dehesh and Pugh, 1999). Between 1987 and 1990, residential land prices in the three major cities more than doubled due to relaxed monetary conditions, like the lowering of the official discount rate by the Bank of Japan to a historic low of 2.5% and long-term interest rates falling from 6.6% in 1985 to 3.8% in May 1987 (Noguchi, 1994). In addition to structural economic changes in Japan, the non-financial corporate sector increased its land purchases dramatically between 1985 and 1989, while banks lent huge amounts of yen to real estate businesses. Noguchi (1994) referred to it as “speculative purchases,” which resulted in the Japanese housing bubble.

The burst of the bubble led directly to what is commonly referred to as the “lost decade:” people who purchased a house during the bubble years have lost more than 50% of their property asset (Hirayama and Ronald, 2007). The sharp decline in the aftermath of the burst of the bubble was followed by an ongoing recession of house and land prices until around 2010. After 2010, the country's housing market is increasing again but has not reached the levels of the peak of the housing bubble of 1987–1990.

Netherlands

In the 19th century, the Netherlands was enduring a long and deep economic crisis. Housing prices, which had been decreasing since the end of the 18th century, stayed low during the first half of the nineteenth century. During the second half of the century, prices gradually improved. Data from Amsterdam show that the onset of the Dutch industrialization led to an

increase in the population, probably driving up demand for the rather constant housing supply. During and shortly after WWI, house prices decreased due to a decrease in demand and an increase in interest rates due to the economic recession caused by the war. During WWI, the Dutch government's expenditures increased, while revenues did not follow suit. This led to the increase in interest rates, as the government issued bonds to finance the war efforts. After the war, the government subsidized construction costs to prevent shortages in the housing supply. When the postwar depression set in, housing prices declined considerably ([de Jong, 2005](#)).

While house prices recovered after and nominally peaked in the 1920s, they fell substantially during the depression period due to the deflation of the Dutch currency, which was still adhering to the gold standard up until 1936 ([Bernanke, 2000](#)). For the interwar period as a whole, both the nominal and the real price indices show a decrease in real estate value with a very high volatility. During WWII, real house prices increased again as a consequence of inflation, population growth, and a reduction in the housing stock. This development continued when the war ended even though the government worked to rebuild the housing stock. The development in the following decades saw the nominal price index increase to unprecedented levels ([Eichholtz, 1997](#)).

House prices have seen considerable increases up until 1979, when they started to decline sharply. The increase in prices during this lengthy period since WWII is attributed to government measures, economic determinants, and demographic factors. Not only did the Netherlands Central Bank terminate its controls on credit in 1972, municipal mortgage guarantees were also expanded in 1973. Along with the growth in dual-earner households, the second income in a household was taken into full account when it came to municipal guarantees. In addition, private banks got the opportunity to expand their mortgage portfolios and the criteria, on which banks would decide to write a mortgage, were substantially extended. Simultaneously, subsidies in the rental housing sector sharply declined. These factors contributed to the growing demand for owner-occupied dwellings. Economic variables contributing to the nominal price increase were the development of wages, mortgage interest rates, rents, construction cost, and inflation. When the Dutch economy crumbled during the Second Energy Crisis between 1978 and 1982, people who had recently garnered comparably favorable access to the owner-occupied housing market, had to cope with high mortgage interest rates under disadvantageous

economic conditions and the bubble burst (Boelhouwer, 2000; Boelhouwer et al., 1996). The reduction of inflation became a key policy objective in the late 1970s. This policy change led to a monetary contraction that did, in fact, lower the annual inflation rate to 4% by 1979. On the flip side, government bond rates increased, with mortgage rates following suit. Therefore, borrowing money to buy a home became expensive again, leading to the drop in demand for owner-occupied housing and a free fall in prices (Brounen and Eichholtz, 2012).

