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Projecting Post-Crisis House and Equity Prices Since the 1870s: Not All Crises are Alike

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Projecting post-crisis house and equity prices since the 1870s: Not all crises are alike*

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Abstract

Since the Great Depression, governments have routinely undertaken substantial expansionary measures to stabilize economies after major recessions. While one of the expected outcomes of such recovery efforts is to put housing and equity markets back on track, the persistence and magnitude of impacts vary across asset classes and type of recessions, *i.e.* normal *vs.* financial *vs.* disasters. We study such responses from house and equity prices by projecting their paths in the aftermath of financial crises, normal recessions and non-financial disasters since the 1870s in 17 western economies. With the help of three newly available historical datasets spanning for 143 years and by employing local projection techniques, we find that financial recessions have the most detrimental effect, causing substantial decreases in house prices, stock prices and construction costs. Post-crisis stock price declines are observed through the whole sample period, whereas both house prices and construction costs are more vulnerable to crises after WWII. We also find that stock prices drop significantly immediately after financial crises and rebound within four to six years, while shocks to house prices are persistent. This asymmetry of persistence in shocks has had a substantial impact on post-recession wealth re-distribution since WWII as lower and middle class families are more likely to have their wealth invested in a home, as opposed to having financial investments like stocks.

Keywords: Financial crisis, Normal recessions, House prices, Stock prices, Local projection.

JEL Classification: C14, E44, G01, N10

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Abstract

Since the Great Depression, governments have routinely undertaken substantial expansionary measures to stabilize economies after major recessions. While one of the expected outcomes of such recovery efforts is to put housing and equity markets back on track, the persistence and magnitude of impacts vary across asset classes and type of recessions, *i.e.* normal *vs.* financial *vs.* disasters. We study such responses from house and equity prices by projecting their paths in the aftermath of financial crises, normal recessions and non-financial disasters since the 1870s in 17 western economies. With the help of three newly available historical datasets spanning for 143 years and by employing local projection techniques, we find that financial recessions have the most detrimental effect, causing substantial decreases in house prices, stock prices and construction costs. Post-crisis stock price declines are observed through the whole sample period, whereas both house prices and construction costs are more vulnerable to crises after WWII. We also find that stock prices drop significantly immediately after financial crises and rebound within four to six years, while shocks to house prices are persistent. This asymmetry of persistence in shocks has had a substantial impact on post-recession wealth re-distribution since WWII as lower and middle class families are more likely to have their wealth invested in a home, as opposed to having financial investments like stocks.

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1. Introduction

Since the Global Financial Crisis of 2008, pre-crisis asset price trends have attracted substantial interest in the academic literature (Shiller, 2007; Mian and Sufi, 2010, 2014; Jordá et al., 2015; Knoll et al., 2017). Most of this earlier research identifies asset price bubbles as a major signal of economic fragility prior to financial crises (Mian and Sufi, 2010; Jordá et al., 2015). Yet, we know very little about how asset prices of different classes respond to recovery efforts in the aftermath of a crisis. Projecting how asset prices from different classes recover following a crisis is important because how they rebounds affects post-crises wealth redistribution, which ultimately has implications for economic and social inequality. While there was minimal government intervention until the 1930s, in the second half of the twentieth century both monetary and fiscal policies were increasingly employed by governments to stabilize crises affected economies. The impact of stabilization policies are likely to be asymmetric across asset markets and crises types. If recovery in house and equity prices are asymmetric, this will amplify inequality in post-recession economic regimes. This influences inequality because while lower and middle- income families are more likely to have their wealth invested in a home, higher income families invest more in in financial instruments like stocks. Hence, comparatively more persistent downturns in the housing sector exacerbate the wealth gap and social inequality.

Rietz (1988) first introduced extreme events into the macro-finance literature. Barro (2006), Barro (2009), Barro and Ursúa (2012) popularized the concept of a rare macroeconomic disaster, arguing that these may explain a wide range of asset-pricing puzzles. Barro and Ursúa (2012) defined these disasters as, major disaster events exemplified by the world wars and the Great Depression. More recently, Jordá et al. (2015) and Funke et al. (2016) have divided recessions into financial crises and non-financial macroeconomic disasters, effectively creating three distinct categories of macroeconomic downturn; namely, normal recessions, financial recessions and disasters. Our novel contribution is to examine how different asset classes (house-land and construction and equity) recover in the aftermath of normal recessions, financial recessions and disasters. For this purpose, this study employs a comparatively new local projection technique, making use of three recently available novel historical datasets for 17 western economies over a period of 143 years.

This research contributes to our understanding of how asset prices move post-crisis in at least two important ways. First, this is the first study to look at the impact of three different classes of recession on different asset classes. Second, this is the first study to employ a rigorous econometric technique; namely, local projection, due to Jordá (2005), in order to study post-recession asset prices over a long horizon. Tracing

impulse responses of asset price paths based on local projections offers favorable statistical properties if there are asymmetries, nonlinearities and model misspecification.

