The Political Causes of Real Estate Bubbles

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Abstract

A model which explains national-level house price appreciation through utility maximization by rational voters is developed and tested using a global sample of 40 democracies, in order to explain why some countries experienced house price bubbles in the past decade and others did not. In the model, a subsidy funded by a tax on all citizens can be provided to home buyers. The subsidy leads to an increase in house prices, which increases the utility of all homeowners for a while. Heterogeneity in various features of housing markets leads to heterogeneity in how much each homeowner benefits from the subsidy. The median voter decides on the optimal level of the subsidy. The more homeowners there are, the more likely the median voter is to be someone who benefits a lot from the subsidy, and thus who desires more of it. Empirical analysis confirms that the share of homeowners in the population at the beginning of the global house price bubble of the 2000s was the main determinant of the size of the bubble at the national level, with other factors which have been proposed in the literature being relatively unimportant. The policy channel through which the median voter generates house price appreciation is confirmed to have been the generation of loans which ended up being non-performing.

1 Introduction

The causes and effects of the global real estate bubble[1] which has preceded the recent worldwide recession have drawn extensive attention from academics, policymakers, and the media. There is little controversy over the fact that the bubble had some very serious costs in the long run, and this episode is generally considered an example of ineffective policy-making

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[1]In the text, we will be using the word "bubble" as a shorthand for a period of sustained and rapid house price appreciation that ends with a rapid reduction of prices to the historical trend. We are not necessarily suggesting bubbles have to reflect irrationality, or any other behavioral inclination from economic agents, which is sometimes implied by other authors.

(some good summaries of these issues are found in Bank for International Settlements 2007; 2008; 2009, Financial Crisis Inquiry Commission 2011). This paper seeks to explain why some countries experienced house price bubbles and some did not in the lead-up to the recession. The list of factors blamed for the occurrence of the bubble is too long to be presented here, including rent-seeking by the financial industry, myopia and irrationality, global imbalances in savings and consumption, technical advances in the financial industry, corrupt or cynical policy-making, and so on. This paper will argue that, while all of the above-mentioned factors might have played a role in the process, we can ultimately explain why some countries developed a bubble and others did not very well through an analysis of utility maximization by rational voters and politicians given different national conditions. The model generates the simple result that the more homeowners there are in a country, the more "artificial" price appreciation will emerge from the political process. Therefore, when the preconditions for bubble formation, namely the existence of large pools of loanable funds, and a financial sector that is complex enough to ensure the intermediation of highly risky credit transactions across the world, are in place at a global level, house price bubbles are to be regarded as natural consequences of electoral politics in certain countries. This statement is strongly confirmed by a statistical analysis of price changes in a global sample of 40 democracies: the level of homeownership at the beginning of the price appreciation period is by far the most important predictor of the severity of the bubble, using three different measures of bubble intensity, in OLS and instrumental variables models. By comparison, other factors which have been hypothesized to play a role are shown to be unimportant. The policy channel through which majority-rule preference aggregation affects the degree of price appreciation is the subsidization of home buying through relaxed credit conditions. The subsidy consists of the payment that will be made by everyone in society when credit becomes non-performing, either in the form of "bailing out the banks" or in the form of having to service increased foreign debt. The fact that price appreciation is temporary bears little importance for the logic of the model, and the reasons for the eventual bursting of the

bubble are not directly relevant to the argument.

The rest of this paper proceeds as follows: Part two presents the state of the literature concerning the political economy aspects of the global property bubble of the 2000s. Part three develops a formal model that shows how median voter utility maximization can generate house price appreciation. Part four presents the empirical analysis and part five discusses the conclusions of the analysis.

2 Related literature

The literature on the global property price bubble of the 2000s and the worldwide recession that followed it is ongoing, multi-disciplinary, and important contributions have been made through both academic and non-academic outlets. Therefore any summary of the state of the literature will necessarily miss important contributions. However, looking at just the political aspects of the bubble and crisis, we propose categorizing the explanations in three main strands, with the understanding that this does not do justice to the complexity of some of the arguments: First, a significant literature places the explanation for the bubble and crisis on interest group poltics at the national level, especially the power of the financial sector. One of the most representative contributions in this direction is the work of Johnson and Kwak (2011). These authors and others in the same strand of literature concentrate on the "too big to fail" nature of financial institutions, which allows them to engage in high-risk lending in the knowledge that the rest of society will not be able to afford to let them bear the true costs of their risky lending. Iversen and Soskice (2012) present a complementary explanation that attributes the different attitudes of governments towards the development of bubble dynamics to the promotion of their national high-value added sectors: while in the US and UK the financial sector was favored by policy, in Germany or Japan manufacturing played this role. Thompson (2009) presents the way in which US private lenders Fannie Mae and Freddie Mac lobbied for relaxed regulation which allowed them to engage in risky real

estate lending. Gourevitch (2013) and McCarty et al. (2010) present the extensive influence wielded by the US financial industry in the years leading up to the crisis and the role of this influence in the development of the bubble. This paper will complement this strand of the literature by explaining why certain countries might develop conditions under which financial speculation is tolerated or encouraged, by concentrating on the electoral politics of these phenomena. While there is no doubt that financial institutions have played a crucial role in intermediating the transactions that gave rise to the bubble, and that they gained a lot in the short run from this intermediation, it is still a significant analytical challenge to explain why there was so much cross-country variation in the degree to which the respective financial systems were allowed to engage in the lending that lead to price appreciation.

A second strand of literature also concentrates on internal politics, but emphasizes electoral constraints rather than interest groups. Hall (2010) argues that fundamental changes in advanced-world economies after the 1970s lead governments to seek solutions to the problem of increasing inequality, and one such solution was the creation of perceived wealth through home price appreciation. In a series of papers, Ansell (2007; 2011; 2012; 2013) emphasizes that changes in the relative prices of assets, in particular home price appreciation, have political causes and effects. Ansell concentrates on how home price appreciation tends to promote anti-redistribution attitudes, by providing an alternative form of social insurance for homeowners. This paper will complement this work by concentrating on why the political system comes to favor house price appreciation in the first place, rather than on the political and policy effects of asset price changes. Schwartz (2008) discusses how the US benefited on an international level from an environment of low interest rates and high home price appreciation, which lead the US electorate to favor this economic model. Watson (2008) emphasizes the role of house price appreciation in Britain in allowing governments to shift from a policy of direct social welfare provision to one of insurance provision through increased household wealth. Broz (2010) contributes to the literature on the political causes and effects of bubbles by showing that the boom phase of financial cycles is generally associated with

the election of right-wing governments, while left wing governments tend to be preferred by voters in the aftermath of a crisis. This paper makes a contribution to this second strand of literature, by showing that the main reason why the political process might lead to property price appreciation is the influence of the homeowner group, as reflected in the preferences of the median voter.

A third strand of literature concentrates on the international aspects of the crisis, regarding it as another iteration of a capital flows cycle caused by global imbalances in savings and consumption. Chinn and Frieden (2011) argue that the large pool of loanable funds available at the global level, as a result of high rates of savings in Asia and in oil-exporting countries, lead to a "search for yield" which necessarily meant higher-risk investments in markets which, for various reasons, were willing to take in such high-risk investments. Chinn and Frieden emphasize the need to finance high budget deficits in the US as a primary reason for the US' willingness to take in such funds. Eichengreen (2004), Pisany-Ferry (2012), and Helleiner (2008), also discuss the role of international imbalances in savings and consumption in creating the bubble and the ensuing recession, with the latter paper emphasizing the role of sovereign wealth funds in transferring large pools of money across borders. The theory presented in this paper agrees with the fact that international imbalances in savings and consumption are factors that greatly favor the development of credit booms, but goes beyond this to show what the internal conditions that allow such credit booms to develop in some countries and not others are.

The model in this paper analyzes the distributive aspects of an episode of house price appreciation, and how these distributive aspects might map onto an electoral process which determines policies that affect house prices. The model can be seen as a complement to models of redistribution of *income* as opposed to wealth, in the tradition of Meltzer and Richard (1981). The model also complements a number of works that emphasize the importance of *assets*, as opposed to current income, for political economy: Iversen and Soskice (2001) analyze how the value of the skills held by economic agents affects their political-economic

decisions. Ansell (2007; 2011; 2012; 2013) looks specifically at house values and analyzes how this variable affects citizens' various policy preferences. Schwartz and Seabrooke (2008) also emphasize the crucial importance of asset holding, especially of housing, for political economy, and propose a "varieties of residential capitalism" distinction between economic systems, which determines citizens' preferences over taxation, public spending, and inflation.