Market liberalization efforts and a positive economic outlook in the 1990s saw housing demand and prices rise again. When the Great Recession hit the world financial markets, the Dutch housing market was also heavily affected. Mortgage interest rates gradually declined since the 1990s, which can be understood as a decline in the cost of financing a new home. This decline is understood to be absorbed by rising selling prices (Boelhouwer, 2017). The Dutch government largely subsidized owner-occupancy through its tax policy, leading to the highly stimulated owner-occupied sector making up over half the total housing stock in 2012. The Netherlands has had one of the most generous fiscal rules, which allowed households to deduct the mortgage interest from their taxable income for a maximum of 30 years. Additionally, the Dutch government exerted stringent spatial planning and zoning rules that, in combination with land scarcity, makes the housing stock rather inflexible, even in 2023. Moreover, rent control was in place. Rent control can contribute to the demand for owner-occupied housing when the excess demand for rental units cannot be met, which, in turn, pushes up house prices. During the Great Recession period, the Dutch government tightened mortgage lending criteria to combat its comparatively large mortgage debt rate. Consequently, the demand for houses dropped and so did prices (Boelhouwer, 2017; Tu et al., 2018).

Norway

At the beginning of the 19th century, real house prices in Norway were volatile and increased only moderately until the middle of the century. In the second half of the century, however, urban house prices roughly quadrupled in real terms as a result of industrialization, railroad expansion, and the exports boom, which boosted the urban population and real wages (Eitrheim and Erlandsen, 2005; Monnery, 2011).

The rise in house prices until the end of the 19th century was interrupted by several economic crises. In the late 1850s, real house prices collapsed due to the international economic and

financial crisis after the Crimean War 1853–1856. The 1870s saw the emergence of urban housing booms, which came to an end in the second half of the decade due to the difficulties in the export sector and because of monetary policy, leading to stagnant house prices in a deflationary context. At the end of the century, there was again a housing boom with its epicenter in Kristiania (as Oslo was called at that time), whose population rose sharply and experienced a construction boom. Expansionary monetary policy, cheap credit, and rising demand for real estate led to strongly increasing housing prices. The speculative bubble burst after the outbreak of the Kristiania financial crisis in 1899, which lasted until 1905 ([Grytten and Hunnes, 2010](#); [Monnery, 2011](#)).

During WWI, house prices fell sharply in real terms, probably due to the economic downturn and rent control introduced in 1915. Furthermore, the postwar recession starting in 1920 hit Norway hard and the Great Depression again cut off the recovery. In the 1930s, the economy started to recover again, but unemployment remained high. House prices remained relatively stable in nominal terms, but rose in real terms due to deflation ([Grytten and Hunnes, 2010](#)).

During WWII, Norway was occupied by Nazi Germany, the housing market collapsed, and price controls were introduced ([Monnery, 2011](#)). Between 1940 and 1954, house prices and rents were frozen, such that real house prices fell due to inflation during and after the war. Between 1954 and 1969, regulations were subsequently slowly liberalized. As a result, real house prices rose sharply in 1955 and continued to rise steadily until the early 1970s ([Eitrheim and Erlandsen, 2005](#)).

Housing prices moved sideways in the struggling 1970s, before rising again strongly in the 1980s. Credit and housing market deregulation, support for homeowners, and the economic boom led to a housing bubble in the 1980s that burst after the 1986 oil price shock ([Tranøy, 2008](#)).

After 1992, Norway experienced another speculative house price boom, which went on even after the Global Financial Crisis of 2008–2009 and led to house price increases well above previous booms. The housing boom may have been driven by the booming economy and rising incomes, housing and monetary policy, low mortgage rates and rising household indebtedness, urbanization and population growth ([Tranøy, 2008](#); [Arnold and Geng, 2016](#)).

