What goes up, must come down. Speculation-encouraging institutions and house price cycles across countries

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Abstract

Since the Global Financial Crisis, there is a growing literature on the Comparative Political Economy (CPE) of housing, but it has not systematically incorporated boom-bust cycles in house prices. This matters as cycles in house prices are large relative to their trend and the intensity of house price cycles differs across countries. Bringing Minskyan and behavioural theories of endogenous financial cycles to CPE, this paper argues that the intensity of house price booms and busts is shaped by institutions that encourage speculative behaviour. In an empirical analysis for 23 OECD countries, the paper explores the role of speculation-encouraging institutions, credit permissiveness, welfare state regimes and macroeconomic policy as potential factors. We find that low capital gains taxes and strong landlord-protection policies that may push households onto the property ladder are linked to more intense house price booms and busts.

Keywords: Comparative Political Economy, growth models, financial cycles, housing, house price cycles

JEL codes: E32, N10, P50, R30

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1 Introduction

The Global Financial Crisis (GFC) has been a powerful reminder that housing systems and questions of financial stability are closely linked. This has given a boost to Minskyan theories of financial cycles and to Comparative Political Economy (CPE) research on housing systems and their socio-political impacts. However, the two approaches have proceeded largely in isolation. CPE scholars have analysed the impact of different housing regimes on political and social structures (Johnston and Kurzer 2019), in particular home ownership's effect on attitudes towards the welfare state (Dewilde, 2017; Ansell and Cansuar, 2021; Wiedemann 2021) and preferences for political parties (Adler and Ansell 2020; André et al. 2018). Further, CPE has investigated the determinants of national variation in housing systems and their macroeconomic relation to household debt (Schwartz, 2008; Fuller, 2015; Johnston et al, 2021; Anderson and Kurzer, 2019; Van Gunten and Navot, 2018). Household debt, in turn, has become increasingly important in the growth models approach to CPE, where it is typically analysed in the context of a finance-led growth model (Baccaro and Pontusson 2016; Ban and Helgadóttir 2022; Reisenbichler and Wiedemann 2022). What is remarkable about this CPE research on housing is that house price *cycles*, that is recurring boom and bust episodes, and speculation play hardly any role. In contrast, applied economics research and studies based on Hyman Minsky's Financial Instability Hypothesis have substantiated the notion that financial cycles are part of a systemic reoccurring dynamics, so-called endogenous cycles, that are less frequent, but more severe than regular business cycles (Borio 2014; Caverzasi and Godin, Claessens, Kose, and Terrones 2012; Ryoo, 2016; Strohsal, Proaño, and Wolters 2019; Zezza, 2008). However, this literature has done little to explain cross-country differences and the role that institutions beyond homeownership play therein.

By providing a comparative analysis of the institutional determinants of housing cycles, this paper contributes both to the CPE literature on housing and to the Minskyan approach. Unlike much of the Minskyan literature we put institutions at the centre of our analysis. Unlike the current CPE of housing literature we interpret house prices as characterised by speculative cycles. We thus ask: why do some countries undergo more intense booms and busts than others?

Our main argument is that the intensity of house price cycles is driven by institutions and policies that encourage speculation. Speculation is a morally loaded term. However, in this article it is used analytically: speculation refers to transactions that are based on the expectation of increasing (or falling) asset prices. Following Minskyan and behavioural economics, we argue that some actors using extrapolative expectations, that is projecting forward past trends in house price growth, can give rise to persistent oscillations, i.e. house price cycles, when other actors follow fundamentalist expectations, i.e. they expect house prices to return to some fundamental value. We highlight the institutional determinants of extrapolative and fundamentalist behaviour. Different sectors (such as developers, owner occupiers, and banks) are predisposed to adopt different expectation heuristics, but they adapt these in light of their recent experience and the institutions and incentives they face. Specifically, developers have short time horizons and are prone to adopt extrapolative expectations. Households demand housing for use, but are aware of its role as financial assets. In an environment of rising housing prices, they may become defensive speculators that premise their decisions on the assumption of further price increases (Tranoy et al 2020). Next to speculation-encouraging institutions, the elasticity of the financial system and housing supply may also shape house prices cycles (Kohl 2021; Sánchez and Johansson 2011). Banks play a key role in enabling transactions and in particular speculative behaviour. In short, the heuristics adopted by different actors will depend on their predisposition, on recent experience and the institutional environment. Countries with institutions that encourage speculation will thus experience more pronounced house price cycles.

As our theoretical framework is based on endogenous cycles, the empirical analysis uses a turning point analysis (Harding and Pagan 2002) to identify the boom and bust episodes of house price cycles. We then explore the role of speculation-encouraging institutions, namely tax rates that influence capital gains and rental protections that influence to what extent people will want to rent or buy, as well as the permissiveness of the credit regime and housing supply in explaining the intensity of house price cycles. Building on the extant housing CPE literature, but with a different theoretical lens, we propose empirical measures for these institutions for 23 OECD countries for the period 1990-2019.

We control for credit elasticity using a new index and supply constraints. Our main finding is that countries with more speculation-encouraging institutions experience more intense house price booms and busts.

This article makes the case for a more central place of speculative house price cycles in the analytical focus of CPE. This is not to say that CPE researchers have not been aware of house price cycles. At some level they are taking for granted a "vicious cycle of rising prices financed by ever larger mortgages" (Tranøy et al., 2020, p.4), but *reoccurring speculative house price cycles* do not currently feature prominently in either theoretical or empirical analyses. Instead, CPE has mostly focused on the secular rise in household debt and on differences across countries (e.g. Fuller 2015). Schwartz and Seabrooke (2009) discuss the housing bust, but mostly in the specific form of the subprime crisis. Much of CPE literature seems to interpret housing booms and busts as due to specific circumstances rather than to systemic dynamics.[1] This is in sharp contrast to growing applied economics research documenting the recurrence of house price cycles and their relationship to household debt (Borio 2014; Claessens, Kose, and Terrones 2012; Rünstler and Vlekke 2018; Schüler, Hiebert, and Peltonen 2020; Strohsal, Proaño, and Wolters 2019).

Among the CPE literature two contributions directly engage with housing cycles. Wood and Stockhammer (2024) emphasise endogenous house price cycles and analyse the interaction of economic growth, house prices and households in a comparative setting, but institutions are not integrated as determining factors. Kholodilin, Kohl and Muller (2023) analyse housing and other policies as determinants of bubble episodes in house prices, but their conceptual framework is not based on endogenous cycles. What is at stake, and what sets this study apart, is the notion of systemic recurring housing boom-bust cycles. Such endogenous cycles are based on mechanisms deeply

[1] For example, Watson (2009) relates British housing cycles to specific macroeconomic policy strategies. Johnston and Regan (2016) do talk about debt booms, but there is no reference to 'busts' or 'cycles'. Johnston et al. (2021) have two references to the business cycle, but none to the housing cycle.

ingrained in the economic and social structure, rather than merely the result of some exogenous shock (such as pandemics). Instead, housing cycles in the spirit of Hyman Minsky and Charles Kindleberger arise naturally in (unregulated) market systems. From this perspective the subprime crisis is just one, if an extreme, case of systemic house price cycles. For CPE this matters. Clearly there have been big changes in house prices and household debt over the past decades. If these changes are not theorised as cycles, they will by default be interpreted either as one-off changes or as a secular trend. Indeed, this seems to be the interpretation of much of the CPE literature: different types of capitalism lead to different housing systems and ownership structures that come with different trends in household debt and house prices, whether they are interpreted as outcomes of different varieties of capitalism or as different growth models. This misses the point that house prices experience particularly pronounced cycles. Their cyclical component (relative to their trend) is much larger than, for example, that of economic growth (as we document in section 2). Thus, the cyclical dynamics are large and need to be analysed in their own right.

The paper is structured as follows. Section 2 provides empirical evidence on the relevance of cyclical dynamics as opposed to trends in house prices. Section 3 discusses the CPE literature on house prices and debt. Section 4 presents a novel theoretical framework for analysing the relationship between speculation-encouraging institutions and the intensity of house price cycles. Section 5 summarises variable construction and the stylised facts of speculation-encouraging institutions. Section 6 reports regression results exploring the determinants of the intensity of house price cycles and section 7 concludes.

2 House prices: the cycle dominates the trend

Much of the CPE literature on housing has looked at cross-country differences in the levels or trends of house prices or household debt (Fuller 2015; Fuller, Johnston, and Regan 2020; Johnston, Fuller, and Regan 2021; Johnston and Regan 2017). But how important is the trend relative to cyclical booms and busts in house prices? As this is key for the salience of the argument of this paper, we start by

establishing some stylized facts about house price trends and cycles. To put the numbers into perspective, we compare these to the trend and cycles in real GDP. (The underlying identification of cycle and trend is discussed in section 5).

Table 1 compares the annual change due to cyclical dynamics and the time trend for (the log of) real house prices and (the log of) real GDP for a sample of up to 23 OECD countries over the period 1990-2019. Quarterly GDP data is only available after 1990 for most countries, as can be seen in the second to last column. House prices rose or fell during boom-bust cycles, on average, by 5.9% per year. By contrast, the average trend saw house prices increase by only 2.6% (per year). Clearly, the cyclical component of house prices is much larger than the trend component. There is some variation across countries, but the finding holds for 21 (of 23) countries. In contrast, for GDP the trend (on average 2.3%) is larger than the cyclical component (1.7%). This holds for 19 countries. When we consider only the seven countries for which data are available prior to 1981 (see Appendix B.1), we find that the annual variation due to cyclical movement (5.4%) is much larger for real house prices than those due to the trend (2.3%). For this longer sample, this holds for all countries. In contrast, for GDP the trend (2.4%) is larger than the cyclical variation (2.3%).

Table 1: Cycle intensity and trend for house prices (HP) and GDP from 1990 to 2019

Country	HP trend	HP cycle	GDP trend	GDP cycle	Start date HP	Start date HP
United States	1.3	5.2	2.4	1.2	1990	1990
United Kingdom	3.6	6.2	2.0	1.4	1990	1990
Austria	2.3	1.1	1.7	0.8	2000	1995
Belgium	3.0	2.4	1.8	0.9	1990	1995
Denmark	3.2	5.6	1.3	1.4	1990	1995
France	2.8	3.3	1.6	1.0	1990	1990
Germany	-0.6	2.1	1.3	0.4	1990	1991
Italy	0.3	4.2	0.3	1.2	1990	1996
Norway	4.9	5.7	2.2	1.1	1990	1990
Sweden	4.8	4.1	2.5	0.9	1990	1993
Switzerland	1.6	3.1	1.8	1.2	1990	1990
Canada	3.3	4.2	2.4	1.3	1990	1990
Finland	2.3	5.6	2.1	1.7	1990	1990
Greece	-0.8	5.8	0.0	2.7	1997	1995
Iceland	2.2	6.9	3.1	3.0	2000	1995
Portugal	-0.9	4.0	0.9	1.6	1990	1995
Spain	1.7	7.1	1.8	2.0	1990	1995
Australia	3.8	4.1	3.2	1.3	1990	1990
New Zealand	4.2	5.2	3.0	1.0	1990	1990
Estonia	4.2	18.8	3.6	3.4	2002	1995
Latvia	3.1	11.2	3.6	3.7	2000	1995
Lithuania	4.8	10.2	4.0	2.0	1999	1995
Poland	3.7	9.7	3.8	1.6	2000	1995
Mean	2.6	5.9	2.19	1.6		

Note: The cycles are constructed by applying the Harding and Pagan (2002) turning point algorithm to de-trended real house price data (see section 5 below and appendix section 2 for further details).

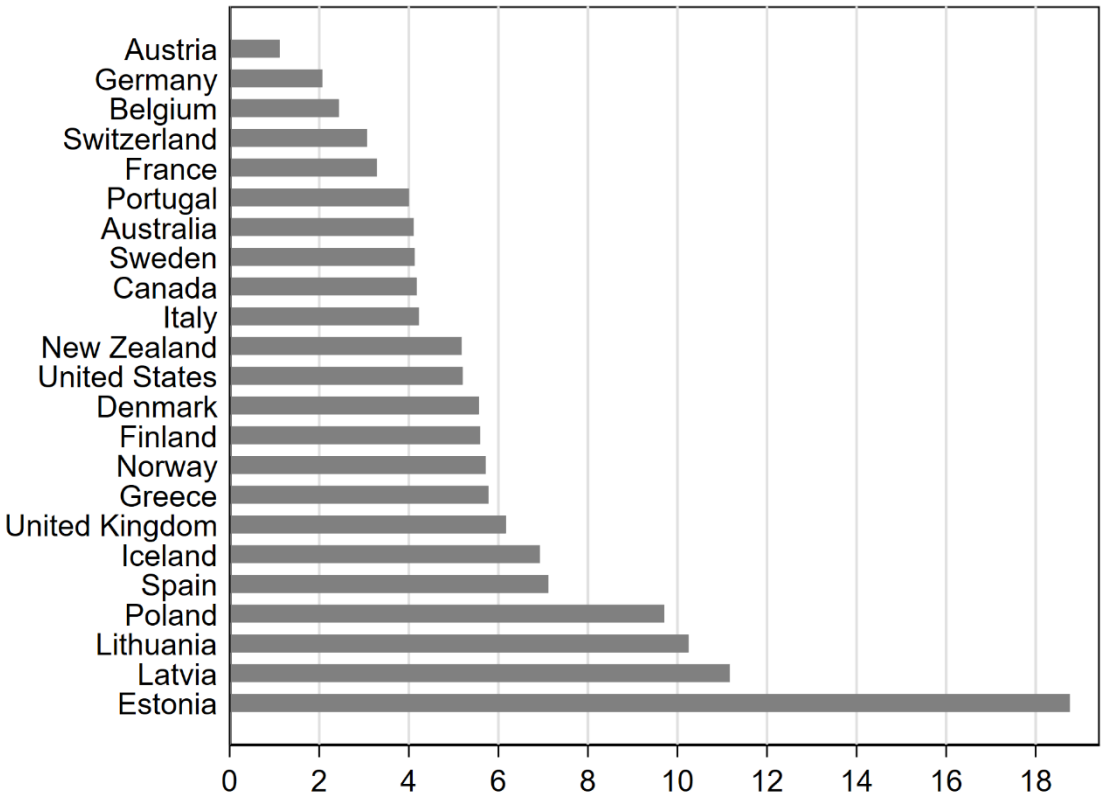
Thus, when it comes to house prices, the cycle dominates the trend. However, the intensity of these cycles differs substantially across countries. Figure 1 shows the average intensity of house price booms

and busts across 23 OECD countries.[2] Continental European countries tend to be at the lower end, eastern European countries (for which time series are shorter) are at the top end. More specifically, Austria, Germany, Belgium and Switzerland display house prices change by less than 4 percent per year during a cycle episode, whereas the Baltic countries exhibit cycle intensities of more than 10 percent per year. The USA and the UK are in the middle. The southern European countries are divided, with Spain and Greece having above mean and Italy and Portugal below mean intensities.[3]

[2] On average busts are more intense (7%) than booms (4.9%), but the latter last longer.