3 An electoral model of house price appreciation

3.1 Informal presentation of the argument

In the model, house price appreciation is a result of policies that subsidize the buying of homes, the most obvious of which is a relaxation of credit regulation which makes more credit available than would be the case in a non-distorted market. The subsidy is paid by everyone in society, most likely with a delay, when the intermediaries that provide the subsidy to house buyers need to be "bailed out" because the excess credit becomes non-performing. Naturally, there are decreasing returns to the subsidy. The presence of intermediaries willing to lend the required funds to home buyers now and to collect payments from all citizens later will affect the degree of price appreciation: The easier it is to shift funds to homebuyers and to delay the payment, the more subsidization can be provided. When the intermediaries lie outside the country, paying the non-performing debt back will take the form of servicing foreign debt. When the source of funds lies inside the country, or the institutions that carry the risk of default lie inside the country, paying the non-performing debt back takes the form of "bailing out" those institutions. However, ultimately both of these cases refer to the same process: that in which all taxpayers become responsible for the non-performing debt contracted by only a subset of them. (In practice, it has often been the case that governments bailed out banks by contracting significant foreign debt, with bank liabilities proving themselves to actually be "contingent liabilities" of the government (Polackova, 1999)).

The interaction of buyers and sellers in housing markets determines how the gains from

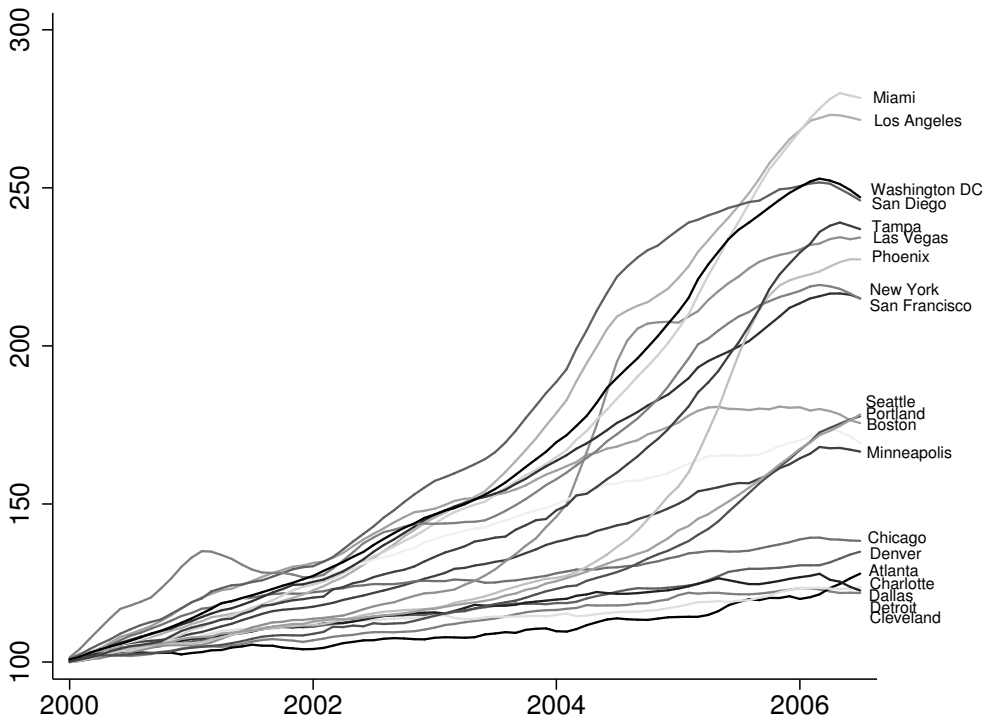

Figure 1: Case-Shiller Index of house prices for 20 US metropolitan areas. 100 = Jan 1 2000. Source: Federal Reserve (2013)

the subsidy are distributed. Heterogeneity in how much the demand for housing goes up as a result of the subsidy across regions, property types, and other variables, as well as heterogeneity in the price elasticity of the supply of housing in each local market, means that individual house price appreciation will also be highly variable. Figure 1 exemplifies this point by showing how much heterogeneity existed among US cities during the property boom of the 2000s. (Of course, there are additional dimensions of variation among housing units). Owners of property which appreciates more will benefit more from the price bubble than owners of property which does not appreciate in price or appreciates very little. The benefit to owners comes from the more attractive menu of options that arises from their ownership of a home. Basically, owners can now extract more equity from the home in case they want or need to, thus gaining insurance against negative income shocks.

All citizens can be ranked according to how much they benefit from the price bubble.

Renters do not benefit at all, and there is heterogeneity among homeowners, ranging from the marginal homeowner who gains nothing to owners of multiple rental properties who may gain an enormous amount. Under majority rule voting the median voter will determine the amount of subsidy and price appreciation that is generated, by setting her marginal cost for the subsidy equal with her marginal benefit from house price appreciation. A crucial factor determining the equilibrium outcome is the share of the population that is made up of homeowners: in countries with lots of homeowners the median voter is more likely to be someone who benefits a lot from house price appreciation than in countries with fewer homeowners, and obviously in case the median voter is not a homeowner at all, she will not desire any appreciation at all.

The empirical section will confirm these intuitions by showing that the major determinant of the size of the house price bubble across countries has been the share of the population that is made up of homeowners, with more homeowners being associated with larger bubbles. By comparison, other factors which have been put forward as explanations for the bubble fail to explain variation in its size to any degree.

3.2 Formal presentation of the model

Consider the simple case of a generic housing market in which a subsidy s becomes available to potential buyers. The subsidy is funded by a tax c^t on each citizen. The subsidy will be paid by citizens later on, at time t, hence the superscript, when they have to "bail out" the intermediaries who actually make the loans. The sum of all subsidies paid now, at time 0, $\sum_j s_j$, where j indexes buyers, has by definition to be equal to all transfers received by buyers at time 0, which is $\sum_l c_l^0$, where l indexes intermediaries who make these transfers. All citizens, indexed by i, will then reimburse the intermediaries for these payments in the future. The discount rate used by the citizens is $\delta \in (0, 1)$ and the interest rate charged by intermediaries is $r > 0$. The cost for each citizen for the subsidy now, at time 0, is therefore $c = \frac{1}{n}\delta^t r^t \sum_l c_l^0$, where n is the number of citizens.

The subsidy will shift the demand curve to the right, and increase the market price and/or the quantity transacted. The degree to which a general per-buyer subsidy s increases the price of any given home depends on a number of factors. The price elasticity of supply is the most obvious influence on the degree of price appreciation: with perfectly inelastic supply, the price increase will be exactly s, as all of the subsidy gets transferred to sellers. With perfectly elastic supply, the price increase will be zero, and with intermediary levels of elasticity, prices will increase to levels inversely proportional to the degree of elasticity. In practice there is very wide variation in the supply elasticity of various housing markets (Green et al. 2005), which means that price appreciation will also be very heterogeneous. Similarly, in practice there will be variation in the degree to which the demand curve shifts right in any given market: Relaxed credit regulations not only "add" a subsidy to an existing demand curve, but rather allow the entrance of previously credit-rationed individuals into housing markets (Stiglitz and Weiss 1981). The new entrants will have heterogeneous preferences in terms of what kinds of housing they desire to acquire, which means demand curves will shift to the right by more or less than s, depending on what the preferences of the previously credit-rationed individuals were.

Given this heterogeneity in how much individual home prices increase, to determine the preferences of the median voter, we need to rank all citizens according to how much they benefit from house price appreciation at the national level. To do so, it is useful to consider first the housing units by themselves, and then three kinds of citizens: non-homeowners, those who own just their own residence, and those who also own the rental units that non-homeowners inhabit.

Consider the housing units themselves, without any consideration of ownership. For the first marginal dollar in overall price appreciation at the national level, house price appreciation will follow a generic distribution between a_{min}, the minimal level of price appreciation in the country, to a_{max}, the maximal level. For simplicity we can normalize a_{min} to zero, and therefore say that house price appreciation given the first marginal dollar of overall

appreciation will follow a distribution described by a generic function a defined on $[1, n_U]$, where n_U is the number of housing units in the country, and with values on $[0, a_{max}]$, with $\int_1^{n_U} a(i)di = 1$. To rank all citizens on how much they benefit from this appreciation, two further steps are needed: first, take into consideration that some citizens own the rental units inhabited by other citizens who are not at all homeowners, and second, that price appreciation must be transformed to utility units for the analysis to be complete.

For the first step, among the n_H homeowners, we consider first the appreciation of their n_H owner-occupied housing units (we can define multiple owner-occupied homes as a single residence). This appreciation is assumed to be given by a random sample from the a distribution, of size n_H with their levels of appreciation therefore following the same relative distribution a_{OO} described by the horizontal compression of the a function on the interval $[1, n_H]$ and with $\int_1^{n_H} a_{OO}(i)di = \frac{n_H}{n_U}$. The other $n_U - n_H$ housing units are assumed to be owned in a very concentrated fashion by a small number of landlords, randomly drawn from all homeowners. This assumption is justified by the empirical data available from a few countries[2]. The per-homeowner total house price appreciation for this subgroup of landlords will therefore be given by a function a_{LL} defined on a subset of $[1, n_H]$ of size less than $n_U - n_H$, with values on $[0, a_{LLmax}]$ where the average value of the function is much greater than the average value of the function a_{OO}: $\overline{a}_{LL} \gg \overline{a}_{OO}$, denoting the highly concentrated nature of gains for landlords. Naturally, $\int_1^{n_U - n_H} a_{LL}(i)di = 1 - \frac{n_H}{n_U}$.