Spain

After the Spanish Civil War of 1936–1939 ended, the Spanish housing market was in need of reconstruction. Many homes were destroyed during the war, causing a shortage of homes after the fighting while much of the existing housing stock became obsolete. The reconstruction as a whole took 15 years due to shortages of building materials and the isolationist economic policy adopted during the postwar period. In order to provide housing, the National Housing Agency was established shortly after the end of the Civil War. In the early 1940s, protected housing units were introduced, which were affordable units that featured basic amenities and were under control of the syndicates. They are also seen as an effort by the Franco regime to establish control over the working class. Affordable housing units were promoted in this era through subsidies, tax incentives, and financial incentives to both public and private interests involved in the construction sector (Candela Ochotorena, 2019; Cardesín, 2016).

During the later years of the 1940s, homeownership and building for sale were promoted by the government. It expanded subsidies and bonuses, while labor reform improved the economic conditions of middle-class workers and the economy witnessed increased industrialization and economic growth. The rise in wages and employment opportunities stimulated demand for housing and improved housing conditions as part of workers' rights. The high demand for and low supply of houses drove up prices, but because of the still struggling economy, the price hikes were not too severe. Due to the ongoing economic hardships, reconstruction only happened slowly and there were huge holes in the financing of it, which made public debt the chosen means to cover the cost (Candela Ochotorena, 2019; Cardesín, 2016).

During the 1950s, the Spanish economy managed to recover, achieving relative stability. In this decade, housing policies were enacted to address the housing needs and stabilize prices, which enabled house prices to remain relatively steady or experience merely nominal increases in line with inflation. In the last years of this decade and the onset of the 1960s, the Spanish economy experienced rapid growth of and urbanization. The middle class expanded along with their incomes. These developments led to a surge in housing demand, particularly in urban areas (Candela Ochotorena, 2019; Cardesín, 2016).

Between 1970 and 1973, real estate prices increased more than in the previous decade, even as 400,000 new houses entered the market each year. This was mainly due to economic

liberalization, which was intended to overcome the autarkic economic model after the period of the Spanish Civil War. Thus, with the industrial development of the 1950s, a larger part of the population moved to the big cities. As a result, there was a housing shortage, estimated at 1.5 million units in 1955. This first episode of real estate explosion was also due to the demographic dynamics in Spain. It was characterized by two factors: the emancipation of the second generation of immigrants (the children of the rural exodus of the previous twenty years) and continuing rural-urban migration ([López and Rodríguez, 2011](#)).

Between 1985 and 1991, Spain faced the next real estate boom, with average real house price increases by more than 30%. As Spain joined the European Community, multinational investments led to a fast overheating of the markets. Paralleling the USA and the UK, the Spanish business cycle at that time was the first attempt in continental Europe to achieve growth through a bubble in financial and real estate assets, which had a positive impact on domestic consumption and demand, without any significant support from industrial expansion ([Martínez Toledano, 2017](#)). After 1991, the real house price index in Spain fell by more than 10%. Crucial for this rapid decline between 1991 and 1995 was the growing balance of payments deficit and the lack of a solid basis for growth. The crash eventually led to an aggressive devaluation of the currency ([Martínez Toledano, 2017](#)).

From 1995 to 2005, seven million jobs were added to the Spanish labor market, the economy experienced growth of nearly 4%, with heavy reliance on the residential and touristic construction sector ([Martinez Pagés and Maza Lasierra, 2003](#)), based on growth “by means of a financial and property asset-price bubble that would have a positive knock-on effect on domestic consumption and demand without any significant support from industrial expansion” ([López and Rodríguez, 2011](#)). Mortgage securitization played an increasingly important role for financing housing credit ([Akin et al., 2014](#)). Construction boomed, adding 7 million units or 30%, and house prices soared — seeing an increase of 220% between 1997 and 2007, when the bubble burst ([Martinez Pagés and Maza Lasierra, 2003](#); [López and Rodríguez, 2011](#); [Kohl and Spielau, 2022](#)). The massive construction boom was supported by liberal land policies, like the Land Act of 1998, which then gave way to a deep recession.