[3] Note that this ranking does not match the extant countries groupings for the varieties of residential capitalism (Schwartz and Seabrooke, 2008). For example, UK and Canada, both classified as liberal markets are far apart; so are Spain and Belgium, which are both classified as catholic familial by Schwartz and Seabrooke (2008).

Figure 1: Average intensity of house price booms and busts across 23 OECD countries 1990-2019



Notes: Intensity: absolute % change per year of house price cycles during booms and busts (average over booms and busts), based on detrended house price data. Phases are dated at the end of an episode, e.g. a boom/bust starting in 1980 but ending after 1990 are included.

3 Household debt and house prices in Comparative Political Economy

CPE has a rich literature on cross-country differences in housing systems (see Johnston & Kurzer, 2020 for an overview). Much of it focusses on distributional and political outcomes (e.g. Ansell and Cansuar, 2021; Wiedemann 2021). Among those studies that analyse cross-country differences in household debt and house prices, three groups of institutions have been identified as important explanatory factors: mortgage-credit encouraging institutions, wage-setting institutions, and the welfare state.

One prominent argument in CPE is that cross-country differences in mortgage-credit encouraging institutions cause differences in the level and growth of household debt (Fuller 2015; Johnston, Fuller,

and Regan 2021; Schwartz 2008; Schwartz and Seabrooke 2008; Van Gunten and Navot 2018). Fuller (2015) identifies five institutions as 'mortgage-credit encouraging': restrictions on interest rates, capital gains on the transfer of households' assets, a society's acceptance of high debt levels (proxied by the typical loan-to-value ratio), mortgage subsidies and the size/type of the secondary debt market. He reports a statistically significant relationship between the level and growth rate of debt and a mortgage encouragement index created from these institutions across OECD countries. Similarly, Van Gunten and Navot (2018) analyse mortgage-credit institutions such as length of mortgage maturity, type of interest rate, early repayment, equity withdrawal, capital market funding, tax subsidies and foreclosure rules as potential drivers of household debt. While household debt is mentioned as a source of economic instability, they offer no analysis of cycles in household debt or house prices. An implicit assumption in this literature is that mortgage debt is the main driver of housing dynamics - what economists would call a credit supply shock (e.g. Mian and Sufi 2022). Institutional changes that allow banks to extend more mortgage loans will directly translate into credit creation and house purchases. However, this downplays the role of expectations of house price growth. Both banks and households need to be confident that the future house price will exceed the mortgage value. Thus, speculative expectations about future house prices are a key element that has not been fully acknowledged in this literature.

Differences in wage bargaining systems have been a long-standing focus in CPE and have also been used to explain house prices and household debt. Johnston and Regan (2017) argue that house price growth occurs when mortgage-credit encouragement is complemented with income shocks driven by wage-setting institutions. Export-favouring wage-setting institutions, where wages are set in line with competitiveness considerations (e.g. in Austrian and Germany), constrain wage incomes and thereby the demand for houses and ultimately house price growth. By contrast, in countries with uncoordinated bargaining systems wage-setting in non-tradeable sectors (such as Italy, Spain and Portugal), drives higher wage growth and thus house price growth. The importance of real wages for house prices is motivated by the fact that banks primarily lend on the basis of an individuals' wage.

Johnston and Regan (2017) do not explicitly discuss the intensity of house price cycles, but it follows from their argument that the boom and bust in house prices should be driven by the boom and bust in wages. With wages clearly much less volatile than house prices, that latter would have to be extremely sensitive to wages to explain the large intensity of house price cycles.[4]

Some authors have discussed the impact of the welfare state on house prices and household debt. However, the hypothesized channels and effects differ strongly. First, Crouch (2009), Hay (2013) and Watson (2009) argue, for Anglo-liberal welfare regimes, that welfare state retrenchment (understood primarily as a lowering of labour market protections) has led to a more insecure and flexible labour market. At the same time governments eased access to mortgage lending and households responded by becoming homeowners and accumulating housing wealth, in part as an insurance against job insecurity. This 'privatised Keynesianism' pushed up household indebtedness and house prices. Second, Tranøy, Stamsø and Hjertaker (2020) and Johnston, Fuller and Regan (2021) take the opposite view and argue, for the Scandinavian countries, that a strong welfare state (in the form of strong labour market protection) increases household indebtedness as comparatively high-income households have improved their creditworthiness and ultimately are able to borrow more. Third, Anderson and Kurzer (2020) argue that in Denmark, Sweden and the Netherlands a strong welfare state, in the form of social housing and renter protection (such as negotiated rents, subsidised rental housing and land use restrictions) constrained the construction of new housing. This reduction in the supply of housing came alongside policy makers' long term pursuit to stimulate home ownership in order 'to reduce social housing expenditure, court dual-income households and foster a society of civic-minded, self-sufficient home owners' (Anderson and Kurzer, 2020, 3).

[4] Furthermore, for *real* house price to grow house prices must rise faster than consumer prices. However, their theoretical framework does not explain why a rise in real wages increases demand for housing more than consumption (which is required for a change in relative prices).

There are only a handful of papers that engage with house price cycles from a CPE perspective. Wood and Stockhammer (2024) offer an analysis of the interaction of economic growth, house prices and household debt, where house price cycles play a central role, but these cycles are not institutionally grounded. Kholodilin, Kohl and Muller (2023) investigate the determinants of speculative house price bubbles. Specifically, they estimate for the post 1950 period the determinants that increase the likelihood of a bubble occurring – which they distinguish from 'normal' periods (identified via explosive roots and some qualitative criteria). They find that population growth, mortgage debt, and capital gains exemptions have positive effects on the likelihood of bubbles, whereas public debt, interest rates, rent controls have negative effects. However, they only identify determinants of house price bubbles, rather than of the intensity of whole cycles (i.e. booms and busts).

A related socio-economic literature on financialisation and capital accumulation, mostly situated in urban studies and human geography, argues that "real estate increasingly becomes the spatial fix for the over-accumulation of capital" (Aalbers and Christophers 2014; van Loon and Aalbers 2017, 234). It emphasises the commodification and assetisation of housing over the last decades. For the Dutch case, van Loon and Aalbers (2017, p.221) argue that "institutional investors now perceive real estate increasingly as 'just another asset class', thereby increasing leverage and volatility." The reemergence of buy-to-let owners and institutional landlords and, thus – a "generation landlord" (Ronald and Kadi 2018) are among the key findings. However, they do not distinguish between cyclical movements and trends in house prices in their empirical analysis. Overall, this literature has a stronger theoretical framing that the CPE literature but shares a lack of analysis of house price cycles.

In contrast to CPE, house price cycles have received more attention in economics since the GFC. Some Minskyan macroeconomic models have included speculative dynamics in housing markets (Caverzasi and Godin 2015; Ryoo, 2016), but have focused on the within-country interplay of house prices, debt and economic growth and thus not contributed to comparative research. We will return to this literature in the following section. Much of the applied economics research analyses financial cycles

more broadly and has found house prices (and associated credit flows) to be a major component of financial cycles (Borio 2014; Claessens et al., 2012; Schüler et al., 2020; Strohsal et al., 2019). Financial cycles are longer than regular businesses cycles (roughly 16 rather than eight years), and recessions related to financial crises are deeper than regular recessions and last longer (Claessens et al., 2012). Economic historians have documented that boom-bust cycles in real estate markets have been a feature of market economies for more than a century (Glaeser 2013, Jorda et al 2016). This literature offers little theoretical analysis of the institutional determinants of house price cycles that goes beyond homeownership rates (Comunale 2020; ECB 2018; Huber 2019; Rünstler and Vlekke 2018). By contrast, our approach provides a theoretical framework that identifies specific institutions as encouraging speculative behaviour.

4 House price cycles and speculation-encouraging institutions

By sidestepping the cyclical dynamics of house prices, CPE studies of housing and household debt underplay the importance of speculation in determining house price dynamics. CPE scholars at times acknowledge the presence of speculation in housing systems. For example, Fuller (2015, p.252) argues that the "demand for mortgages will tend to be lower where … residents rarely view the physical home as an asset subject to speculation." However, he does not offer a theoretical analysis of speculative dynamics and his empirical analysis makes no effort to distinguish between trend and cyclical changes in house prices or household debt. Given the size of cyclical effects relative to any trend documented in section 2, this is a substantial shortcoming. We argue that CPE needs to account for speculative dynamics, which are likely to be shaped by institutional structures. Differences in speculation-encouraging institutions can then help explain differences in house price cycle intensities across countries.

To develop a comparative framework for analysing cross-country differences in the intensity of housing cycles, we build on heterodox economic theories linking house price cycles to speculation.

We define speculation as engaging in housing transactions in anticipation of future price changes. This is in line with Minskyan and behavioural economics approaches, where speculation plays a central role (Carro et al 2023; Caverzasi and Godin, 2015; Charpe et al., 2011; Dieci and Westerhoff, 2012; Dieci and Westerhoff, 2016; Ryoo, 2016; Zezza, 2008; for a less technical discussion see Stockhammer and Wolf 2019). While Minsky's initial work focussed on corporate debt, recent extensions have argued that house prices drive both household debt and cyclical growth. In periods of optimism, housing markets boom and prices overshoot due to speculative demand for houses. Such episodes can drive economic activity for a sustained period of time but typically come with a build-up of household debt (Caverzasi and Godin 2015; Ryoo, 2016), which eventually brings the boom to an end. House prices impact economic growth either directly via mortgage-financed residential investment (Charpe et al. 2011; Zezza 2008) or by increasing consumption demand (Caverzasi and Godin 2015; Ryoo 2016). A key channel here is the increase in collateral values. Real estate is accepted as collateral and thus higher house prices often allow for more borrowing. Eventually the boom runs out of steam and once a critical number of actors revise their price expectations, prices start to decline, which tightens collateral constraints and makes the refinancing of mortgages difficult. This turns the boom into a bust where demand for houses collapses, prices fall, and households deleverage. This deleveraging means reducing current expenditures and is likely to come with an extended period of stagnation. As balance sheets improve, deleveraging eventually lays the basis for another boom period. Endogenous house price cycles are thus a key driver of cyclical growth dynamics as well as household debt.

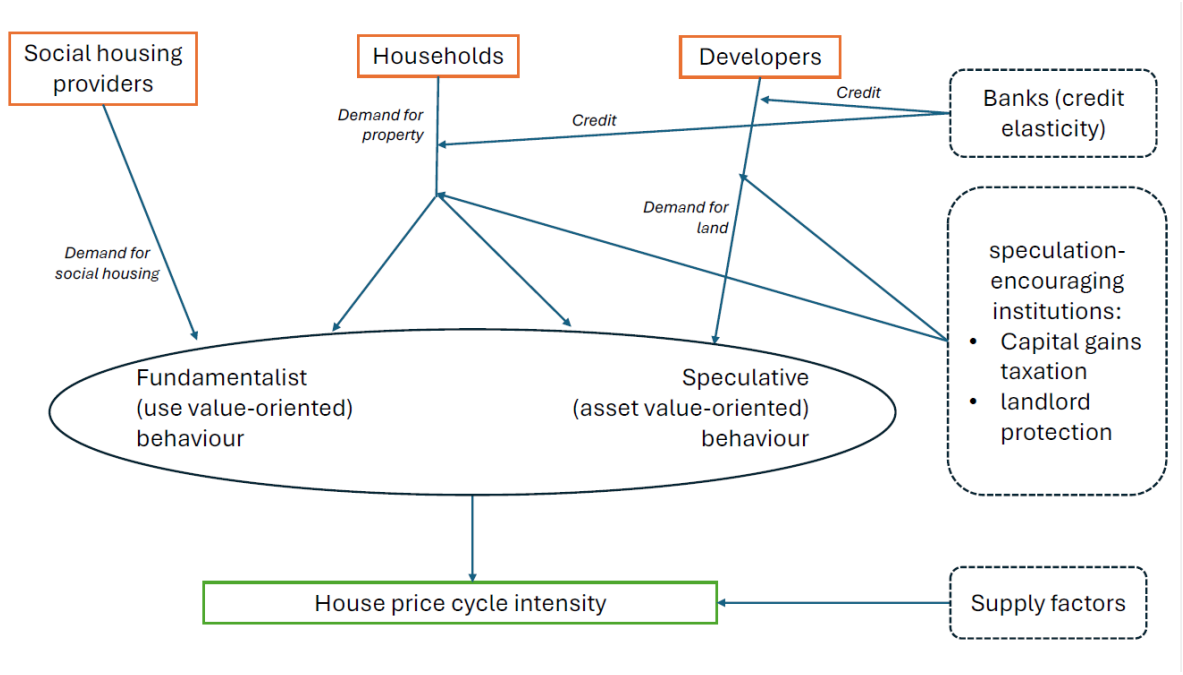
We also draw on behavioural asset pricing models, where cycles are generated by the speculative behaviour of some investors in interaction with fundamentalist investors (Beja and Goldman 1980; Dieci and He, 2018; Hommes, 2006). In the face of fundamental uncertainty about the future, agents rely on simple behavioural rules (or heuristics) to anticipate future prices. Two simple heuristics play a key role: the extrapolative rule assumes that past trends continue or become even more pronounced. The important implication of these expectations is that demand will *increase* in response

to price increases (as further price increases are expected). Actors following this rule are also called momentum traders. The fundamentalist rule predicts that prices revert to some fundamental value (e.g. their long-term mean). Consequently, fundamentalists will respond to price increases by a *decrease* of their demand. The extrapolative rule tends to destabilise the system; the fundamentalist rule stabilises it. The interaction of these two rules can (under certain conditions) generate endogenous cycles. While parts of the literature treats the momentum traders and fundamentalists as fixed groups (Beja and Godman 1980), other models allow actors to switch between heuristics, for example based on the past profitability of the respective rules (Dieci and Westerhoff 2012).