Homeowners do not consume house prices, so a translation must be made between the fact that a citizen's home is evaluated at price p and an utility level $u(p)$. The utility coming to the homeowner from the price of the home being p (as opposed from the utility coming from the fact of actually inhabiting the home), arises from the various options that are available to them at that price level. The homeowner can choose to extract equity from the

[2]In the US there are approximately 22 million landlords, corresponding to 9% of the adult population, according to calculations made by the Rental Protection Agency (retreived Aug 2013). In the UK there are 1.9 million landlords, 4% of the adult population (Lodge and Wright 2012). The number of landlords with many rental properties, who make up the bulk at the right of the distribution of gains from appreciation is naturally lower than these numbers.

home by selling it and buying a less valuable home. This possibility also acts as an insurance against undesirable income shocks, and this insurance is undeniably valuable to a risk-averse individual. The point is that, all else being equal, increases in prices will always increase the utility level of a homeowner by increasing the value of the options that are available to her. So utility for each individual as a function of the appreciation of each owned unit, $u(a)$ will always be an increasing function, $u'(a) > 0$, with no further assumptions on the precise nature of this link being necessary for the argument. As there exists heterogeneity in the distribution of individual home-prices appreciation, there will also exist heterogeneity in the distribution of utilities from that appreciation.

We can rank citizens according to how much they benefit from the first marginal dollar of overall appreciation by adding the distribution of utility increases due to the appreciation of owner-occupied homes to the distribution of utility increases from price increases of rental properties. An illustration of of this addition is presented graphically in Figure 2: The first panel presents the distribution of utility increases from owner-occupied properties in a hypothetical country in which approximately 75% of citizens are homeowners. The precise shape of the $u(a)$ function does not matter, as long as it is an increasing function of the price appreciation for each individual. The second panel again ranks citizens on how much they benefit from the appreciation of rental properties, with a much smaller share of them benefiting at all. (Note that the citizen sitting at percentile x in this distribution is not necessarily the same citizen as that sitting at percentile x in the own-home distribution.) The third panel presents the addition of utility levels from appreciation across all citizens, while again ranking them from highest to lowest. The addition of a highly skewed distribution to the first-home distribution will generate a highly-skewed distribution as well, with most of the homeowners benefiting nothing from the appreciation of rental units. In general, adding up and ranking citizen utilities means adding up the appreciation functions a_{OO} (with $a'_{OO}(i) < 0$) and a_{LL} (with $a'_{LL}(i) < 0$, a_{LL} defined on a smaller domain than a_{OO} and $\overline{a}_{LL} \gg \overline{a}_{OO}$), and then ranking the resulting appreciation levels for each citizen as a total

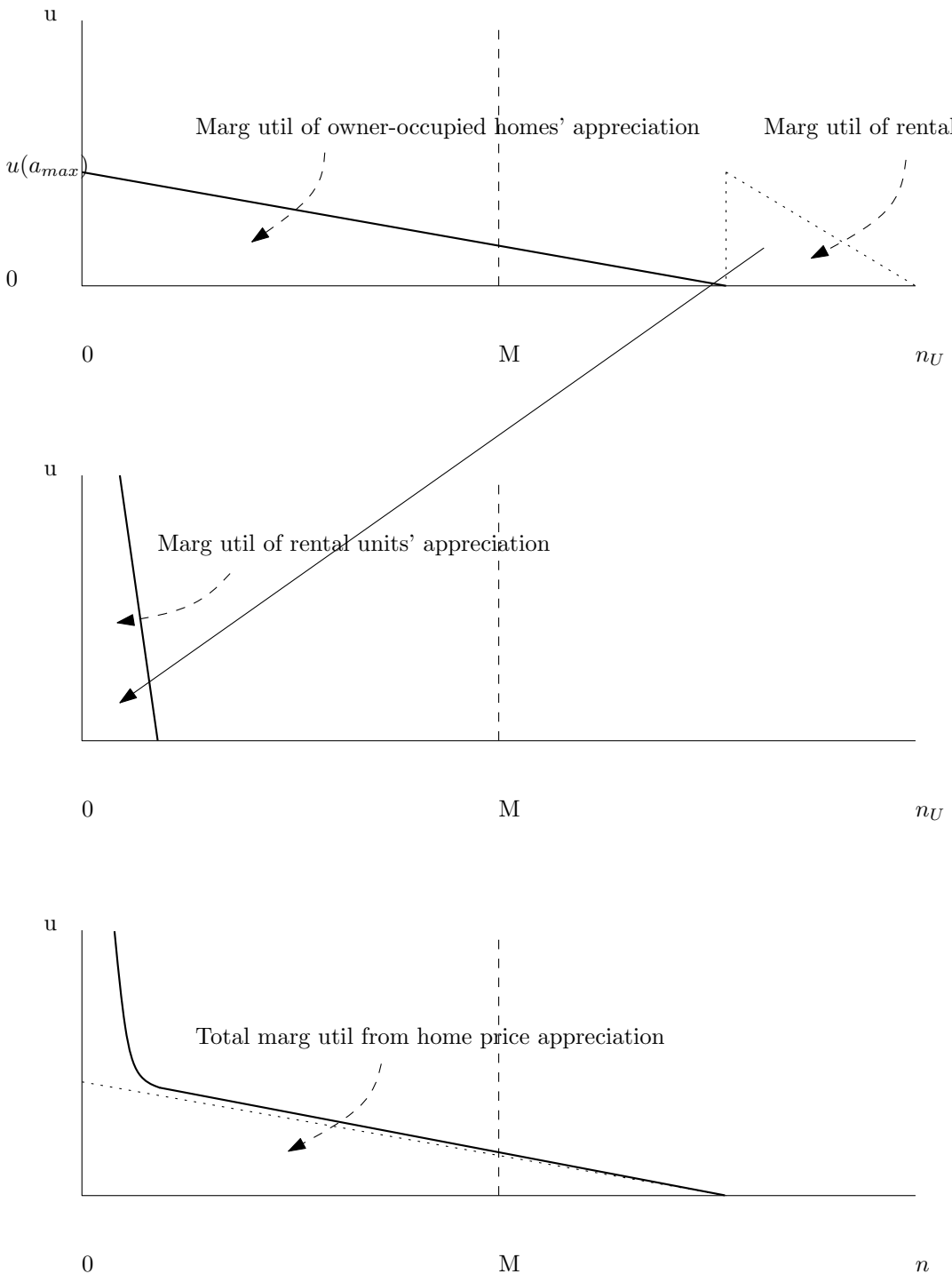

Figure 2: Appreciation of owner-occupied and rental units.

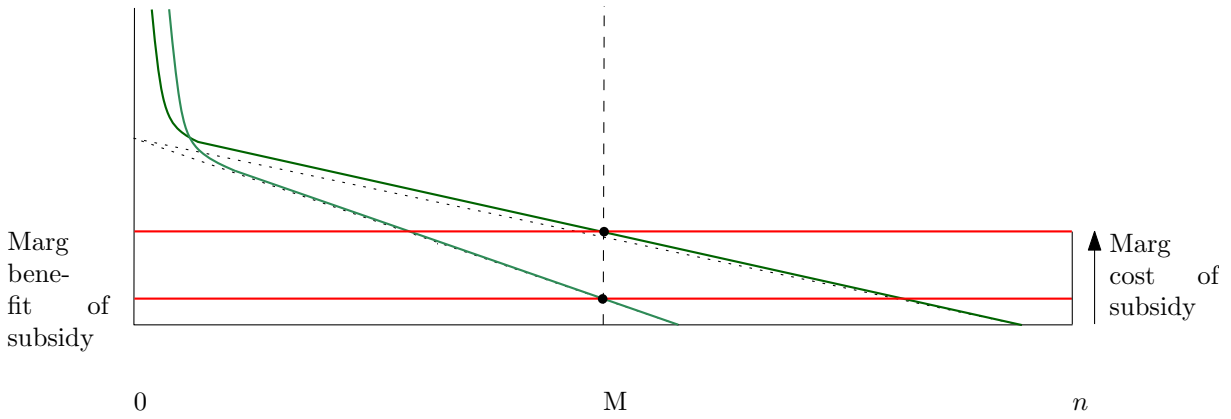

Figure 3: Equilibrium outcomes depending on number of homeowners

appreciation function a_T, which will have the properties $a'_T(i) < 0, a''_T(i) \gg 0$, that is a_T decreasing and highly convex over the ranking of the citizens.