When sales began to fall away, coastal regions were hit especially hard by the mid-2007 UK bubble burst, which resulted in problems for British owners of second homes in Spain.

By the end of 2008, one million unsold homes were available in the Spanish housing market. Consequently, household indebtedness rose to 84% of the GDP. Property developers collapsed with massive debt, while unemployment rate doubled to 20% by 2009. The “asset-price Keynesianism” reversed, leading to a decline in private consumption. Temporary contracts of workers were regularly terminated as a consequence of the declining demand, leading to further reduction in demand, causing governmental revenues to plummet (López and Rodríguez, 2011; Martínez Toledano, 2017).

Sweden

In little urbanized Sweden of the 19th century, the housing market boom beginning in mid-century was mainly concentrated in the capital Stockholm. It began in 1855, accelerated between 1870 and 1885, and ended at end of the latter year (Edvinsson et al., 2021). Two major driving factors were behind the boom. First, it was the beginning of industrialization, followed by demographic changes in Sweden, which started around 1870 and led to a strong population growth in Stockholm (due to newly created jobs). In the 1870s, Stockholm’s population grew by 20% and in the 1880s by 46%, leading to a large demand for housing. Second, in 1860 the Swedish government introduced the “hypoteksinstitutet,” a credit institution for real estate investments. The new institution created the possibility of investments for larger parts of the population (Forsell, 2006). Nevertheless, the housing shortage was problematic and the public service did not try to find a solution. At this point, private investors entered the scene, constructing 900 buildings in the 1870s and over 2000 in the 1880s. All in all, these factors led to a sharp “hockey-stick”-like rise in housing prices increasing by 315% during the first Swedish boom period, with the fall of one of Stockholm’s biggest private bank, which was involved in real estate speculations.

The crisis led to an increase in housing prices and had a huge impact on the building sector. While newly completed rooms and kitchens counted to 11,000 in 1885, the number decreased to 6500 in 1886, and fell to 924 in 1893. During the beginning of the bust, compulsory sales of real estate increased to 15% in 1886 and 17% in 1887. Next to the compulsory sales, many financial institutions went bankrupt. The former housing surplus transitioned into a housing shortage. The bust ended in 1893, as the construction sector profited from a large increase in the number of industrial working migrants (Hammarström and Hall, 1979). New house price increases led

to a new peak in 1909, after which real prices tended to stagnate or decline for several decades, as transport expansion and government public housing programs produced new housing supply (Edvinsson et al., 2021).

A new housing boom emerged in the 1980s, when financial deregulation initiated a series of developments including credit expansion, asset price inflation, rapid growth in consumption and investment, an inflow of foreign capital, loss of foreign competitiveness, and speculation against the fixed country's exchange rates (Englund, 1999). During the bust in 1990 to 1992, real interest rates rose, asset prices deflated, unemployment rose, and budget deficits exploded amidst fragile financial conditions. The government's attempt to reduce budget deficits through tax increases and cuts in expenditures resulted in reduced private demand that intensified the crisis (Jonoug et al., 2009).

Three main factors were decisive for the latest boom in the Swedish housing market between 2004 and 2016. First, it was the government's very expansionary monetary policy in the form of extremely low interest rates and financial innovations. This policy led to an amplified effect of interest rate movements on house prices and mortgage loan growth. A second factor was structural, related to housing supply rigidities and tax incentives. The Swedish government abolished taxes on real estate, wealth, and inheritances, while also introducing a 30% mortgage interest deduction. While the population had been growing rapidly since the beginning of the century, accelerating in 2006 due to an increase in net migration, housing demand grew rapidly, but housing construction remained low. Finally, a persistent real undervaluation of the exchange rate combined with capital inflows. As a result, real housing prices increased by 70% between 2004 and 2016, while national real housing prices increased by 6% over the same period. At the peak of the boom, the house price-to-rent ratio increased by 24% between 2014 and 2016, resulting in an overvalued housing market of 170% of the historical price-to-rent ratio. After 2016, the pace of increase slowed (Asal, 2019).