These Minskyan and behavioural models operate on a high level of abstraction and have little to say about how institutions and different housing systems across countries shape this process. We argue that institutions play a critical role. We propose that different actors are predisposed to employ certain heuristics, and that their decisions are based on institutional factors as well as past experience.

Our theoretical framework for explaining the intensity of house price cycles is visually presented in Figure 2. In our empirical strategy, we separate cyclical and trend movement in house prices (see section 5), our framework is thus designed to explain cyclical movements, not house prices as such. We consider four main actors. Social housing providers, usually funded by (local) governments and non-profit corporations, demand (and build) social housing. Households buy houses as places to live in (i.e. for use) but are susceptible to become passive speculators. Developers demand land to build and sell housing to realise capital gains. Banks finance these transactions and can discourage or encourage speculative behaviour. These actors have a predisposition to employ different heuristics based on their aims. Use value-oriented actors will be predisposed to adopt fundamentalist heuristics, while profit seeking ones with short time horizons to extrapolative heuristics, but the heuristics they choose will also depend on the institutional structure of the housing market and the past experience of actors.

Figure 2. Theoretical framework for explaining house price cycle intensity



Developers have a shorter time horizon than owner-occupiers as for them the expected house price when they sell a property is key, which predisposes them to follow extrapolative expectations. Furthermore, as these actors are not buying homes for themselves, they purchase property and land without simultaneously supplying property to the market, pushing up overall demand for a given supply of land.[5]

Households usually demand houses to live in.[6] A first question for them is whether to rent or to buy. This will depend on the attractiveness of renting, which in turn depends on the availability of social housing and the extent of landlord protection, the access to credit and their expectation of future

[5] Developers demand land (creating upward pressure on house prices) and, with some delay, supply housing (potentially creating downward pressure). However, they will usually try to build into booming markets. The component explaining house price growth is usually real estate prices, not construction costs (e.g. Knoll, Schularick, and Steger, 2017).

[6] Some households also demand housing to rent out. While buy-to-let has contributed to the reshaping of housing markets since the GFC, we will argue below that their impact on house price cycle intensity is ambiguous and will discuss them in the context of institutional landlords.

prices (e.g. Carro et al. 2023). They will be predisposed to regard housing as a use value but are aware that it is also a financial asset. In an environment of relatively stable house prices, they will act like fundamentalists and use a fundamental value based on their (expected) income, rental costs and the interest rate. However, they may switch their behaviour (or heuristic) in an environment of rising house prices, even without being fully aware that they have become speculators. Tranøy, Stamsø and Hjertaker (2020, p.7) distinguish between offensive and defensive speculation. Offensive speculators are those actors (e.g. developers) who are not looking to buy somewhere to live in but instead want to realise capital gains. Defensive speculators are those who are buying a home as a primary dwelling but are willing to accept higher debt levels *under the assumption that prices will continue to rise*. The concept of 'getting onto the housing ladder', which originally was about demographic transitions, takes on a different meaning in an environment of (perceived) rising house prices. Households expect to benefit from increasing house prices and become passive speculators. This will also depend on the tax treatment of capital gains and availability of credit. Case, Shiller, and Thompson (2012) provide evidence for the USA that households' overestimate long-term growth in house prices.

Finally, there is a social housing sector which is use-oriented and thus will work in a fundamentalist spirit. It is usually sponsored by states and municipalities. This sector has played a stabilising role in the postwar era and has been in decline in the period under investigation, which is characterised by a shift from social renting to private renting.

Overall housing demand will thus have actors that are more likely to adopt extrapolative expectations and others that behave more like fundamentalists. The large group in between are households, who may adopt extrapolative heuristics as passive speculators. To what extent they behave as such will depend on what we call speculation-encouraging institutions. For the empirical analysis we will use the attractiveness of renting (or, inversely, the extent of landlord protection) and the treatment of capital gains by the tax system as the key variables that influence behaviour. Strong landlord protection pushes households onto the property market, which is a precondition for becoming passive

speculators. Low capital gains taxation rewards short time horizons and thereby directly encourages extrapolative behaviour.

Banks, and the financial sector more broadly, provide finance to those actors who demand housing. They are thus a important actors in the background, in particular by enabling (or curbing) speculative behaviour which will typically be leveraged. They are profit-oriented organisations, but the anticipated profitability of loans critically depends on their expectation of future house price growth as these determine collateral values and repayment probabilities.[7] Substantial parts of the CPE literature regard house price booms - and household debt booms - as the result of lending practices (e.g. Fuller 2015). This corresponds to what economists call a credit supply shock (Mian and Sufi 2022), which is often based on a standard loanable funds framework where interest rates adjust to clear the credit market. In contrasts, in our Minskyan perspective credit supply is relatively passive. Within given credit worthiness checks, loan supply is elastic and mortgage rates are set as a markup on central bank interest rates. Thus, overall credit is endogenous. Credit supply matters insofar as some borrowers are credit rationed, and in our empirical analysis we will measure credit elasticity in the form of regulatory constraints, domestic financial balance sheet shocks and the ease of international refinancing, all of which may impact the extent of banks' credit rationing. In short, credit elasticity plays an amplifying or an insignificant role in our framework and can only be a sufficient cause in the context of binding credit constraints (which in turn require sufficient credit demand).

[7] Like other actors, banks can follow extrapolative or fundamentalist expectations. For banks, this choice is reflected in how much weight they assign to the loan-to-income ratio versus the loan-to-value ratio in their lending decision. Once they prioritize loan-to-value ratios, loan-to-income ratios will rise during the boom. Moreover, loan-to-value ratios themselves have risen during property booms in Ireland (Duffy 2012) and the USA (Duca, Muellbauer, and Murphy 2011). The subprime boom would not have been possible without the expectation of rising property prices (and thus rising collateral values). For example, Gerardi et al. (2008) analyse subprime mortgage defaults at the onset of the financial crisis and report that the defaults given the movement in house prices was in line with past experiences, which suggests that actors (including banks) had underestimated the probability of house price decline, not its impact. Overall, banks thus play an amplifying role in our approach.

Finally, the elasticity of housing construction plays a dampening effect on house price cycle intensity (Dieci and Westerhoff 2016). This is the standard argument that if construction is elastic, then increased demand would primarily generate quantity adjustments rather than price movements. While housing supply acts as a dampening factor, our framework asserts that housing markets are characterized by high price flexibility, but limited quantity adjustment and therefore reoccurring house price cycles will arise.

Some actors that have received considerable attention in recent analyses do not feature in our framework: buy-to-let (BTL) owners and institutional investors. This is because our focus is on house price cycles, not on house price trend growth. Both of these actors have reshaped housing markets, in particular since the GFC. Ronald and Kadi (2018) talk about a "generation landlord" and Aalbers, Hochstenbach, Bosma and Fernandez (2021) claim that "a shift from a debt-driven to a wealth-driven model of financialization, in which BTL purchases are key" (Aalbers et al 2021, p. 541) has occurred. Concurrently, the share of households that rent privately has risen. In addition, financial investors (such as pension funds) have increasingly become active in residential real estate markets (there is a longer history of their involvement in commercial real estate). The challenge for financial investors is that real estate is an illiquid asset that has high running costs, but real estate (over long periods) offers high returns and diversifies investment portfolios. This investment usually takes the form of Real Estate Investment Trusts (REITs), which handle large portfolios of properties. Both BTL owners and REITs have been important in enabling the shift from social to private renting over the past decades. The impact of these actors, in particular of real estate investment trusts, on house prices has now also been documented by quantitative studies. Banti and Phylaktis (2025), analysing 57 cities in 15 countries for the period 2001–2022, find that the entry of institutional investors raises house prices (but lowers rents). Bandoni et al. (2025) report positive and persistent effects of institutional investors on house prices in the Euro area and a weakening link between house price growth in local economic conditions. However, all these document effects on price levels, not cycle intensity, which is the subject of our paper. The business model of these actor relies on rent payments rather than on short-

term capital gains. In fact, these actors may have temporarily dampened the housing cycle when they bought real estate in the downturn after the GFC and have thus contributed to stabilising prices in the downturn. Their long-term impact on house price cycles remains yet to be seen.

The main contribution of this paper is to offer an analysis of house price cycle intensity. While some aspects of our analysis are familiar within the CPE literature on housing, they get refractured in the context of endogenous (speculative) cycles. First, Fuller (2015) and Wiedemann (2021) give a prominent role to the impact of banking and finance and operationalise this with mortgage encouragement or credit permissiveness, respectively. However, their approach is closer to one where cycles are due to (exogenous) credit supply shocks (e.g. Mian and Sufi 2022). In our framework endogenous house price cycles are the driver of credit rather than the other way. Second, several CPE authors argue that when the availability and affordability of rental properties decline, this will push households onto the property markets. Bohle (2014, 2018) analyses the privatisation of the public housing stock in Estonia, Latvia, and Hungary as a key institutional change that created the environment for spectacular housing bubbles before the GFC. Similar developments took place one or two decades earlier in Iceland and Ireland (Bohle, 2018) as well as the US and UK (Reisenbichler and Wiedemann, 2022; Ryan-Collins, 2021). Thus, consistent with our framework, but we hypothesize that policies that weaken the social rental sector and push households onto the property market create a larger potential for passive speculation and thereby intensify house price cycles.

This section has provided a simple framework to identify economic actors and key institutions that may influence speculation. It suggests that key factors for house price cycle intensity will be institutions such as social housing provision, landlord protection and capital gains taxation, that increase the likelihood that household adopt passive speculative behaviour. Governments play a dual role in our framework: they shape the finance and scope of the social housing sectors, but they also set the policies that shape the housing institutions that determine the incentives for the different actors to engage in speculative activities. As this paper seeks to explain the intensity of house price

cycles, we focus on those institutions which encourage actors to engage in (defensive or active) speculative behaviour. In the subsequent empirical analysis, which builds on this framework but is also shaped by data availability, we focus on two sets of institutions that are particularly likely to encourage behavioural change: first, institutions that enable the realisation of capital gains from housing, in particular in terms of taxation; secondly institutions that determine how many people seek to own rather than rent and thus allow for defensive speculation. In addition to speculation-encouraging institutions, we will consider two other factors that may influence the intensity of house prices cycles: the elasticity of the financial sector to housing demand and the supply of housing.

5 Data and variable construction

To empirically investigate the determinants of house price cycle intensity, we use a sample of up to 23 countries over the period 1990-2019. Data availability is uneven; in particular for Eastern European countries data often only start around 2000. The dependent variable is a measure of the intensity of a cycle phase (i.e. a boom or a bust). We use institutional variables as explanatory variables, taking either their value at the start or their average over each phase of the cycle, depending on their likely endogeneity. Thus, time-series data are collapsed into one observation for each cycle phase.[8]

To measure the intensity of house price cycles, we need to isolate the trend from the cyclical component. We chose the simplest approach that assumes a linear time trend. We first regress the log of (real) quarterly house prices on a linear time trend for each country. The estimated coefficient provides a measure of the trend, whereas the residuals from the regression constitute the cyclical component. Second, to identify cycles and measure their intensity, we draw on the turning point

[8] Table A1 in the appendix provides an overview of the data description and sources. A full overview of the construction of all variables are outlined in the appendix.

algorithm developed by Harding and Pagan (2002) and apply it to the de-trended series.[9] The details can be found in Appendix A, but the underlying logic is simple: peaks are defined as local maxima within a 20 quarter (5-year) window, troughs are defined correspondingly via minima.[10] Booms are defined as periods that start with a trough and end in a peak. Busts are defined accordingly. Once turning points have been identified, we measure the intensity of house price cycles as the (absolute value of the) percentage change in house prices over a boom or bust episode divided by the duration of the episode. Thus, the resulting value yields a percentage change *per year* during an episode, which can be readily compared with the annual change due to the linear trend. In section 2 (Table 1) we used this methodology to presents average house price cycle intensity by country. In the following, the intensity for each house price cycle will be the dependent variable for the regression analyses.