This leads to a characterization of the general shape of the marginal utility distribution among voters for home price appreciation. As utility is a positive function of appreciation, the utility distribution function for the first dollar of overall appreciation among homeowners is assumed to have the same properties as a_T: $u'(i) < 0, u'(i) \gg 0$. It will naturally be the case that the median voter in terms of appreciation will be important for the outcome of the political process that determines the degree of appreciation. Fig. 3 illustrates the point, by comparing a high-ownership society with a low-ownership society.

The shape of the curve which denotes benefits from appreciation is for the most part approximately equal to the shape of the first-home appreciation curve (denoted as the dotted line), as most homeowners only have one housing unit. As long as the distribution of costs is equal across the population, it will appear as a horizontal line. (A relaxation of the equal-distribution assumption will also be discussed). Citizens for whom the gains curve lies above the cost curve will benefit from appreciation and those below will be hurt. A way to express the decreasing marginal benefit of the subsidy in terms of generating utility for homeowners is to say that achieving the same level of gains in utility as described by the utility distribution curve in Fig. 3, takes a higher level of the cost, that is the cost curve shifts up. In any society acting through majority voting on a policy space on which the amount

of subsidization is decided, additional subsidy will be provided until the marginal benefits curve intersects the marginal cost curve at the level of the median voter. Formally, the costs of the subsidy are denoted by a family of constant functions $c_A(i) = k_A$, where A is the total level of house price appreciation. For each level A of the total house price appreciation, the function c_A denotes how much must be spent per capita in subsidies to get the last dollar of appreciation. The decreasing returns on the subsidy mean that $k'_A(A) > 0$, that is as the total subsidy increases, the marginal cost of the subsidy goes up as well. Denoting the median voter by M, the equilibrium levels of the subsidy and price appreciation are given by the condition:

$$k_A(A) = u(M)$$

All else being equal, a country with higher levels of homeownership will see more of the gains of additional appreciation going to the median voter, and therefore the median voter will want to push the subsidy to a higher level before its costs outweigh its benefits. This leads to the main result of the analysis:

Proposition 1: All else being equal, and as long as more than half of voters are homeowners, higher levels of homeownership lead to the electoral equilibrium featuring a higher subsidy for home buying and more house price appreciation. If more than half of voters are not homeowners, there will be no home price appreciation.

Proof: A sufficient condition for the proposition to hold is that for any two countries 1 and 2 in which $n_{H1} < n_{H2}$ the utility curve distributions $u_1(i)$ and $u_2(i)$ intersect at an $i < M$. This would mean that $u_1(M) < u_2(M)$, which in its turn would mean that $k_{A1} < k_{A2}$, which would mean that $A_1 < A_2$, that is there is less overall price appreciation in the country with fewer homeowners. To see that the two relative utility curves intersect at $i < M$ given the assumptions of the model, note that the functions a_{T1} and a_{T2} are both decreasing, highly convex, and always greater than the functions a_{OO1} and a_{OO2}, except in the points H_1 and H_2 denoting the last homeowners, where $a_{T1} = a_{OO1}$ and $a_{T2} = a_{OO2}$. It is clear that the curves a_{OO1} and a_{OO2} maintain their ordering throughout their domains,

so $a_{OO1}(M) < a_{OO2}(M)$. It will also be true that $a_{T1}(M) < a_{T2}(M)$ if the a_{OO} curves approximate the a_T curves closely enough at point M. Denote by $d_1 = a_{T1}(M) - a_{OO1}(M)$ and $d_2 = a_{T2}(M) - a_{OO2}(M)$. Given the properties of the a functions, d_1 and d_2 will be equal to zero at H_1 and H_2 respectively, and will increase as the indices i decrease. This means that if $d_1(M)$ and $d_2(M)$ are small enough, the ordering $a_{OO1} < a_{OO2}$ will imply $a_{T1} < a_{T2}$ for all $i \geq M$. The sufficient condition for the ordering of appreciation distributions to be maintained is $d_1 < (a_{OO2} - a_{OO1}) + d_2$. The left hand side of the inequality is maximized and the right hand side is minimized on the interval $[M, n_H]$ at the point M when $n_{H1} = M$ and $n_{H2} = n_U$, when $d_2 = 0$. Therefore a sufficient condition for the inequality to hold is that $d_1(M) < a_{OO2}(M) - a_{OO1}(M)$. For a_{T1} convex enough $d_1(M)$ can be made arbitrarily small, so the condition will hold. This shows that if the gains for landlords are concentrated enough to not affect the median voter's calculations enough, then more homeowners will always mean more appreciation, all else being equal.

The timing of the bubble will depend on the extent to which the various dynamics present in the model can take place. The cost of the subsidy for each taxpayer can be written as $c = \frac{1}{n}\delta^t r^t \sum_l c_l^0$, as described above. An increase in the amount of funds available for lending on a global scale would reduce r in the cost formula above, which would reduce the cost of the subsidy to citizens, increasing the equilibrium subsidy and price levels. Therefore, over-time variation in the amount of price appreciation can be explained by an increase in the amount of funds available for lending. Similarly, the price r charged by financial institutions for intermediating these transactions can be affected by technological change in the financial industry: if intermediating the transaction between taxpayers and subsidy-receivers requires complex financial products, then a reduction in the price of those products will similarly lead to price appreciation occurring in countries where the median voter desires it. This can be summed up by saying that the magnitude of the result presented in Proposition 1 is influenced by exogenous factors which determine the cost of the subsidy at any point in time, with the most obvious such factors being the availability of intermediaries for the

subsidization process, and the cost of this intermediation.

A discussion of various assumptions of the model must be made at this point. Regarding the shape of the functions describing the distribution of gains for primary homes, the more concave the distribution (that is, the more equal the distribution of gains), the smaller the difference between high ownership and low ownership countries will be. However, the relative ranking of countries in terms of appreciation will be maintained as long as the distribution of gains takes the same functional form. This is because the functions describing owner-occupied housing appreciation given homeownership levels are just horizontal compressions/stretches of eachother, and the overall appreciation functions approximate them at the level of the median voter.

The assumption of equal costs for the subsidy for all citizens can be relaxed to allow for heterogeneous costs. As long as these costs are orthogonal to the benefits distribution, the conclusions of the analysis are not changed, as the high and low-cost individuals are evenly distributed among the voters, and the cost curve can be seen as an average cost for each percentile of the gains distribution. In case there is a significant positive or negative correlation between costs and benefits, the costs need to be subtracted from the benefits for each individual before they are ranked to determine the electoral equilibrium. The only way for this to change the conclusions of the model is if the costs are closely correlated with the benefits: individuals whose property appreciates a lot will also pay disproportionately for the bailing out of the banks or for foreign debt. In this case the redistributive motive that makes the median voter want the subsidy would be reduced. However, there is no reason to believe that this case is empirically relevant. (Of course, individuals who benefit from lots of home price appreciation are also likely to have their utility reduced a lot when prices come down to their long-run equilibrium levels, but this does not mean they pay disproportionately for the tax that funds the bailing out of the banks or the payment of the foreign debt.)

The model seeks to explain the effects of price appreciation on citizens with respect to their ownership status, as the empirical analysis will concentrate on this aspect. Therefore

we do not explicitly analyze the utility of price appreciation for citizens seen in their role as potential buyers of housing units. There might exist heterogeneity in how much price appreciation affects each voter in their role a a potential buyer. A sufficient condition for this heterogeneity to not affect the results of the analysis is for the distribution of these gains to be orthogonal to the distribution of gains for sellers across the population. Given the diverse nature of reasons for changes in buyer utility in the presence of a subsidy, there is no special reason to believe these gains would be strongly correlated to the seller gains. If such a correlation does not exist, then these buyer gains would lower the cost curve in proportion to their average size, but not affect the overall distribution.

To summarize, the model explains the significant variation in the degree of house price appreciation in various countries in the 2000s by analyzing the gains and losses for voters from such appreciation, given the number of homeowners in the population. The prerequisite for the credit boom was undoubtedly the existence of a global imbalance between savings and consumption, with large pools of funds becoming available for lending (Chinn and Frieden 2011, Chinn et al. 2013), as well as technological change in the financial industry which allowed the complex intermediation transactions to take place. However, individual countries chose through their political systems how much of the available credit to absorb. Given significant heterogeneity in how much individuals benefited from the credit bubble, the median voter in terms of benefits from price appreciation decides how much price appreciation to allow. In countries with lots of homeowners, the median voter is more likely to allow more appreciation, thus leading to the observed empirical pattern, as shown in the next section.

4 Empirical analysis

The main proposition to emerge from the theoretical arguments is that the share of homeowners in the population should be positively linked to the size of the house price bubble, all else being equal, and when other conditions that favor house price appreciation are present at

the global level. To test this hypothesis, we need national-level data on house price changes, homeownership levels, and any needed control variables. Data on these variables has been assembled from various sources as presented in the following. Tables 3 and 4 in the Data Appendix present more information about the dataset.