Switzerland

Even though Switzerland did not see the development of large metropolises, its economic centers grew rapidly from the 19th century onward in the wake of industrialization and urbanization. Housing construction was in the hands of private-sector actors and was often speculatively driven and characterized by volatile cycles. Boom phases with housing shortages and high con-

struction activity alternated with crises comprising reduced new construction activity and high vacancy rates (Beck, 1983; Bärtschi, 1983).

WWI broke out at a time when housing markets were overheated. After peaks in the early 1910s, housing construction collapsed dramatically in 1913 (Saitzew, 1920). The war then led to a further decline in housing construction. Inflation, deteriorating living conditions, severe housing shortages, and social unrest forced the federal government to intervene in the housing market. In 1917, the federal government introduced rent control and improved tenant protection, further restricting the free housing market in subsequent years and introducing housing subsidies for the first time in its history (Zitelmann, 2018).

As the economy recovered during the interwar period, a housing boom occurred, which developed into a bubble during the Great Depression. Profitability was high and attracted domestic and foreign capital into real estate investments: Intervention in the rental market was removed in the mid-1920s, demand for housing was high and rental prices rose. The speculative real estate boom did not peak until 1932 and did not collapse until after 1934 (Müller, 2022).

During WWII, new construction collapsed and an acute housing shortage developed. The outbreak of the war led to stronger regulation. Rent control and tenant protection were enhanced, building materials were rationed, and a housing subsidy program was introduced. Housing prices collapsed as a result of the crisis and regulations (Müller, 2021).

After WWII, housing construction boomed in parallel with the economic recovery for almost three decades. The construction boom was interrupted by brief, sometimes severe, downturns in 1949, 1952, 1957–1958, 1963, and 1966–1968. However, until the oil price crisis in the mid-1970s, development showed a very strong upward trend and housing markets remained tight. Rent control was maintained after the war and relaxed starting in the 1950s, but was not deregulated until the late 1960s, while housing subsidies were drastically reduced after 1950. From the 1950s onward, the boom was mainly driven by private investors. In the public debate, the housing shortage and rising rent prices were being blamed on real estate speculators, leading to a critique of “capitalist housing” (Müller, 2022). After the outbreak of the oil price crisis, the economy collapsed, numerous foreigners did not have their residence permits renewed, housing construction slumped, and, for the first time in a long time, many rental apartments were unoccupied.

In the late 1970s, housing markets began to recover and a real estate boom developed in the 1980s, which turned into a real estate bubble in the late 1980s and burst in the early 1990s. The boom was driven by demographic, social, and economic factors, but was particularly fueled by developments in the capital market. After the 1987 stock market crashed, the Swiss National Bank loosened monetary policy and lowered interest rates; at the same time, mortgage lending was liberalized. Real estate became even more attractive and house prices rose sharply. When the Swiss National Bank raised interest rates from 1988, the real estate bubble burst in the early 1990s, triggering an economic crisis that hit the banking sector hard ([Halbeisen and Straumann, 2012](#); [Baltensperger, 2007](#); [Bourassa et al., 2010](#)).

At the beginning of the new millennium, a real estate boom set in that continues to this day. As a result of the flourishing economy and high immigration, demand for housing rose sharply. Unlike many other countries, the housing markets did not run into difficulties after the outbreak of the Global Financial Crisis. However, the new political and economic environment had a major impact on the markets. Since the 2010s, institutional investors have invested massively in rental properties due to the lack of investment alternatives, while demand for owner-occupied housing has risen sharply due to low interest rates. Real house prices have risen to new record highs and are far above the prices before the real estate crisis of the 1990s.