As key explanatory variables, we identify two types of speculation-encouraging institutions that (i) enable the realisation of capital gains from housing; and (ii) determine how many people seek to own rather than rent. We call the latter "capital gains encouraging institutions" that encourage housing demand that aims to benefit from capital gains, and the former "landlord protecting institutions" that discourage renting and thereby push household onto the property market.

The capital gains-encouragement index is an inverse measure of the capital gains and transfer tax (higher capital gains taxes get a lower value), taken from the capital gains and transfer tax component in Fuller's (2015) mortgage credit-encouragement index. To account for the diversity of tax rates as well as exemptions, Fuller (2015) categorises countries into three groups: countries with large exemptions for personal residences, or where overall transaction costs typically run less than 5

[9] Harding and Pagan (2002), in their work on real GDP, use raw data and make a case against removing a *stochastic* trend, but their methodology can be applied to data where a *linear* trend had been removed. Different from Harding and Pagan, this section is concerned with the relative size of trend and cycle. In the econometric analysis we do perform a robustness check with raw data.

[10] In addition, peaks and troughs must alternate, and the length of a full cycle must at least be 5 years. Such an algorithm has also been used in Drehmann et al. (2012) and Claessens et al. (2012), although with slightly different criteria. Drehmann et al. (2012) impose a 5-quarter rather than a 10-quarter window to identify local peaks. We chose the longer period to focus on medium-term cycles. We add a further criterion to include truncated phases at the sample start and end to maximise the sample period.

percent of the property, are categorised in the highest group. Countries which include most primary residences or countries that require at least 5 years to gain an exemption are put in the lowest group. The remaining countries are grouped in the middle category. This index is time invariant. As an alternative measure we use transfer tax data (from the EU Housing Taxation Database), for which time varying data is available, albeit for a reduced number of countries (Barrios et al. 2019).

The landlord-protection index is constructed by means of a principal component analysis on four landlord protection variables: rent controls, tenure protection, housing rationing, and social housing rates. If a country has relatively low rent controls, tenure security, rationing and social housing rates, it will get a higher index value. We use data from the Rental Market Index (ReMaIn) Database to measure rent control laws, protection of tenants from eviction and housing rationing to maintain supply (Kholodilin 2018). Rent control laws protect tenants from rental increases and can take the form of either a rent freeze or a limit on the growth rate of rents. Tenure protection from eviction includes automatic prolongation of existing rental contracts or the prohibition for landlords to break rental controls, unless for specific reasons such as non-payment of rent. Housing rationing refers to government policies taken to fully use the housing stock when there is an acute shortage. For example, by creating a register of available and vacant dwellings, banning the demolition of housing, putting new tenants into vacant buildings, preventing movement to highly populated areas and/or the nationalisation of private housing. Data on the social housing rate is combined from four data sources: the OECD Affordable Housing database, the ECB SHI database, Kohl (2018) and Kholodilin et al,. (2022).[11]

[11] We do not have data on landlord protection institutions for Luxembourg, the Netherlands, Japan, South Korea, Hungary, Croatia and Slovenia. Moreover, we do not have data on the credit permissiveness index for Czech Republic nor the Slovak Republic. These countries are therefore not included in the sample.

We expect positive signs for the capital gains-encouragement and the landlord-protection indices, as more capital gains-encouragement and landlord-protection leads to more intense house price cycles as discussed in the theoretical section.

Our baseline specification includes two controls: credit elasticity and supply constraints. To capture the credit elasticity of the banking system we use a new credit elasticity index constructed by means of a principal component analysis from three variables. Each variable captures a different dimension that may impact credit supply. First, the maximum loan-to-value ratio at the beginning of each phase captures the regulatory permissiveness of bank lending. Second, the change in the stock market capitalisation to GDP ratio acts as a proxy for various domestic factors that may influence the risk appetite of lenders, given that stocks are key assets on bank's balance sheets. Third, an index of de jure financial globalisation (named 'KOF index', Gygli et al. 2019) is included to capture the ease of access of banks to international financial markets, which may impact banks' willingness to lend. From these three variables, we construct an index using the first principal component as discussed further in the appendix. An increase in the index reflects a more elastic credit supply. We impose opposite effects in booms and busts as credit supply constraints are expected to reduce the intensity of the boom, but increase the intensity of the bust. Thus, for the econometric analysis we invert the sign of the effect for the bust, i.e. impose identical coefficients of opposite signs on booms and busts. This is also done for a range of the control variables summarised in the Appendix, section 7.

To check the robustness of our results, we will consider three alternative measures of credit supply which have been used in the literature. First, we include and extend the index constructed by Wiedemann (2023). The original index by Wiedemann includes six indicators to measure credit regime permissiveness: stock market capitalisation (% GDP), total pension fund assets (% GDP), share of lending to the household sector (% of total lending); the share of government-owned banks, the maximum loan-to-value ratio and tax relief for debt-financed homeownership. We gather data to extend the index to include eight additional countries: Norway, Switzerland, Iceland, New Zealand,

Czech Republic, Estonia and Latvia. We also extend the index back to 1995, although some countries have a slightly shorter time span due to data limitations. The data appendix presents details on the construction of this index. A difference between our extended Wiedemann index and its original version is that we do not include tax relief for debt-financed homeownership given that this variable is closely related to our main capital gains-encouragement index. All three variables are z-transformed so that the coefficients can be interpreted as the effect of a one standard deviation increase on the intensity of house price cycles. Second, we use Fuller's (2015) time-invariant mortgage credit-encouragement index without the capital-gains component. Our modified version thus consists of three factors: restrictions on interest rates, government mortgage subsidies and the size and depth of secondary mortgage markets. Like the Wiedemann credit permissiveness index, it is also z-transformed. Third, we include a measure of loan duration from the EU Housing Taxation Database (Barrios et al. 2019). Loan duration captures the average mortgage lending period in the country each year; however, it is only available for a reduced number of countries. We expect all of these factors to have either a positive or insignificant sign, depending on whether credit supply is a binding constraint on (speculative) credit demand .

Lastly, we also control for housing supply factors that may impact house price cycle intensity. We do this with data from Kohl (2021) on the construction intensity, defined as the number of new completions of housing units per person at the beginning of the cycle. As with other variables, we use its value at the beginning of the cycle to mitigate potential endogeneity issues.

6 Statistical analysis

As many of our explanatory variables exhibit little time-variation, we estimate the relationship between institutional variables and cyclical properties (i.e. average intensity) using pooled OLS regressions (see Comunale, 2020; Huber, 2019; ECB, 2018 for a similar approach). For the estimates to have a causal interpretation, the explanatory variables need to be exogenous, i.e. not affected by

reverse causality or omitted confounding variables. To mitigate the reverse causality problem, several of the institutional variables (credit permissiveness, construction of new housing units per person, debt to GDP, homeownership rates) are measured at the beginning of a cycle episode. Omitted variable bias cannot be ruled out but might be limited compared to macroeconomic aggregates insofar our institutional variables are governed by policy choices that reflect longer-term socio-political processes that are relatively independent from the short-term macroeconomic environment.

Table 2 summarises the main results of the regression analysis. Specification 1 zooms in on our two main variables of interest. The capital gains-encouragement index has a coefficient of 1.85 and is statistically significant at the 1% level. The landlord protection index has a coefficient estimate of 0.55 is statistically significant at the 10% level. The signs are as expected – stronger speculation encouraging institutions are associated with more intense house price cycles.

Table 2. Regression results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Capital gains-encouragement	1.851***	1.703***		2.200***	1.793***	1.882***	1.969***
	(0.000)	(0.001)		(0.005)	(0.001)	(0.000)	(0.003)
Landlord protection	0.547*	0.530*	2.114***	1.108*	0.534*	0.722**	0.787*
	(0.079)	(0.085)	(0.008)	(0.067)	(0.092)	(0.029)	(0.084)
Transfer Tax			-0.812***				
			(0.010)				
Credit supply elasticity		-0.589	-0.048	-1.069	-0.424	-0.584	0.302
		(0.203)	(0.953)	(0.201)	(0.398)	(0.237)	(0.586)
Construct new units per person		-0.157*	-0.251**	-0.413*	-0.257**	-0.155*	-0.100
		(0.052)	(0.044)	(0.081)	(0.039)	(0.057)	(0.250)
Public-manuf wage difference				-0.456			
				(0.438)			
Unemployment benefits				0.038**			
				(0.026)			
Monetary Policy (Interest rate)					0.111		
					(0.427)		
Fiscal policy (CAPB)					0.124		
					(0.387)		
Synchronisation index						0.014	
						(0.872)	
Intercept	5.861***	5.685***	8.935***	5.631***	5.589***	5.479**	6.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.015)	(0.000)
N	85	77	45	48	74	73	65

Note: Dependent variable: intensity of cycle phase. See Appendix for variable definitions. P-values are included in parentheses. *, **, *** denote statistical significance at the 10, 5, and 1% level, respectively. The estimations use heteroskedasticity robust standard errors. Data only include phases of the cycle that end after 1990. Specification 7 uses raw rather than de-trended data for the cycle identification.

Specification 2, our baseline, adds in the two main control variables discussed in section 5: credit supply elasticity and construction of new units per person as a measure of housing supply. The coefficient of credit supply elasticity index is insignificant through all the specifications of Table 2.[12] The housing supply measure has the expected negative sign and is statistically significant at the 10% level – suggesting that a more elastic housing supply dampens the intensity of house price cycles. The coefficients on capital gains-encouragement and landlord protection remain significant at the 1% and 10% level respectively.

Specification 3 replaces the time-invariant capital gains encouragement index with the transfer tax rate that exhibits variation across time as well as countries, but only captures one aspect of capital gains, i.e. the taxes that are paid when selling and buying a property. It is available only for a limited number of countries and reduces the overall sample size. It is statistically significant at the 1% level and exhibits the expected negative sign (recall that the capital gains index is scaled inversely), while the landlord protection index remains statistically significant (with a larger coefficient estimate of 2.11).

Specification 4 adds institutional factors used in the previous CPE literature: wage-setting institutions and welfare state provision. As discussed in section 3, the welfare state is defined in two different ways in the CPE literature: either with respect to the size of social housing stock and other rental market protections (Anderson and Kurzer, 2020) or with respect to labour market institutions (Johnston et al. 2021). The former are already captured by the landlord-protection index (higher values of the index indicate lower social housing rates and lower rental protections); for the latter we follow Johnston et al. (2021) and use the generosity of unemployment benefits from the OECD, measured by the net replacement rates unemployment of unemployment payment (relative to

[12] If we include the three variables that make up the credit elasticity index separately (rather than as a principal component), they are also statistically insignificant.

previous in work household income after two months of unemployment).[13] For domestic-favouring wage-setting institutions, we follow Johnston and Regan (2017) and use the difference between the growth rates of public and manufacturing sector wages taken from the EU KLEMS database. Positive values indicate that public sector wage growth outstrips wage growth in the manufacturing sector in a given year. Like the credit elasticity variable, we invert the signs for the boom and bust for both the wages and labour market institutions. Due to data availability, the sample size for this specification is reduced. We find that in specification 4, which has a smaller sample size, the capital gains-encouragement index remains statistically significant at the 1% level (with a slightly smaller coefficient estimate of 1.793) and the landlord protection index is statistically significant at the 10% level, with a similar coefficient (0.534) than the baseline. Unemployment insurance and the wage gap are all not statistically significant.

Specification 5 controls for the impact of macroeconomic policies that may influence the intensity of house price cycles via countercyclical policies. We use the cyclically adjusted government budget balance (CAPB) to control for fiscal policy. This measure, published by the World Bank, gives the budget balance if the economy were at normal capacity utilisation. It is expansionary when there is a deficit, and contractionary when there is a surplus. We further use the short-term interest rate from the OECD to capture the impact of central bank rates on housing markets.[14] Neither monetary policy nor fiscal policy is statistically significant. The capital gains index remains statistically significant at the 1% level, the landlord protection index at the 5% level. The other controls have the same significance and signs as the baseline.

[13] For the period from 1970-2001 data on net replacement rates don't exist and so we construct a series using the growth rates of the historical gross replacement rates, spliced with the net replacement rates dataset. Higher measures indicate that countries have more generous unemployment benefits and therefore a stronger welfare state, measured in terms of labour market protections.

[14] Short-term interest rates are the rates at which short-term borrowings are affected between financial institutions or the rate at which short-term government paper is issued or traded in the market.

Specification 6 adds a measure of the international synchronisation of house price cycles that was constructed based on the methodology in Mink, Jacobs, and de Haan (2012) and uses the US house price index as a reference series.[15] The synchronisation index is statistically insignificant, while the capital gains and landlord protection variables remain significant at the 1% and 5% level respectively. This lends support to our argument that house price cycles have a significant domestic component shaped by institutional factors.

All specifications so far have used the turning point algorithm following Harding and Pagan (2002) applied to de-trended data. Specification 6 reports results where the turning point algorithm was applied to raw data. This procedure identifies fewer cycle episodes, and therefore the sample size decreases to 65. However, the coefficients on both speculation-encouraging institutions remain statistically significant. Thus, our results do not rely on de-trending prior to turning point identification.