House prices: Assembling indices of house price changes at the national level is not an easy task, as there exists major variation in the methodologies employed by various indices. Moreover, many popular sources for such data do not present real (inflation corrected) price changes, which matters a lot in countries with significant inflation rates. There are a handful of sources for such real price change data, which have been combined to obtain data on house price evolution in 41 democracies in the period roughly characterizing the global property bubble—the years after 2000. The sources of this information are:

The Dallas Federal Reserve Bank's compilation of real house price indices provided price series from 21 major economies. (Note that presenting *real* changes in house prices is essential, as many popular house price indices present only nominal data. Computing real price changes for housing is challenging, because of the need for a consumer price index or GDP deflator for all goods other than housing, which is a measure that is not widely available.)

Eurostat (the European Union's statistics institute) gathers data on real house price changes in the EU member states. For many countries this information becomes available only after 2005 or 2007, when these countries joined the EU.

The OECD presents real house price indices for 20 of its member states. However, all of these are already contained in the Eurostat and Fed datasets, so OECD data was only used for the case of Greece, which does not have a full record in the Eurostat data.

The Bank for International Settlements also gathers data from national sources in 48 countries on house price changes. These price series however are not generally standardized to be made comparable between countries: the house price levels are generally not corrected for inflation and might sometimes not represent national samples but rather just urban or large-city properties. The BIS dataset has been used for a few countries for which data from

other sources was not available, as described in the data appendix.

Information on homeownership levels in 38 countries has been gathered from the following sources:

Eurostat presents data on homeownership levels in EU countries. For each country we selected the level of homeownership in the year closest to 2002 for which measurements were available. Levels of homeownership change very little from one year to another inside one country, so levels from a few years before or after 2002 can be used as proxies for the 2002 level.

The World Bank's World Development Indicators present data on homeownership in a global, albeit rather incomplete, sample, for years generally around 2000 to 2005. We used the WDI for countries for which Eurostat data was not available.

National sources: for a few countries for which we had price information but not homeownership rates from the previous two sources, we located data from national sources as described in the appendix.

We use three different variables to capture the house price bubble, each carrying a set of advantages and disadvantages. The three variables reflect changes in year-level price indices.

Six-year price increase: Total real house price change for the six years before the highest level of the price series, as long as the highest level was in 2007, 2008, or 2009. Most countries in the sample, encountered a peak in house prices in one of these three years, with the US being the first major economy to hit the peak in 2007. The amount of appreciation varies a lot between countries (a 19% drop in Japan versus an 85% appreciation in Spain), and is the most natural measure of the size of the bubble. This variable however also has a few problems: First, the data on house prices only begins after 2001-2003 for many countries in the sample, perhaps because a wide interest in charting house price changes only developed during the course of the bubble. Second, such a variable has trouble distinguishing between house price increases due to the bubble dynamics analyzed in this paper and long term appreciation due to economic development that shifts the demand curve right without any

subsidy. This leads to the second variable used to capture bubble dynamics.

Four-year price drop: Total house price change in the four years following the peak in 2007-2009. A large majority of countries in the sample saw significant declines in house prices after the peaks in 2007-2009. All else being equal, countries with the highest declines should be the ones to have experienced the highest level of artificial price inflation during the bubble. This indicator has the advantage of being available for more countries than the price increase indicator, and of being less likely to be affected by long term trends in house price appreciation due to economic development in emerging economies.

Δ *price increase*: The difference between house price changes during the six bubble years versus the four bust years (where falls in prices carry a negative sign). This variable is the most clear measurement of the size of the bubble. If the bubble is a hump on a long term price trend, then a higher bubble should mean sharper slopes on both the boom as well as the bust sides. A country with a large house price bubble will see a larger value of this indicator, a country with no bubble should see a lower, perhaps even negative, value. This indicator however is more limited in coverage than the "bust" variable. Other control variables to be used in the empirical models will be described later on.

Figures 4-6 present simple scatter plots of the three price variables versus the rate of homeownership, with regression lines overlaid. The connection between price changes and rates of homeownership is very strong and confirmed by all three measures of the bubble. This strong connection is confirmed by formal regression results. In Table 1, we present OLS regression results in which the dependent variables are the three price change indicators. Models 1,1', and 1" present the bivariate regression of these indicators on home ownership rates. Leaving aside the very high significance levels of the coefficients on the home ownership variable, what is striking is how much of the total variation in house prices can be explained just by the homeownership variable: the three models show R^2 values of .41, .34, and .48 respectively. This shows that home ownership levels are not just one factor among many that affect house prices, but rather a very important explanatory factor for house price variation, as indicated by the theory. The size of the coefficients on the home ownership