USA

Real estate speculation has been an “integral part” of the United States throughout its history ([Glaeser, 2013](#)). As already well documented for the 18th century, real estate markets were characterized by long cycles ([Kaiser, 1997](#)) and spectacular speculative transactions, sometimes on a very large scale. Throughout the 19th and early 20th century, major boom and bust periods in land and real estate values occurred in various regions during westward expansion and during the rise of major cities, including Chicago (1830–1841) and Los Angeles (1880s), often exacerbated by government lending practices and land sales. Some of the real estate booms took on larger dimensions, such as the boom of the 1880s that affected many parts of California. However, bubbles did generally not develop into nationwide crises ([Glaeser, 2013](#); [Shiller, 2015](#)).

At the end of the 19th century, real house prices reached a temporary high. In the following years, periods of strong economic growth altered with depressions, and house values were

volatile, with rapid price increases and short sharp falls as after the panics of 1907. During WWI, real land and house prices collapsed. The value of housing did not reach pre-WWI levels again until the 1940s and of farmland not until about 1960. The crises and inflation caused values to fall rapidly. However, with the recovery in the Roaring Twenties, real house prices rose in many cities, such as Chicago and New York, only to collapse after the onset of the Great Depression. Regionally, in Florida, a bubble peaked in 1925, only to burst in 1926 ([Monnery, 2011](#); [Glaeser, 2013](#); [Shiller, 2015](#); [Nicholas and Scherbina, 2013](#)).

After WWII, real house prices rose sharply, but according to [Shiller \(2015\)](#), there was no evidence of a speculative market environment. Rather, reasons such as returning soldiers, the baby boom, and the GI Bill of Rights of 1944, under which the purchase of houses was subsidized, had led to rising demand, which was reflected in rising prices. Between 1950 and 1970, however, home prices remained remarkably stable. [Glaeser \(2013\)](#) has described it as a “bubble that didn’t happen.” The stable prices may be explained by strong credit growth, which was encouraged by federal programs and very high levels of new construction on the urban fringe.

The 1970s saw the beginning of a series of boom-bust cycles characterized by high volatility, leading to crises in the early 1980s, the early 1990s, and the financial crisis in the 2000s ([Nicolaidis and Wiese, 2017](#)). From 1975 to 1980, house prices rose sharply in California, most likely driven by stricter zoning laws and building restrictions as well as cuts in property taxes, before falling again in the early 1980s. Between 1984 and 1989, sharp price increases occurred in the Northeast, particularly in metropolitan Boston, as well as in California, probably driven by exaggerated expectations ([Case and Shiller, 1994](#); [Shiller, 2015](#)). Both boom/bust episodes remained regional in scope.

The next big housing bubble, starting in the 1990s, was again particularly pronounced in some metropolitan areas but affected the entire country, with global consequences. The US economy faced a moderate recession in 2001 due to the end of the dot-com-boom and a resulting drop in stock prices. The Federal Reserve lowered the federal funds rate from 6.5% in late 2000 to 1% from June 2003 to June 2004. All in all, house prices almost doubled between 1996 and 2006. The rising house prices combined with these interest cuts created a flood of money and credit met with government policies that encouraged homeownership and new financial

products that increased the liquidity of real estate-related assets ([Tooze, 2018](#); [Muller-Kahle and Lewellyn, 2011](#); [Bernanke, 2010](#); [Kiff and Mills, 2007](#)).

Subprime mortgage defaults are considered the key trigger for the Global Financial Crisis. When the Fed increased interest rates in the mid-2000s, adjustable-rate mortgages were reset at higher rates, mass mortgage defaults and millions of foreclosures ensued. Amidst the high housing prices, investors stopped buying houses and when home buyers realized that house prices could decline, prices began to plummet causing a sell-off in mortgage-backed securities ([Tooze, 2018](#); [Muller-Kahle and Lewellyn, 2011](#); [Bernanke, 2010](#); [Kiff and Mills, 2007](#)). Since the 2010s, real home prices in the USA have been rising again and have reached new all-time highs as of 2023.