Table 3 presents further robustness tests. The first three specifications of Table 3 consider alternative measures of credit supply elasticity. Specification 1 replaces the credit supply elasticity index used in specification 2 of Table 2 with the modified mortgage-credit encouragement index from Fuller (2015). Like the credit supply elasticity index, the modified mortgage-encouragement index is insignificant, while capital gains-encouragement and landlord protection remain significant at the 1% and 10% level respectively. Specification 2 of Table 3 uses the Wiedemann index - another alternative measure of credit supply, which is also insignificant. The capital gains-encouragement and landlord protection indices remain significant at the 1% and 5% level respectively. Specification 3 includes the average loan duration of mortgages along with our credit elasticity index. Capital gains-encouragement

[15] See the Appendix for details. We apply the synchronicity index proposed in Mink, Jacobs, and de Haan (2012) to a binary time series obtained from the turning point algorithm, which measures whether a country's house prices are expanding or contracting. Choosing the USA as a reference region, we then compute for each country the synchronicity between its and the USA's housing cycle. The total synchronicity index used in specification 6 is the unweighted average over the country-level synchronicity indices.

remains significant (with a larger coefficient of 2.852) at the 1% level, as does landlord protection (with a larger coefficient of 1.802), while loan duration is insignificant.

Table 3. Robustness test results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Capital gains-encouragement	1.705***	1.663**	2.852***	1.290**	1.065***	1.733***	1.011***
	(0.002)	(0.011)	(0.004)	(0.016)	(0.001)	(0.001)	000)
Landlord protection	0.547*	0.721**	1.802***		0.203	0.542*	0.245
	(0.097)	(0.044)	(0.002)		(0.465)	(0.086)	(0.330)
Fuller Index	-0.107						
	(0.812)						
Wiedemann index		-0.683					
		(0.323)					
Loan duration			0.033				
			(0.290)				
Credit supply elasticity			-0.762	-0.593	-0.480	-0.873*	-0.411
			(0.397)	(0.196)	(0.243)	(0.062)	(0.238)
Construct new units per person	-0.195**	-0.219**	-0.297**	-0.136*	-0.142	-0.455***	-0.159*
	(0.026)	(0.026)	(0.033)	(0.068)	(0.129)	(0.004)	(0.052)
Homeownership rate				0.080			
				(0.220)			
Household debt					-0.015		
					(0.299)		
Boom						4.089*	
						(0.064)	
Intercept	5.485***	5.294***	6.529***	0.459	5.904***	3.276**	4.852***
	(0.000)	(0.000)	(0.000)	(0.914)	(0.000)	(0.019)	(0.000)
N	77	63	45	75	66	77	66

Note: Dependent variable: intensity of cycle phase. See Appendix for variable definitions. P-values are included in parentheses. *, **, *** denote statistical significance at the 10, 5, and 1% level, respectively. The estimations use heteroskedasticity robust standard errors. Data only include phases of the cycle that end after 1990. Specification 7 excludes eastern European countries.

An import channel in our argument is that strong landlord protection incentivises people to go onto the property market. Specification 4 replaces landlord protection with the homeownership rate (i.e. the proportion of households that own their own property), which has been widely used in economics studies.[16] As landlord protection affects house prices via homeownership it would not make sense to include both in the same specification. We generally prefer landlord protection as an explanatory variable as it is likely to be more exogenous, whereas homeownership is likely to be endogenous to the housing cycle. It can be seen that homeownership has an insignificant relationship to the intensity

[16] To ensure comparability with previous specifications the sample is restricted to that of specification 2.

of the cycle. The findings of some of the previous financial cycle literature has highlighted the role of homeownership in driving the amplitude of house price cycles (Rünstler and Vlekke 2017, ECB 2018, Huber 2019, Comunale 2020), albeit this does not seem to hold for the intensity of the cycle. Amplitude measures the percentage change in house prices over a phase of a cycle regardless of its length, while the intensity captures the percentage change per year. Therefore, homeownership may drive changes over the whole phase but does not have a significant relationship to intensity.

Specification 5 adds household debt to the baseline specification. It is not statistically significant, but landlord protection falls below the 10% level, while capital gains encouragements remain statistically significant at the 1% level. The insignificance of household debt supports our argument that house price dynamics need to be studied on their own.

Specification 6 explores whether the intensity of house price booms differs from busts by adding a dummy variable for booms. This dummy is not statistically significant, and the coefficient estimates for our two explanatory variables as well as their level of statistical significance are unaffected.

Lastly specification 7 drops the Eastern European countries (Estonia, Latvia, Lithuania and Poland). These have shorter time series and the highest values for the house price cycle intensity and could therefore be considered extreme values that drive our results. The coefficient estimate for capital gains encouragement drops to 1.099 but is statistically significant at the 1% level. The coefficient estimate for landlord protection also becomes smaller (0.215) and is indeed not statistically significant anymore, suggesting that the landlord-protection channel is particularly relevant for Eastern European countries.

Overall, these results are consistent with our argument that cross-country differences in the intensity of house price cycles are influenced by speculation-encouraging institutions. Put simply, countries such as Latvia or the United Kingdom have particularly intense house price cycles because their institutions encourage speculative behaviour in housing markets. An elastic housing supply dampens house price cycle intensity, while credit elasticity is not related to cycle intensity. While the effects of

capital gains-encouraging institutions are robust, the one of landlord protection somewhat more sensitive to the specification. Institutions which promote capital gains are particularly important. A one standard deviation increase in the capital gains-encouragement index is correlated with an increase in the intensity of cycles by about 1.85%-pts per year. A one standard deviation increase in the landlord-protection index on the other hand is correlated with a 0.55%-pts increase per year. To illustrate the size of the effects related to the speculation-encouraging institutions consider the contrasting cases of Germany and Spain, which have average cycle intensities of 2.1% and 6.2%, respectively. Multiplying the difference in average values for the landlord protection and capital gains indices between the two countries by the respective estimated coefficients in column 1 of Table 1 suggests that capital gains encouragement explains 70% of the difference in house price cycles between the two countries, while the impact of landlord protection explains 10%. Speculation-encouraging institutions thus explain a substantial part of cross-country variation in house price cycle intensity.

7 Conclusion

The central aim of this paper was to bring endogenous house price cycles to the CPE debates on housing and institutional analysis to Minskyian financial cycles. House price cycles are large compared to their secular trend. While there is a sizeable literature on differences in household debt across countries and some on house price growth, recurring cycles have rarely been analysed systematically in CPE. The neglect of house price cycles and the role of institutions in shaping them is a serious oversight. House prices and associated credit flows are considered a key component of financial cycles (Borio 2014). Busts of financial cycles are rarer than regular business cycles and they lead to deeper and more long-lasting recessions. Drawing on Minskyan and behavioural theories of endogenous cycles, the paper has argued that house price cycles are driven by the speculative demand for houses that seeks capital gains. Combining this with an institutionalist perspective, we proposed that the

intensity of these cycles can be explained by speculation-encouraging institutions, which we identified as low capital gains taxation and strong landlord protection. Empirical evidence for 23 OECD countries confirms that these institutions are positively related to the intensity of housing booms and busts, whereas credit permissiveness does not seem to play a decisive role.

Our approach differs from that taken by most of the existing CPE literature on house prices and household debt (Anderson and Kurzer 2020; Johnston, Fuller, and Regan 2021; Tranøy, Stamsø, and Hjertaker 2020). Their results are about the impact on the level (or growth) of house prices (or household debt); ours are about house price cycle intensity. Our results do not necessarily contradict their findings as regards to secular effects but offer a different perspective on the role of house prices. Our approach also differs from that Kholodilin, Kohl and Muller (2023) in that we investigate the intensity of house price cycles rather than the likelihood of a bubble episode occurring. Ours is a framework of endogenous boom-bust cycles, whereas theirs is one of isolated speculative episodes that contrast with normal times. Interestingly, Kholodilin, Kohl and Muller report similar effects of the housing institutions which we label speculation-inducing institutions, despite their different theoretical framework and empirical methodology. However, they also report effects of what we consider credit permissiveness, which seem to affect the likelihood of bubbles but not the cycle intensity that our paper analyses.

Our findings have direct implications for CPE research, whether in the growth models or the varieties of capitalism approach. House price cycles are key for an understanding of growth models. House prices are drivers of both consumption and investment (Kohler, Tippet, and Stockhammer 2023, Wood and Stockhammer 2024); thus, understanding the determinants of the intensity of house price cycles is crucial for understanding the instability of finance-led growth models. Our findings imply that unstable house price-driven growth models are more likely to occur in countries with speculation-encouraging institutions. From a varieties of capitalism perspective it suggests that some varieties are more prone to macroeconomic fluctuations than others. However, our findings fit more readily into

the growth models than the varieties of capitalism approach as the latter usually analyses institutions as efficient solutions to coordination problems that ultimately support comparative advantage (Hall and Soskice 2001).

This paper has treated housing cycles as national and institutions as given. As there are substantial differences in housing cycles across countries that is a useful starting point, but clearly also a limitation. There are specific areas for future research that would extend our approach. Given the strong transnational financial linkages, a follow up question is: when and under what institutional arrangements do housing booms spill over to other countries? Why do countries differ in the degree of speculation-encouraging institutions? To what extent are national house prices driven by or hide divergent regional house price movements? Beyond these specific issues, the argument of this paper is of broader significance for the study of institutions. Most of CPE treats institutions as anchors of stability. Institutions, in historical institutionalism, are regarded as self-reproducing and as stabilising the behaviour of actors. Our approach emphasises that institutions can also be (economically) destabilising.[17] While the institutions we highlight do structure social interactions like all institutions, in our case they may destabilise the system because they can encourage speculative behaviour (or more precisely: extrapolative price heuristics) and thereby lead to house price cycles.

The notion that politically self-reproducing institutions may give rise to unstable economic dynamics is one that that has relevance well beyond housing. Blyth and Matthijs (2017) and Schwartz and Tranoy (2019) have pointed out that IPE and CPE have neglected problems of fallacies of composition. They discuss cases where the fallacy of composition occurs when some national strategies (say, a strategy

[17] This is not necessarily inconsistent with historical institutionalism, which emphasises that institutions are politically self-stabilising, but often has little to say about the economic impact or matters of financial stability. In one of the rare occasions where they discuss banking regulation, Hacker et al (2015) analyse it as a case of drift: existing regulation not getting updated despite changing circumstances. Our concept of speculation-encouraging institutions goes beyond that: it highlights that once such institutions are in place, the resulting financial effects can be disproportionate to the underlying institutional change (e.g. when financial bubbles build up) and they will vary substantially over time (e.g. boom-bust cycles).

of export competitiveness via labour cost reduction) become generalised and implemented in many countries simultaneously, which can give rise to unintended consequences (such as generalised export orientation leading to lower growth). Our argument instead rests on different spheres of the political economy and picks up on Keynesian themes: institutional arrangements that solve particular problems or are useful for actors under specific circumstances may have unintended consequences when these institutions dominate the social structure.

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Appendix to: What goes up, must come down. Speculation-encouraging institutions and house price cycles across countries

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1. Data sources overview

Table A1. Data Description

Name	Description	Data sources and notes	Mean	St Dev	Min	Max
Real house prices	Real house price index (log)	Constructed from: (1) BIS (2) OECD (3) ECB (4) Palacin & Shelburne (2005). Starts in 1970, except for: AUT (2000), GRC (1997), ISL (2000), PRT (1988), ESP (1971), KOR (1975), CZE (2000), SVK (2005), EST (2002), LAT (2006), HUN (1999), LTU (1999), HRV (2002), SVN (2005), POL (2000)	447.18	32.38	356.16	534.41
Boom	Dummy variable that is equal to 1 during house price boom periods and 0 otherwise	Computed based on turning point algorithm (described below) applied to logged real house price data				
Phase	Binary variable that is equal to 1 during house price boom periods and -1 during busts	Computed based on turning point algorithm (described below) applied to logged real house price data				
Landlord protection index	Index of the degree of protection given to landlords vis a vis renters	Constructed from a principal component analysis of the following variables: social housing rate, rent laws, tenure security and rationing.	0.23	1.12	-4.99	2.08
Social housing rate	Proportion of households who rent socially (%)	Social housing data from four data sources: (i) Social housing stock / total housing stock from OECD Affordable Housing database; (ii) Percentage of households who live in social housing from ECB SHI database; (iii) homeownership rate data; (iv) Data from https://dataverse.shinyapps.io/socialhousing/	9.56	8.19	0.00	47.50
Rent Laws	Index of the degree of rental protection laws for renters (0-1)	ReMain dataset; higher values indicate stronger rental protection laws	0.34	0.28	0.00	1.00
Tenure security	Index of the degree of security for renters (0 – 1)	ReMain dataset; higher values indicate stronger tenure security for renters	0.47	0.24	0.00	1.00
Rationing	Index of the degree to which governments ration housing supply and demand for use values (0-1)	ReMain dataset; higher values indicate more government rationing	0.07	0.14	0.00	0.75
Capital gains encoura	Degree to which country's capital gains and transfer	Fuller (2015); high values indicate more capital gains encouragement	-1.76	.71	-3	-1

ging index	taxes on housing encourages capital gains (-1 - -3)					
Difference in public and manufacturing wages (wage-setting)	Difference in public sector and manufacturing sector labour compensation growth (%)	EU Klems; Public sector is a (employment-weighted) composite of the public administration and defence (ISIC code O), education (ISIC code P), and health/social work (ISIC code Q) sectors. Growth rates are measured as the percentage change in total labour compensation between the start and end of each phase of the cycle. high/lower values indicate public sector wage growth overshoots/undershoots wage growth in the manufacturing sector	2	6	-16	24
Unemployment insurance (welfare state)	Net Replacement Rates in unemployment - the proportion of income that is maintained after 2 months of unemployment (%)	OECD NRR and HGRR datasets; For 2001-2022 we use the net replacement rate for a single person without children on 67% of the average wage after two months on unemployment. For the 1970-2001 we use the growth rates of the historical gross replacement rates of unemployment benefit, spliced with the NRR dataset.	65.23	13.42	3.88	100.98
Transfer Tax Rate (%)	Minimum tax rate on transfer of property (%)	Housing Taxation Database V2.0, Barrios et al. (2019), Housing taxation: a new database for Europe	3.72	3.16	0.00	15.00
Homeownership rate	Proportion of households who own their own home (%)	Constructed from : (i) Homeownership rate from Kohl (2017, p. 20-22) Homeownership, Renting, and Society. Routledge; (ii) Homeownership rate from ECB SHI; (iii) Homeownership rates from OECD Affordable Housing Database	66.52	13.70	30.43	94.57
Household debt to GDP	Household debt to GDP ratio.	BIS				
Fiscal Policy	Cyclically Adjusted Primary Balance (%)	World Bank	60.78	27.96	2.75	135.93
Monetary Policy	Short term interest rate (%):	OECD; Short-term interest rates are the rates at which short-term borrowings are affected between financial institutions or the rate at which short-term government paper is issued or traded in the market.	-0.48	3.26	-16.11	14.95
Construction per population	New residential units finished per 1000 inhabitants per year	OECD	4.48	2.42	0.34	14.79
Globalisation Index	De Jure Financial Globalisation Index (0-100)	KOF Globalisation Index (Gygli et al., 2022)	77.76	11.18	29.46	93.10