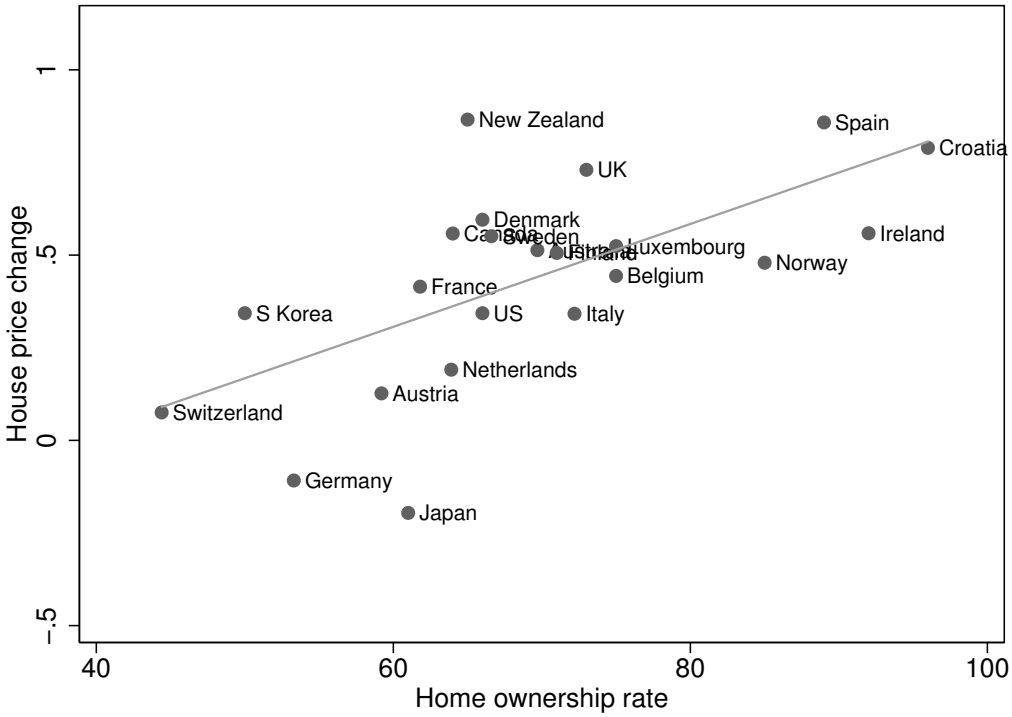

Figure 4: Regression of price change during the boom on home ownership rates

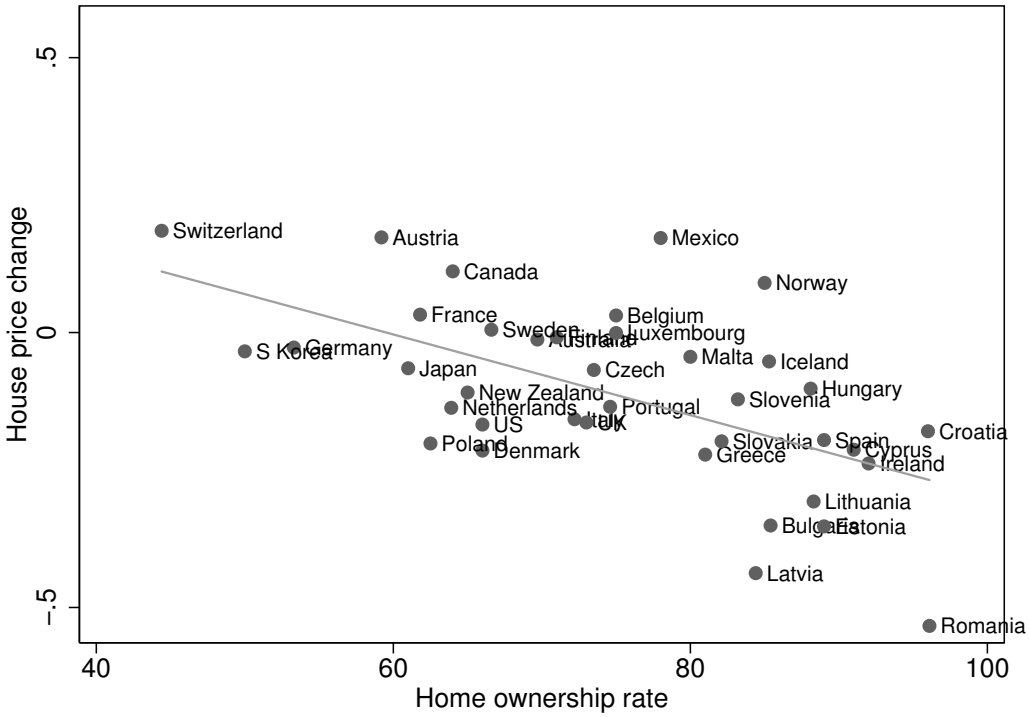

Figure 5: Regression of price change during the bust on home ownership rates

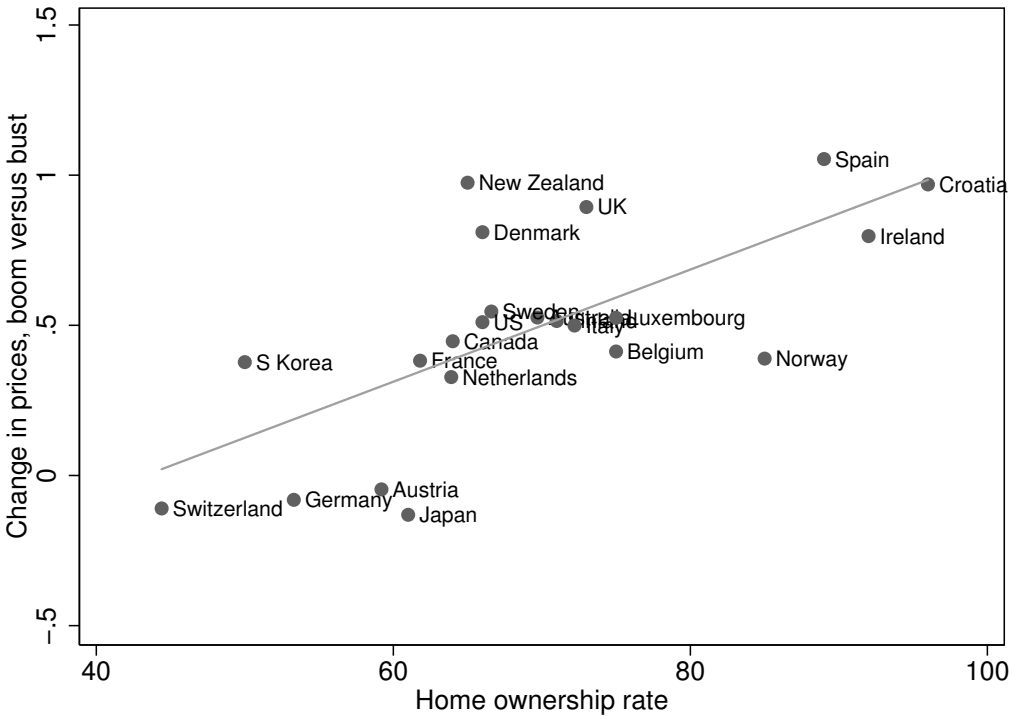

Figure 6: Regression of difference in price changes in boom versus bust on home ownership rates

variable is very substantively significant: Looking at models 1-1", 10 percentage points of extra homeownership are associated with a price appreciation that is 13.8 percentage points higher during six years of the bubble, with 7.8 percentage points of extra fall in prices during four years of the bust, and with 18.6 percentage points more variation in the Δ price increase measure. Given that the range of the homeownership variable is 50 percentage points, there will be very significant differences between the countries in the sample in terms of predicted price bubbles given the homeownership rate.

A host of other factors have been put forward as possible explanations for the existence and for variation in the size of the housing bubble. The size and influence of the financial sector is a popular explanation for the bubble, especially in the US (Johnson and Kwak 2011), given that the increase in credit that accompanies bubbles is very likely to benefit the intermediaries of this credit. However, using the standard measure of the size of the financial sector (as argued in World Bank 2013a), namely total credit as a share of GDP, either by itself or as a control in a model including homeownership, does not explain variation in house prices at all (Models 2-2" and 3-3"). Indeed, a number of countries with highly developed financial sectors, such as Switzerland or Japan, show some of the lowest levels of appreciation in the sample, with the UK and Ireland being some often-cited examples of the opposite pattern.

Another explanation for the house price bubble, more prevalent in the academic literature, is variation in the degree to which countries are willing to absorb foreign capital (Chinn and Frieden 2011). It is obvious that the existence of large pools of loanable funds at the global level is a prerequisite for a global borrowing boom, and such a large pool was available during the bubble. However, capital openness, that is the ability of foreign investors to move capital into a country, as measured by the capital openness score of Chinn and Ito (2008; 2011), is again not a predictor of house price appreciation and does not affect the relation between home ownership and appreciation at all. It seems that whatever variation there was between countries in terms of their openness to foreign capital was not enough to counter

Six-yr price increase	1	2	3	4	5	6	7	8
Home ownership	**.0138**		**.0105**		**.0139**		**.0143**	
	(.001)		(.018)		(.002)		(.001)	
Financial share02		-.0021	-.0016					
		(.077)	(.106)					
Capital openness				-.0917	-.0567			
				(.163)	(.469)			
Financial legal rights						.0283	.0360	
						(.414)	(.196)	
Non-performing loans								**.1502**
								(.007)
N	22	25	22	24	21	25	22	24
R^2	.41	.13	.49	.09	.42	.03	.46	.29

Four-yr price drop	1'	2'	3'	4'	5'	6'	7'	8'
Home ownership	**-.0073**		**-.0068**		**-.0072**		**-.0075**	
	(.000)		(.002)		(.000)		(.000)	
Financial share		.0009	.0002					
		(.085)	(.614)					
Capital openness				-.0012	.0052			
				(.969)	(.846)			
Financial legal rights						.0011	-.0205	
						(.947)	(.085)	
Non-performing loans								**-.1206**
								(.000)
N	38	40	37	40	37	40	37	38
R^2	.34	.07	.35	.00	.35	.00	.40	.42

Δ price increase	1"	2"	3"	4"	5"	6"	7"	8"
Home ownership	**.0186**		**.0167**		**.0188**		**.0192**	
	(.000)		(.003)		(.001)		(.000)	
Financial share		-.0018	-.0009					
		(.304)	(.423)					
Capital openness				-.0755	-.0699			
				(.412)	(.442)			
Financial legal rights						.0149	.0493	
						(.759)	(.124)	
Non-performing loans								**.2733**
								(.000)
N	22	25	22	24	21	25	22	24
R^2	.48	.04	.50	.03	.50	.00	.54	.48

Non-performing loans	9	
Home ownership	**.0519**	(.000)
N = 35	R^2 = .41	

Table 1: Explaining variation in house price appreciation in the 2000s

the increased availability of funds and ease of moving them around. In as much as capital openness is seen as an endogenous mechanism through which the political process determines the extent of price appreciation (size of subsidy in the model), there is no empirical support for this variable acting as a mediator of the relation between homeownership and price levels (models 4-4" and 5-5").

Similarly, the institutional details governing credit markets can serve as alternative explanations for the bubble and as possible omitted variables. Countries in which the legal framework ensures well-functioning, developed, credit markets might be more likely to suffer price bubbles during periods of high availability of funds. To capture the quality of the institutional framework governing credit markets, models 6-6" and 7-7" use the "financial legal rights index" score given by the World Bank World Development Indicators as a control or as a main explanatory variable. This score ranks countries on the extent to which their legal and regulatory frameworks ensure well-functioning credit markets. Again, this variable fails to predict house price bubbles or to affect the explanatory power of the home ownership variable.

The mechanism proposed by this paper for how high homeownership levels lead to price appreciation is one in which the median voter decides to subsidize the buying of homes by allowing excessive credit. "Excessive" credit is credit which will not be fully serviced in the future, so a direct measure of the amount of subsidy from the theoretical model is the share of credit which proved itself to be non-performing once the subsidy period/bubble had passed. To test this hypothesis we gathered data on the share of non-performing loans in each country in the years after 2001 from the World Development Indicators. As the baseline level of non-performing loans differs a lot between countries, we looked at increases in non-performing loans between 2001 and 2011. As this variable has a very long tail (for example Ireland saw a 16-fold increase in non-performing loans), we linearize it by taking the natural logarithm. This variable is both very well predicted by the homeownership share variable, and is itself a very good predictor of the size of the house price bubble, confirming that this