Credit Permissiveness Index	Index of the degree of credit permissiveness	Extended from Wiedemann (2023) as outlined below in the appendix. Constructed from five variables: (i) Share of government-owned banks (as a % of total banks); (ii) Lending to the household sector (% of total lending): (iii) Stock market (% GDP); (iv) Pension assets (% GDP); (iv) Maximum Loan to Value (%).	0.00	1.00	-1.80	3.06
Gov banks	Share of total banks owned by the government (%)	Panizza (2023)	0.08	0.13	0.00	1.00
Household lending	Lending to the household sector (% of total lending)	BIS and see below for other construction	0.40	0.12	0.09	0.67
Stock market (% GDP)	Stock market capitalisation as a ratio to GDP	World Bank and see below for further construction	61.06	61.79	-89.23	399.96
Pension assets (% GDP)	Total pension funded assets as a ratio to GDP	OECD and see below for further construction	28.99	36.57	0.00	164.36
Max LTV	Maximum Loan to Value Ratio (%)	IMAPP Macroprudential regulation dataset	83.41	11.96	55.00	120.00
Housing supply elasticity	Price elasticity of supply	Sánchez and Johansson (2011)	0.68	0.49	0.15	2.01
Construction new units/population	Number of new units constructed per person	Kohl (2021)	4.48	2.42	0.34	14.79
Synchronisation index	Degree of cross-country synchronisation in real house prices	Computed based on phase series following the methodology in Mink et al. (2012), see below	22.17	2279	-61.29	67.74

Notes: The means, min and max have been taken for the years between 1990 and 2019.

2. Turning Point Algorithm

The following turning point algorithm is run on detrended log of real house prices for each country. To detrend the data, we regress the log of real house prices on a linear time trend for each country. The detrended series, i.e. the cyclical component, is given by the residuals from the regression.

Using the detrended series, the algorithm identifies peaks and troughs by conducting the following steps:

1. Determine local peaks and troughs according to the following rule:

A local peak is the highest local point considering both the previous 10 quarters and the following 10 quarters. For troughs, it is the lowest point considering both the previous 10 quarters and the following 10 quarters. Figure A1 shows a series of peaks and troughs for the UK from 1970 to 2020. Consider peak P. It is a peak because house prices are higher at P than the 10 quarters before it and after it. Similarly, trough T is a trough because house prices are the smallest at T compared to the 10 quarters immediately preceding and following it.

Mathematically, suppose y_t is the quarterly log of real house prices in each country. A local peak occurs at time t whenever:

$\{y_{t+k} - y_t < 0\}\ and\ \{y_t - y_{t-k} > 0\}\ for\ k = 1, \dots, K$, where K is set to 10.

A local trough occurs at time t whenever:

$\{y_{t+k} - y_t > 0\}\ and\ \{y_t - y_{t-k} < 0\}\ for\ k = 1, \dots, K$, where K is set to 10.

2. Peaks and troughs must alternate.

If a peak is consecutively followed by another peak, we drop the peak with the smaller house price value and keep the highest peak. Similarly, in the case of two consecutive troughs, we drop the trough with the highest house price value.

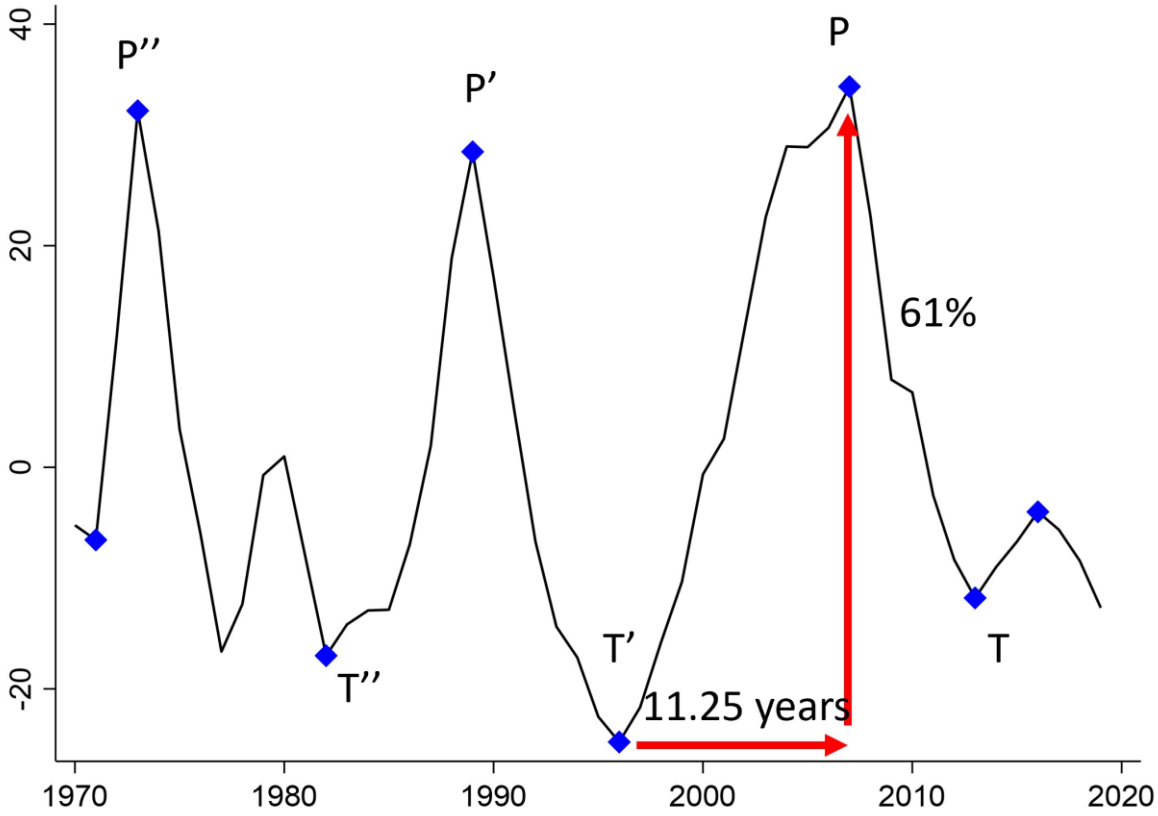
3. The length of a full cycle must be longer than 5 years (20 quarters)

A length of a full cycle is defined as the number of quarters between two consecutive peaks (troughs). In Figure A1, this is the period between P' and P (T' and T). If the cycle is shorter than 5 years, then the middle set of peaks and troughs are dropped, until the cycle is longer than 5 years. Step 2 is re-run to make sure that peaks and troughs alternate in the new set of peaks and troughs.

4. The phases at the beginning and end of the series are only included if they are longer than 2.5 years (10 quarters).

As every house price series has both a beginning and an end, the first and last phases will be truncated. In Figure A1, we do not know when the first boom began (ending in peak P'') nor when the last boom will end (starting at trough T''). Truncation at the beginning of the cycle is caused by a lack of data, while truncation at the end is caused by the uncertainty of future events that have not yet passed. We include truncated phases only if they are longer than 2.5 years (10 quarters). As these are phases rather than full cycles, we use the shorter cutoff of 2.5 years rather than 5 years. If these phases are smaller than 5 years, we ignore these datapoints and do not measure their intensity, as we only want to measure the intensity of substantial phases that are long enough to really be considered booms or busts.

Figure A1: Identifying house price cycles using turning point analysis | UK Real Log House Prices



Notes: This example looks at the UK Real House Price Index from the Bank of International Settlements (BIS) between 1970 and 2020.

Each phase of the cycle has three measurable properties: amplitude, duration and intensity. The amplitude of a phase is defined as the height of the phase between two consecutive turning points. As real house prices are taken in logs, amplitude is measured in percentage terms. The duration of a phase is defined as the number of years (quarters) between the turning points. Intensity is amplitude divided by duration. For example, in Figure A1 the amplitude of the boom between T and P is 61%, its duration is 11 years, and its intensity is just under 5.4% per year. In other words, house prices increased by around 5.4% per year during this boom period.

3. Landlord protection index

The landlord-protection index is constructed by means of a principal component analysis on four rent protection variables: rent controls, tenure protection, housing rationing and social housing rates. If a country has a higher index value, it has relatively lower rent controls, tenure security, rationing and social housing rates.

Rent controls, tenure security, rationing (ReMAin)

We use data from the Rental Market Index (ReMaIn) Database to measure rent control laws, protection of tenants from eviction and housing rationing to maintain supply (Kholodilin 2018). Rent control laws protect tenants from rental increases and can take the form of either a rent freeze or a limit on the growth rate of rents. Tenure protection from eviction includes automatic prolongation of existing rental contracts or the prohibition for landlords to break rental controls, unless for very specific reasons, such as non-payment of rent. Housing rationing refers to government policies taken to fully use the housing stock when there is an acute shortage. For example, by creating a register of available and vacant dwellings, banning the demolition of housing, putting new tenants into vacant buildings, preventing movement to highly population areas and/or the nationalisation of private housing.

Social Housing

Data on the social housing rate is combined from four data sources: the OECD Affordable Housing database, the ECB SHI database, Kohl (2018) and Kholodilin et al,. (2022).

For the latest years (from 2010 onwards), we use data from the OECD affordable housing database. We then extrapolate these series back using the growth rate in social housing rates from the ECB SHI database. For several countries the ECB SHI database does not have data, and so these gaps were filled using the social housing data from Kohl (2018) and Kholodilin et al,. (2022) back to 1990.

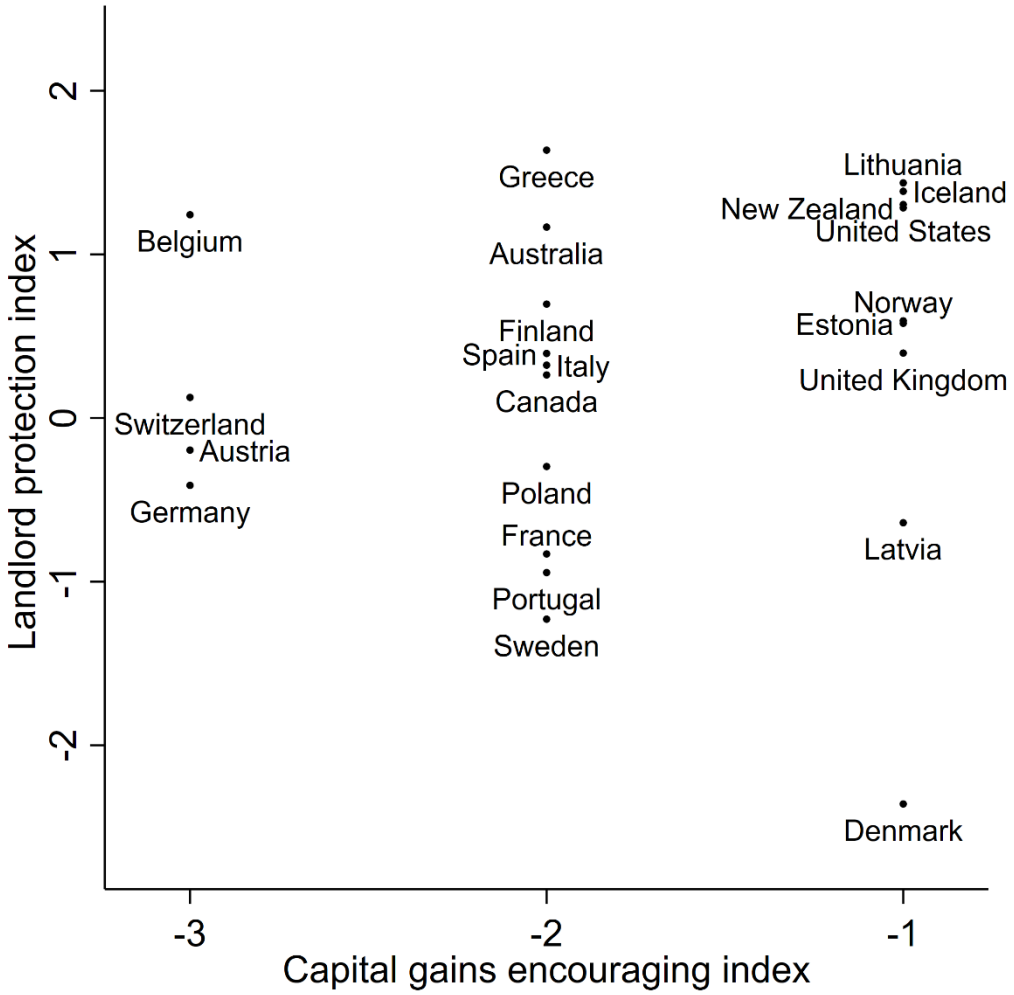
We use the first component as the index. All variables load onto the index positively, and therefore an increase in the landlord protection index represents an increase in protection for landlords (vis a vis renters).

4. Stylized facts on speculation-encouraging institutions

Figure A2 plots our indices to illustrate differences across countries. For the landlord protection index we take the average of the period (the capital gains encouragement index is time invariant). At the top right-hand side are countries with institutions that promote speculation via low capital gains taxes and landlord protection. They include the Baltic countries (Estonia, Lithuania and to some extent Latvia), liberal financialised countries (the United Kingdom, the United States), in addition to Iceland, Norway and New Zealand. Norway has a particularly low social housing and tenure rate, which is why it scores highly on the landlord index. At the bottom left hand-side are countries with the weaker speculation-encouraging institutions in both dimensions - Switzerland, Austria and Germany. The

remaining countries are grouped somewhere in the middle according to their relative degree of landlord protection or capital gains encouragement. For example, France, Portugal and Sweden have an institutional configuration that protects tenants but sits in the middle with respect to capital gains taxation. Belgium and Denmark stand out as peculiar cases, as Belgium has an institutional configuration that encourages ownership but mitigates against capital gains, while Denmark has the opposite.

Figure A2. Capital gains-encouraging and landlord protection institutions across OECD countries 1990-2019

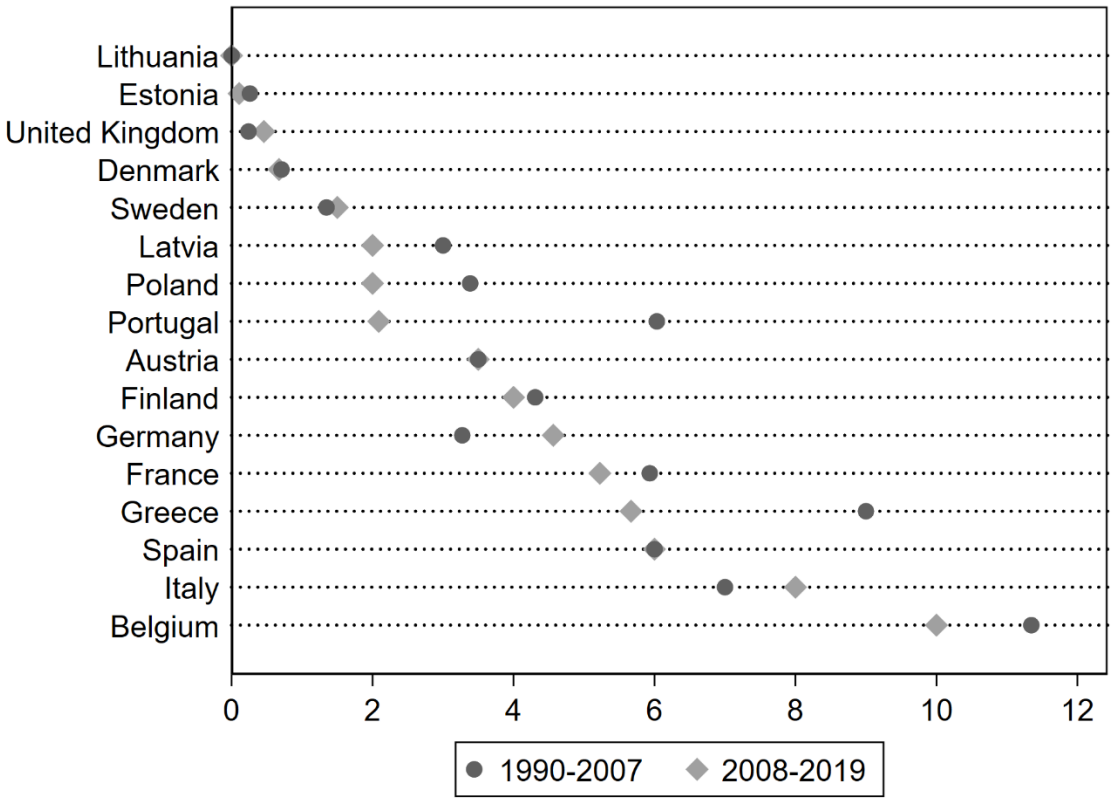


Notes: Higher values on the capital gains-encouraging index and landlord-protection index signifies stronger speculation-encouraging institutions. Data taken from 1990 to 2019. Capital gains-encouragement index is adapted from Fuller (2015). The landlord protection index is the first principal component of tenure security, rent controls, housing rationing and social housing rates.

The capital gains-encouragement index is based on the time invariant capital gains and transfer taxation index of Fuller (2015), constructed using average data for the 2000s. For transfer tax rates

(from the Housing Taxation Database)[18] data at different points in time are available. Figure A3 presents the average transfer tax rate for those countries where data are available for the periods 1990 -2007 and 2008 – 2019 (these have been chosen to roughly split the sample in half along the GFC). There has been a decline in the transfer tax rates in 12 of 16 countries with the largest change occurring in Portugal. Italy and Germany are the only two countries with non-trivial increases.

Figure A3. Average transfer tax rate for two periods: 1990-2007 and 2008-2019

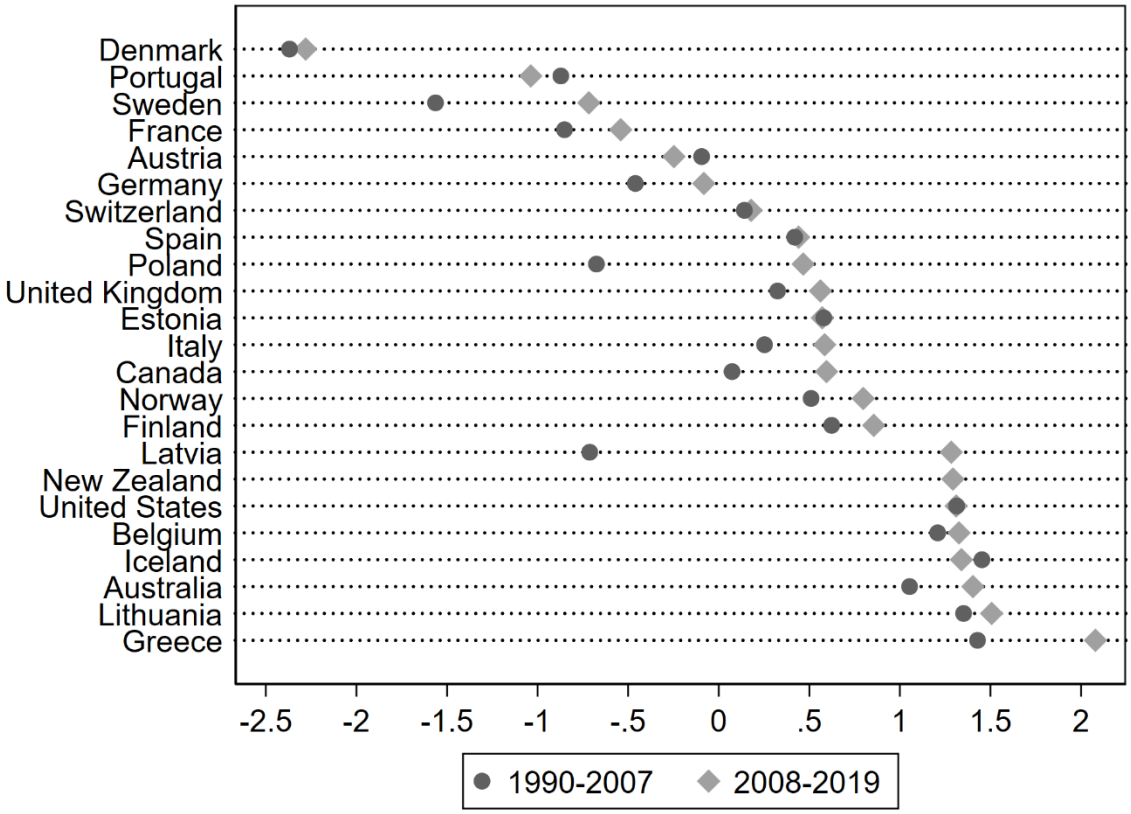


Notes: Transfer tax rate (in %) is included as one of the components of the capital gains encouraging index. We take the average transfer tax rate for each country over two periods: 1990-2007 and 2008-2019.

[18] The database only collects data on a select European countries, excluding the USA, Norway, Switzerland, Canada, Iceland, Australia and New Zealand. We do not include capital gains tax rates as they cannot be compared across countries due to complicated treatment of different assets as discussed in Fuller (2015).

Figure A4 presents the changes in the landlord-protection index. It has increased the most in Eastern Europe, such as Poland and Latvia, with the latter two countries moving from the most renter-friendly to some of the most landlord-friendly in this period. This is likely due to the collapse of socialist housing systems, being replaced by deep transnational financial integration that went hand in hand with EU accession (Bohle, 2018). Overall, we see a general change over time towards more speculation-encouraging institutions across all countries, albeit with significant cross-country differences.

Figure A4. Average landlord protection index for two periods: 1990-2007 and 2008-2019



Notes: Higher values on the landlord protection index signifies stronger speculation-encouraging institutions. Data taken from 1990 to 2019. Landlord protection index is the first principal component of four variables: tenure security, rent controls, housing rationing and social housing rates. As such the absolute values of the index have no meaningful economic interpretation.

5. Constructing the Credit Supply Elasticity Index

To construct the credit supply elasticity index, we utilise a principal component analysis of three variables.

Firstly, the change in stock market capitalisation (% GDP) over phase. Data on stock market capitalisation valuation (as a % share of GDP) comes from the World Bank, following the original Wiedemann index. There is no data available for Iceland, Estonia, Lithuania or Latvia. For these countries, we take data from the Federal Reserve Bank of St. Louis up until 2012 and from CEIC Economic Data for 2012 until 2020.

Secondly, Maximum Loan to Value (%) at beginning of the phase. The maximum loan to value data comes from IMAPP Macroprudential regulation dataset. This is different to the original index constructed by Wiedemann who uses data from Catte et al. (2005), Cerutti, Dagher and Dell'Ariccia (2017), ESRB (2019), IMF (2011, 2020) Lastly, we have the KOF Financial Globalisation Index (0-100) at beginning of phase.

The last variable used in the index is the de jure financial globalisation index from the KOF Globalisation Index (Gygli et al., 2022) . This captures the degree to which legal, economic and political institutional laws and policies make it easy for financial global flows into the given country. Higher values of the index captures more financial globalisation.

The principal component analysis loads these variables positively onto the first component, which is taken as the index.

6. Extending the Wiedemann Credit Permissiveness Index

This section shows how we extend the original credit regime permissiveness index by Wiedemann (2023). The original index includes six indicators capturing three dimensions of credit regime permissiveness. The first dimension regards the depth of financial markets and the size of the pool of capital and is captured by two indices: the stock market capitalisation (% GDP) and total pension fund assets (% GDP). The second dimension is about institutional factors that determine the allocation of credit between households and businesses. Wiedemann (2023) captures this with lending to the

household sector (% of total lending) and the share of government-owned banks. The third and final dimension of a credit regime are regulatory and fiscal policies that create, promote and sustain the institutional links. Wiedemann uses two further indicators to capture this: the maximum loan-to-value ratios and tax relief for debt-financed homeownership. A full overview of the data sources and construction of the original index can be found in the supplementary material provided by Wiedemann (2023).

Table A2 below presents an overview how we extend the original credit permissiveness index. Column 1 and 2 presents the mean value of the new and original credit permissiveness index for each country respectively. Our new dataset includes 8 new countries: Norway, Switzerland, Iceland, New Zealand, Estonia, Latvia and Lithuania, Poland.

Columns 3 and 4 present the earliest available data for both the new and the old index respectively. We also extend the index back to 1995 for all the original countries (apart from Greece which only goes to 1997 due to a lack on pension assets to GDP). Regarding the newly added countries, the new index starts in 1995 for Norway and Poland, 1998 in New Zealand, 1999 in Switzerland and Latvia, 2000 for Lithuania and 2004 for Estonia. The remaining columns show the starting date values for the indices which make up the new credit score index. Specific details on the data construction of these sub-indices are presented below.

Table A2. Overview of data availability of extended credit permissiveness index and its components

Country	Credit index new	Credit index original	Starting Date						
			Credit index new	Credit index original	Share of state banks	Lending to household sector	Stock Market / GDP	Pension assets /GDP	Max LTV
United States	2	1	1995	2000	1995	1945	1960	1970	1970
United Kingdom	2	1	1995	2000	1995	1976	1960	1991	1970
Austria	-1	0	1995	2000	1995	1995	1960	1991	1970
Belgium	-1	0	1995	2000	1995	1980	1960	1991	1970
Denmark	1	0	1995	2000	1995	1994	1960	1991	1970
France	-1	0	1996	2000	1995	1977	1960	1996	1970
Germany	-1	0	1995	2000	1995	1970	1960	1985	1970
Italy	-2	0	1995	2000	1995	1950	1960	1991	1970
Norway	-1		1995		1995	1975	1960	1991	1970
Sweden	0	1	1995	2000	1995	1980	1960	1985	1970
Switzerland	4		1999		1995	1999	1960	1984	1970
Canada	1	1	1995	2000	1995	1969	1960	1990	1970
Finland	0	0	1995	2000	1995	1970	1960	1991	1970
Greece	-1	0	1997	2000	1995	1994	1960	1997	1970
Iceland	1		2003		1995	2003	1995	1991	1970
Portugal	-1	0	1995	2000	1995	1979	1960	1989	1970
Spain	-1	0	1995	2000	1995	1980	1960	1991	1970
Australia	2	1	1995	2000	1995	1977	1960	1991	1970
New Zealand	0		1998		1995	1998	1960	1991	1970
Estonia	-1		2004		1995	2004	2000	1991	1970
Latvia	0		1999		1995	1999	1996	1991	1970
Lithuania	-1		2000		1995	1993	1996	2000	1970
Poland	-1		1995		1995	1995	1960	1989	1970

In addition to the stock market/gdp and max LTV discussed above, the Wiedemann index also includes the following variables:

Share of government-owned banks (as a % of total banks)

Data on the share of government-owned banks (as a % of total banks) is taken from Panizza (2023). This is different to Wiedemann who uses data from the World Bank's Bank Regulation and Supervision Survey. We use the data from Panizza as it has better data coverage: 181 countries over 1995-2020.