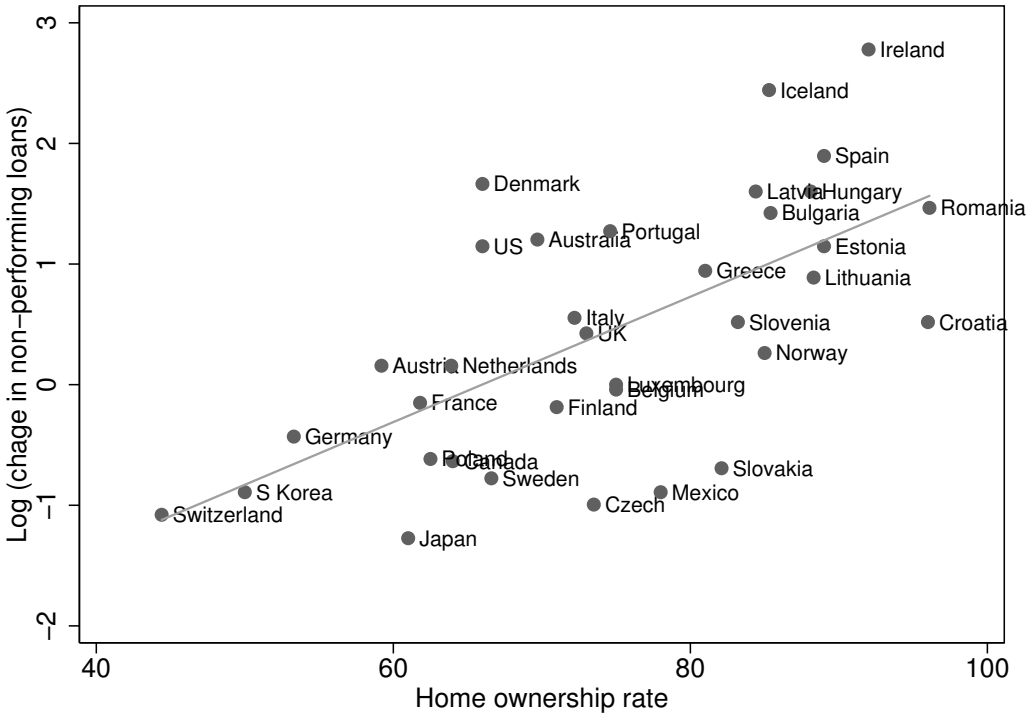

Figure 7: The relation between increase in non-performing loans and the homeownership rate

is the channel through which the homeownership rate determines the degree of house price appreciation. Figures 7-8 plot the relation between, first the share of non-performing loans and the homeownership rate, and then between the Δ house price variable and the share of non-performing loans, to illustrate how strong this relation is, as also illustrated by the very high R^2 levels of the associated linear regressions.

An alternative way to establish the causal relation between home ownership rates and house price bubbles is to use an instrumental-variables approach in which a source of exogenous variation in home ownership is used. One such source of exogenous variation is whether the country in question is a former Communist country. These countries have higher levels of home ownership for two connected reasons: first because private property of multiple/rental properties was forbidden under Communism, thus making impossible the existence of a landlord group until after 1990; and more importantly because in most of these countries tenants of state-owned homes during Communism were allowed to buy their homes after the fall of Communism, usually for nominal sums (Zavisca 2008 for the case of Russia). The experience

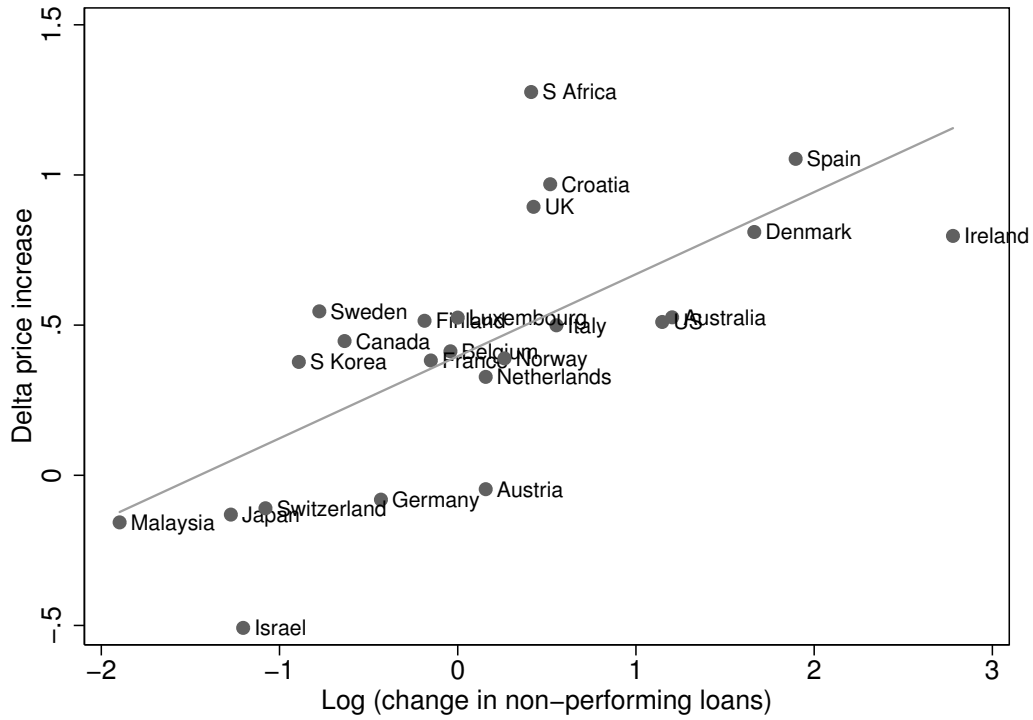

Figure 8: The relation between Δ price increase and the increase in non-performing loans

of having been a Communist country is unlikely to affect the existence of a house price bubble through mechanisms other than by affecting the homeownership rate, and is therefore a good candidate for an instrumental variable for the ownership variable. (However, it is impossible to use the former-Communist dummy in models where the dependent variable is "six-year price increase" or "Δ price increase", because these variables are only available for one former communist country, Croatia. All results using this instrumental variable are on the "four-year price drop" variable.) Table 2 presents instrumental variables regressions where a former-Communist country dummy is used as a source of exogenous variation. The relation between home ownership and this measure of the housing bubble is strengthened by the IV approach, and coefficients continue to be very precisely estimated.

The purpose of the paper is primarily to explain cross country variation in the extent of price appreciation, rather than the timing of the bubble in the years after 2000 as opposed to another period. The model, however, suggests that the cheap availability of funds for the subsidization of homeowners at the global level, as well as the availability and low price of financial products designed to intermediate this subsidization should give rise to

First stage regression	Home ownership rate	
	Former communist	**13.566 (.002)**
	N = 38, R^2= .23, F-stat = 10.87	

Second stage regression	Four-year price drop	
	Home ownership rate	**-.0152 (.002)**
	N = 38	

Table 2: Instrumental variable regression of price drop on the home ownership rate

the possibility of price bubbles, the size of which is then determined by the number of homeowners. Indeed, there is agreement in the literature that a number of developments made such transactions much cheaper and readily available after 2000. A number of points which have been made by other authors towards this end are: First, the availability of funds for lending increased a lot in this period, as a result of persistent trade surpluses in countries such as China, Japan, Germany, and the major oil exporters (Chinn et al. 2013). Fig. 9 illustrates this by plotting the total current account surpluses of all surplus countries in the period 1980-2007, in constant 1980 dollars. As can be seen, a huge increase in these surpluses develops after 2001, corresponding very well to the timing of the price bubble in most countries. Second, the willingness of investors to move money into real estate lending was also spurred by "unnaturally" low return rates in other types of lending, due to the low interest rates maintained by both the US Federal Reserve, and the European Central Bank (this argument is developed in Taylor 2009). These low rates of return gave rise to a "search for yield" in new and more risky lending activities. Third, technological change in the financial industry allowed the development of derivative products which effectively reduced the short-term cost of engaging in risky lending in general. Figure 10 plots the total value of financial derivative contracts outstanding in the world between 1998 and 2007, in constant US dollars, using data from the Bank for International Settlements. As can be seen, after 2001 a five-fold increase in the amount of derivative products occurred over the following six years, corresponding to an increase in the ability of the financial system to engage in complex and risky lending on a global scale. All these developments meant, in

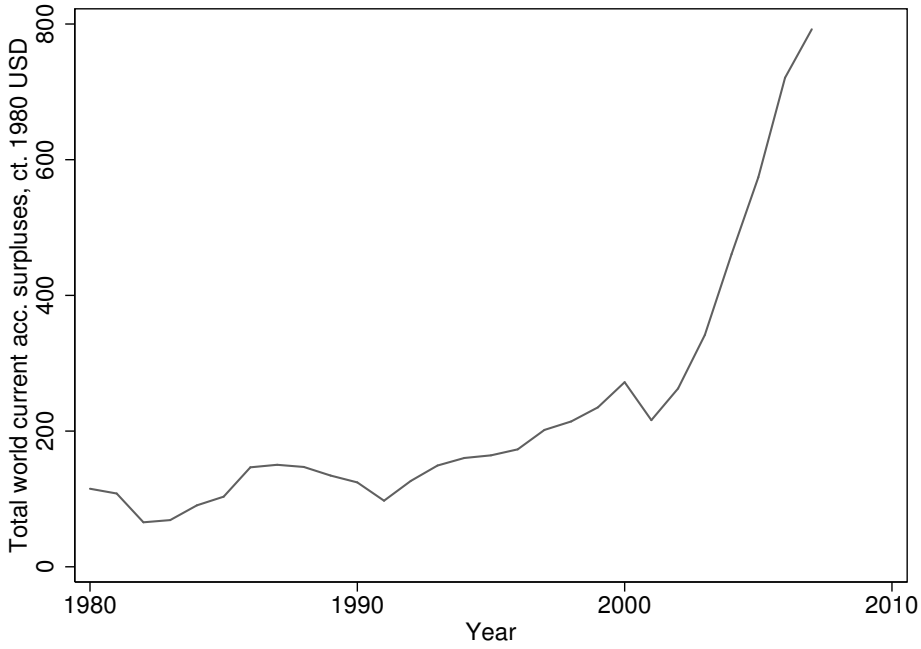

Figure 9: Total current account surpluses across all countries, in Bln constant 1980 US Dollars. Source: IMF Financial Statistics for current account data, and World Bank World Development Indicators for US Dollar yearly GDP deflator.