Lending to the household sector (% of total lending)

Following Wiedemann we measure the share of lending to the household sector as a percentage of total lending to the household sector and businesses. For most countries this comes from BIS – the same data source as the original index. However, BIS does not have data for Lithuania, Latvia, Estonia and Iceland. For these countries, we download the lending data from the central banks of each country. The available data series are available until the following dates: Lithuania (2000), Latvia (1999), Estonia (2004) and Iceland (2003). For the Latvian series, we define lending to the household sector as lending to consumers and mortgages, and lending to the business sector as lending to commercial and industrial.

Pension assets (% GDP)

The original index takes data on total pension fund assets (% GDP) from the OECD. We also take the data from the OECD. However, as pension fund data is only available for a shortened period, we extend the dataset back by 10 years for each country based on the final value of pension asset data available. Figures A5 and A6 below present the new series that are constructed for eastern European countries and the remaining countries respectively. The horizontal lines indicate the newly constructed data for each country. For most Eastern European countries, the last non-missing value of pension wealth is around 0 and so extending this back in time is reasonable. Likewise for the rest of the countries, the cross-country differences are much more important than changes over time and extending the series back is a reasonable assumption.

Figure A5: Pension fund assets (% GDP) for Eastern European Countries

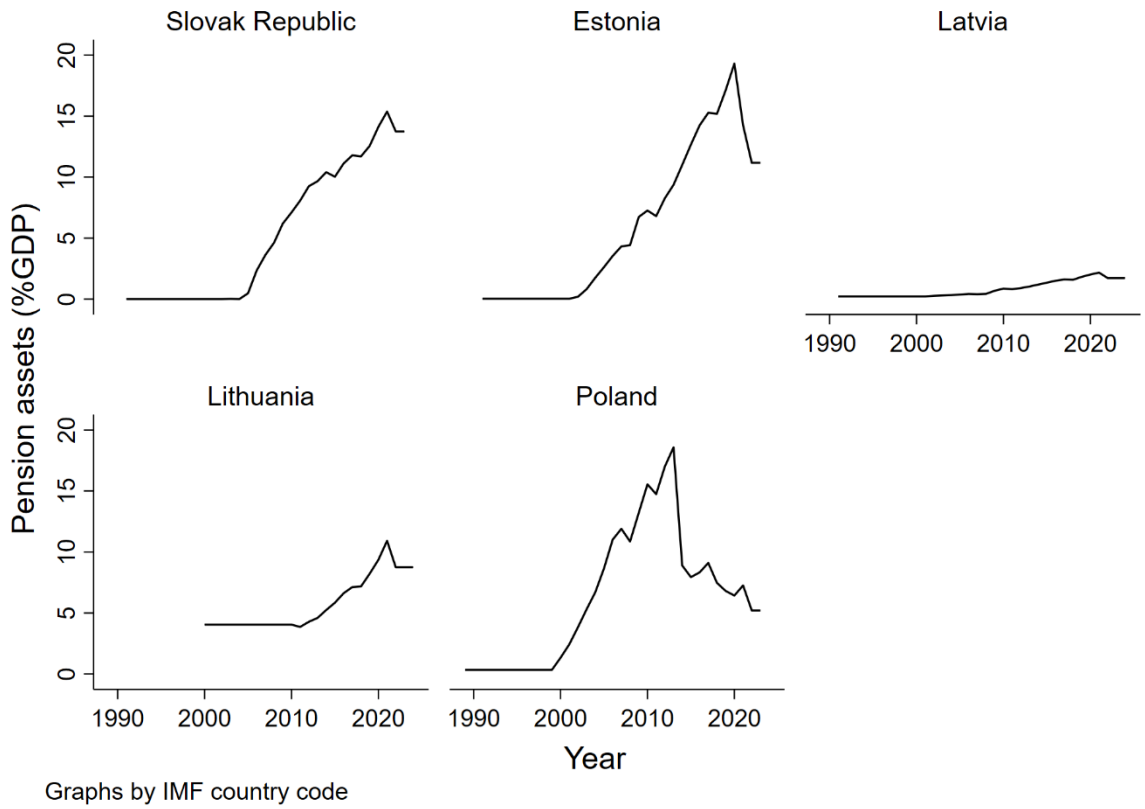
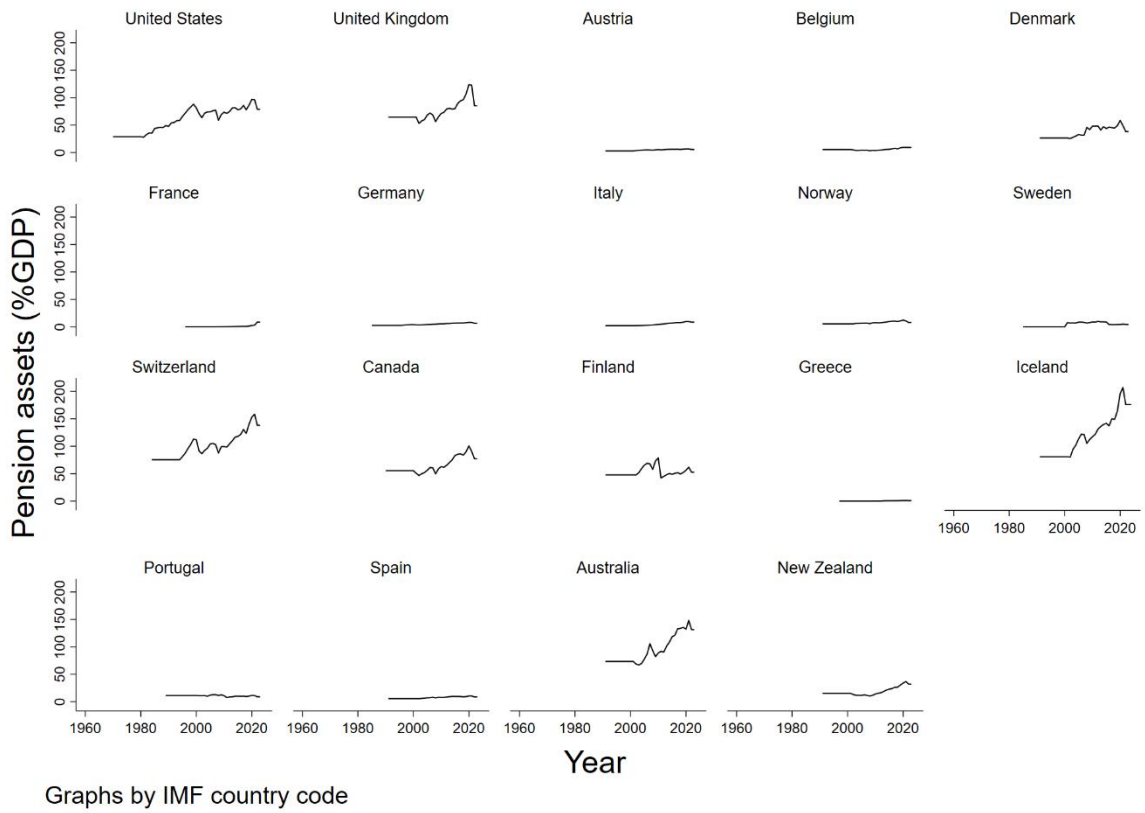


Figure A6: Pension fund assets (% GDP) for Other Countries



Tax relief for debt-financed homeownership

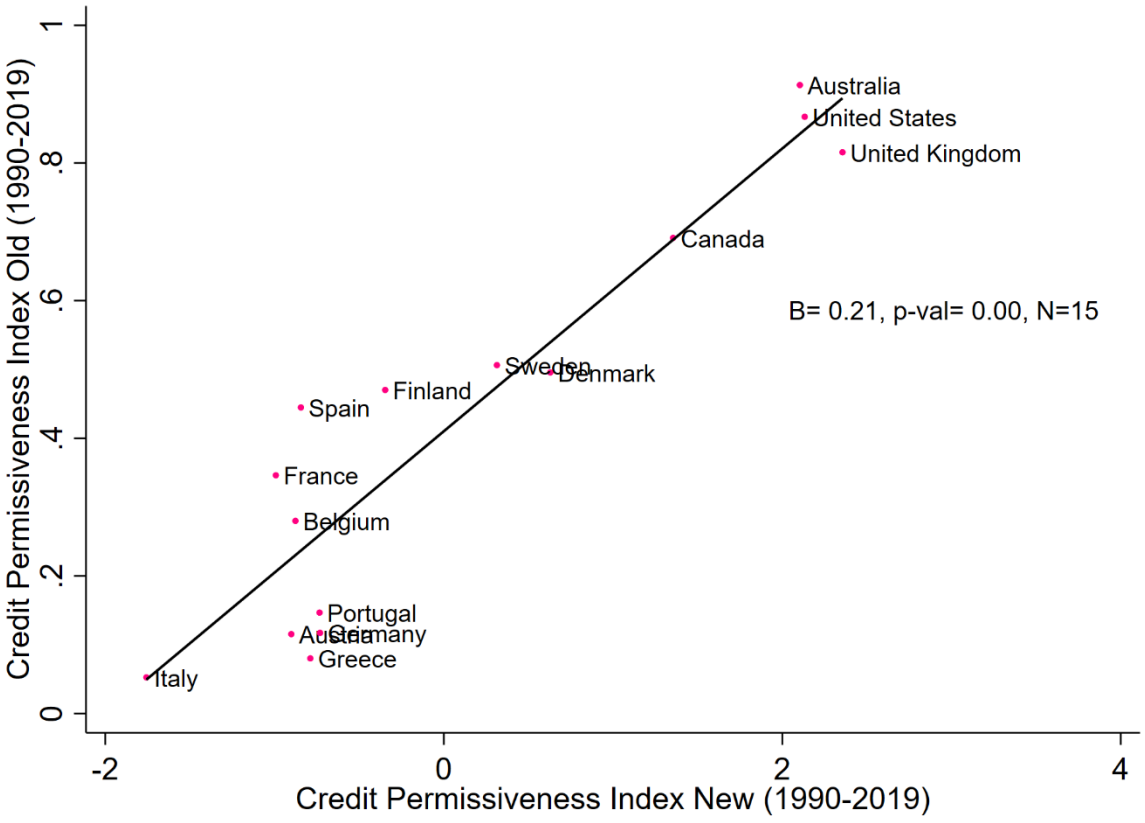
The original index uses data on tax relief for debt-financed homeownership from the OECD. This dataset however is only available until 2010 and therefore cannot be used for the period we are analysing. Moreover, as we include a tax measure as one of our main explanatory variables, we do not include this in the new measure of credit permissiveness.

Principal Component Analysis

To construct the new Wiedemann index, we utilise a principal component analysis of these 5 variables, taking the first component as the index. Apart from the government owned bank variable, the remaining variables load onto the first component positively and therefore an increase in the credit permissiveness index represents an institutional framework that is more conductive to credit formation.

Figure A7 shows the correlation of the original credit permissiveness index and the new credit index, taking the average value over the 1990-2019 period. The two indices are highly correlated, with a correlation coefficient of 0.9278.

Figure A7. Correlation of New and Original Credit Permissiveness Index



7. Imposing opposite effects in booms and busts

We impose opposite effects in booms and busts for all explanatory variables where we expect the variable to increase/decrease the intensity of the boom but reduce/increase the intensity of the bust. Thus, for the econometric analysis we invert the sign of the effect for the bust, i.e. impose identical coefficients of opposite signs on booms and bust.

For a given variable we change its value according to the following formula where phase is a dummy that equals 1 in the boom and -1 in busts.

$$variable_{adjust} = variable \times phase$$

This is performed for the following variables:

- Credit supply elasticity index
- Wiedemann index
- Fuller index
- Construct new units per person
- Public-manuf wage difference
- Unemployment benefits

- Monetary Policy (Interest rate)
- Fiscal policy (CAPB)
- Household debt

8. Construction of international house price synchronicity index

To construct an index of the international synchronisation of real house prices, we apply the methodology in Mink et al. (2012) to the *phase* variable, which takes the value 1 during booms and -1 during busts, as obtained from applying the turning point algorithm described above to the log of real house prices. It requires choosing a reference series with respect to which the degree of synchronisation is measured, for which we use the US house price index. Using the *phase* series for the i countries in our sample as well as the US reference series r, we compute the index in two steps. First, we compute a synchronisation index for each country:

$$sync_{it} = \frac{phase_{it} \times phase_{rt}}{|phase_{it} \times phase_{rt}|}.$$

Second, we compute an aggregate index by taking the unweighted average over the country-specific indices:

$$sync_t = 100 \times \frac{1}{N} \sum_{i=1}^{N} sync_{it}.$$