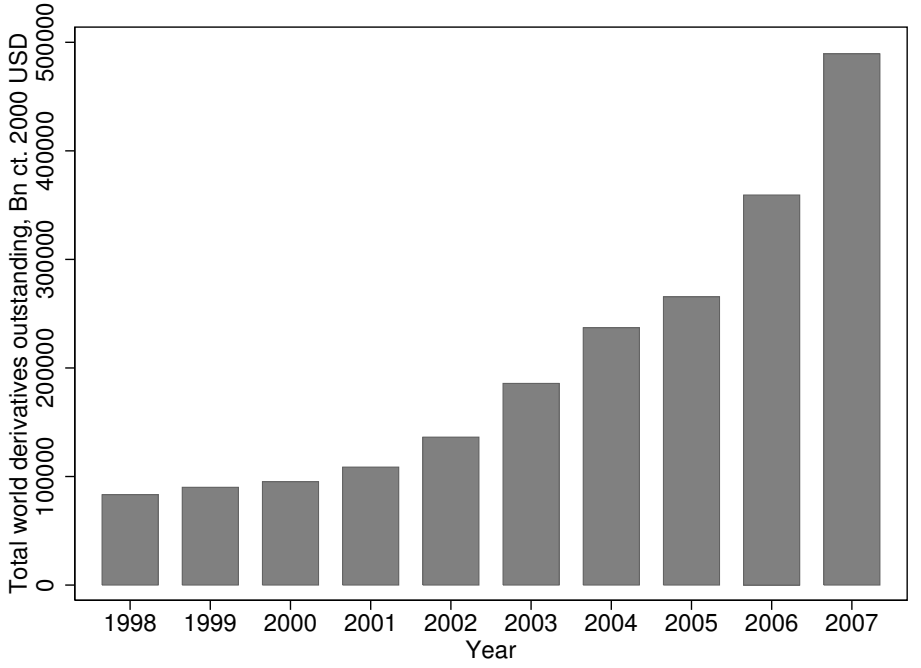

Figure 10: Value of total derivative contracts outstanding in the world, in billions constant 2000 USD. Source: Bank for International Settlements Derivatives Statistics, and World Bank World Development Indicators for US Dollar yearly GDP deflator.

terms of the model, that the costs for providing the subsidy greatly decreased for median voters in all countries, and lead to the bubbles developing in this time period.

5 Conclusions

This paper has argued that variation in the degree of house price appreciation during the global housing bubble of the 2000s can be explained to a very large extent through the electoral constraints facing policymakers in democracies across the world. There is little doubt that factors such as myopia, "irrational exuberance", and ignorance of the complicated workings of credit markets played their role in inflating the house price bubble, but there is no need to rely on such factors in explaining cross-country variation. The global recession after 2008 has shown that this method of redistributing welfare can be extremely costly. However, the intense pressure from homeowners to reflate house prices has lead to a policy climate which, in many countries, remains favorable to the idea of again raising the relative prices of homes[3]. The slowdown in global lending after 2008 has made a re-inflation of house prices impossible in most countries, but in a world of free-flowing capital and extensive imbalances between savings and consumption between countries, this remains an ever-present possibility.

[3]The unusual relation between policy makers and home prices emerges, for example, from Federal Reserve Chairman Ben Bernanke's Congressional testimony of May 22, 2013: Fragments from the testimony include paragraphs such as: "Increased housing activity is fostering job creation in construction and related industries [...], while higher home prices are bolstering household finances, which helps support the growth of private consumption. [...] Low real interest rates have [...] contributed significantly to the recovery in housing sales, construction, and prices. Higher prices of houses and other assets, in turn, have increased household wealth and consumer confidence, spurring consumer spending and contributing to gains in production and employment. [...]" (Bernanke 2013). It is hard to imagine a policymaker cheering an increase in the price of food or energy, or of any product that does not carry a resale/wealth motive for its ownership—economic growth implies by definition a *decrease* in the real price of a fixed bundle of goods from one year to the next. A charitable interpretation of this kind of attitude towards house prices is that it reflects a Keynsian approach in which consumer confidence is crucial for avoiding recessions, and increasing home prices sustains this consumer confidence through increasing perceived wealth. A more cynical view is that this approach simply reflects the significant political/electoral pressure from homeowners to maintain or increase the value of their property.

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Data appendix

Name	Description / formula	N	Min, Average, Max	Sources
Six-yr price increase	$(I_t/I_{t-6}) - 1$ where I_t is the highest value of the price index in the years 2007, 2008, or 2009.	25	-.195; .435; 1.127	Fed, Eurostat, OECD, BIS
Four-yr price drop	$(I_{t+4}/I_t) - 1$ where I_t is the highest value of the price index in the years 2007, 2008, or 2009.	41	-.533, -.084, .563	Fed, Eurostat, OECD, BIS
Δ price increase	Six-yr price increase - Four-yr price drop	25	-.508; .447; 1.276	Fed, Eurostat, OECD, BIS
Home ownership	Share of population that owns a residence in year closest to 2002 for which data available	38	44.4; 74.77; 96.1	Eurostat, World Bank WDI, National sources
Finance share	Domestic credit provided by banking sector (% of GDP); value for 2002 or closest year available	40	21.07; 119.10; 306.44	World Bank World Development indicators
Capital openness	"The Chinn-Ito index (KAOPEN) is an index measuring a country's degree of capital account openness. The index was initially introduced in Chinn and Ito (Journal of Development Economics, 2006). KAOPEN is based [...] the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions." Average for years 2002-2007.	40	-1.16 1.75 2.43	Menzie Chinn, Hiro Ito
Financial legal rights	"Strength of legal rights index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. " Average of this measure for the years between 2004-2008; 2004 is when data becomes available	40	3; 7.13; 10	World Bank World Development Indicators
Δ non-performing loans	$\ln(NPL_{2011}/NPL_{2001})$ where NPL_t is the year t value of "Bank nonperforming loans to total gross loans are the value of nonperforming loans divided by the total value of the loan portfolio"	38	-1.897; .334; 2.778	World Bank World Development Indicators

Table 3: Summary statistics

Country	Coverage	Price source	Homeownership source
Australia	Pre+post	Fed	ABS Census
Austria	Pre+post	BIS	Eurostat
Belgium	Pre+post	Fed	Eurostat
Bulgaria	Post	Eurostat	Eurostat
Canada	Pre+post	Fed	World Bank
Croatia	Pre+post	BIS	Eurostat
Cyprus	Post	Eurostat	Eurostat
Czech	Post	Eurostat	Eurostat
Denmark	Pre+post	Fed	Eurostat
Estonia	Post	Eurostat	Eurostat
Finland	Pre+post	Fed	Eurostat
France	Pre+post	Fed	Eurostat
Germany	Pre+post	Fed	Eurostat
Greece	Post	OECD	Eurostat
Hungary	Post	Eurostat	Eurostat
Iceland	Post	Eurostat	Eurostat
Ireland	Pre+post	Fed	Eurostat
Italy	Pre+post	Fed	Eurostat
Japan	Pre+post	Fed	World Bank
Latvia	Post	Eurostat	Eurostat
Lithuania	Post	Eurostat	Eurostat
Luxembourg	Pre+post	Fed	Eurostat
Malta	Post	Eurostat	Eurostat
Mexico	Post	BIS	World Bank
Netherlands	Pre+post	Fed	Eurostat
New Zealand	Pre+post	Fed	World Bank
Norway	Pre+post	Fed	Eurostat
Poland	Post	Eurostat	Eurostat
Portugal	Post	Eurostat	Eurostat
Romania	Post	Eurostat	Eurostat
S Korea	Pre+post	Fed	World Bank
Slovakia	Post	Eurostat	Eurostat
Slovenia	Post	Eurostat	Eurostat
Spain	Pre+post	Fed	Eurostat
Sweden	Pre+post	Fed	Eurostat
Switzerland	Pre+post	Fed	Eurostat
United Kingdom	Pre+post	Fed	Eurostat
USA	Pre+post	Fed	World Bank

Table 4: Data coverage and sources. Coverage: "pre"=the six years before max price; "post"=the four years after max price.