This study finds that financial recessions are the most detrimental crisis, causing substantial decreases in house prices, stock prices and construction costs. The prominence of financial crises in the business cycle is also documented in earlier works by Fisher (1933), Minsky (1986), Jordá et al. (2011) and Eggertsson and Krugman (2012). This could be due to the fact that financial crisis is associated with increased uncertainty about the macro-financial outlook and intense media speculation. Our results document that post-crisis stock price declines are observed through the whole sample period, *i.e.* in both pre- and post-World War II, whereas both house prices and construction costs are more vulnerable to crises after WWII. This could be a result of the increased leverage in housing markets, leading to house price booms which result in events like bubbles bursting in more recent times.

This research also finds that stock prices drop significantly immediately after financial crises and rebound within four to six years, while shocks to house prices are persistent. As equity investments are often made with comparatively short-term intent and are transacted in almost real times, stock prices react immediately to any macro financial changes. The greater persistence of house prices is also documented in Reinhart and Rogoff (2009a). The sheer size and complexity of the housing market could impede the ability of stabilization measures to have an immediate impact on house prices. Our study finds that in periods after WWII, both house prices and their construction costs drop after all three types of crisis. However, while house prices falls are largest after financial recessions, construction costs decreases the most after non-financial disasters. This could reflect that house prices are more susceptible to uncertainty during adverse financial events, whereas construction costs are more prone to supply disruptions during non-financial disasters.

Existing studies mainly focuses on pre-and-post-crisis trends in major macroeconomic aggregates like, GDP, inflation, investment and unemployment (Romer, 1986; Backus and Kehoe, 1992; Basu and Taylor, 1999; Cerra and Saxena, 2008; Reinhart and Rogoff, 2009a,b; N.Teulings and Zubanov, 2010; Jordá et al., 2011; Schularick and Taylor, 2012, among others). More recently some studies have linked political outcomes with crises periods (Funke et al., 2016; Mian et al., 2014). There are very few studies that examine post-crisis asset price trends. Reinhart and Rogoff (2009a) study 22 (systematic) banking crises since post-World War II (WWII) to identify the magnitude and persistence of their impact on house and equity price cycles as well as unemployment and income. They find that following financial crises asset market collapses are deep and prolonged. Goetzmann and Kim (2018) study crashes using data from 101 global stock markets between 1692 and 2015. Using conditional distributions methodology, they find that extremely large, annual stock

market declines (negative bubbles) are typically followed by positive returns. While they consider a long period of time, their study only includes a rapid and unusually large decline in a national stock market index. In contrast, this study analyses both stock and housing market responses after three types of crisis. This study also differs from Reinhart and Rogoff (2009a) in several areas like we consider three types of shocks instead of only banking crisis, our crises dataset include a wide range of shocks over a much longer time horizon. With regards to analyses techniques, while they employ very basic percentile and averaging exercises to identify the impact and duration of the effect of systematic financial crisis on individual country context, this study undertakes local projections technique within a panel of 17 countries over a period of 143 years.

In summary, this study employs a very recent local projection technique in the context of large historical dataset to study both pre- and post-World War II, which notably includes aftermath of the present global financial crisis. Furthermore, our housing database has aggregate house price as well as its disentangled components *i.e.* land price and construction cost. In our analysis in addition to financial crisis, we look at the impact of normal recessions and non-financial disasters. The dataset this study puts together is arguably the largest historical dataset consisting of macroeconomics, housing, equity and political variables.

On the empirical side, this study undertakes local projection analyses due to Jordá (2005) to project five and ten year paths of house and equity prices following the beginning of three different types of crisis. Building upon Jordá et al. (2013), Funke et al. (2016) and Jordá et al. (2016), this paper compares asset prices aftermath of financial crisis recessions to the aftermath of (non-financial) recessions. Yard sticking normal against financial recession enables us to develop a cleaner identification of the effects of financial crises than comparing crises periods to counter factual of all other years. Hence, this study could be considered as one of the pioneering initiatives to trace post-crises asset prices undertaking statistically advanced technique with a comprehensive historical dataset.

2. Crises Explained: Normal Recessions, Financial Crisis and Non-Financial Recessions

Following Funke et al. (2016), this study defines financial crisis as periods when the economy experiences events like, increased default rates associated with large capital losses fuelling public intervention, bank runs and bankruptcy or forced merger of financial institutions. Dates are matched with Jordá et al. (2013) and presented in Appendix Table A3. While historical crisis events are identified through Bordo et al. (2001) and Reinhart and Rogoff (2009b), post-1970 dataset of systematic banking crisis is gathered from Valencia

and Laeven (2008) and Valencia and Laeven (2012). In addition to financial crisis dates, this paper identifies the dates of recessions following Funke et al. (2016).

Recessions are identified through the basic intuition of Bry and Boschan (1971) algorithms where a peak represents to a local maximum and a trough represents a local minimum in real GDP per capita. This paper defines recession as the period between a peak and the following through and expansion as the period between a trough and the subsequent peak. We then make distinction between a normal and financial crisis recessions. Once recessions are identified, we distinguish them into financial crisis recessions as the ones where a financial crisis occurred within two years window and normal recession which is no way associated with any financial crisis event. A full list of normal and financial crisis recession dates are provided in Appendix Table 4. In the spirit of Barro (2006), Barro and Ursúa (2008) and Barro and Ursúa (2012), this study also compares financial recessions to another subset of normal recessions that are infrequent and large in magnitude (as Barro dearly termed them as Rare Macroeconomic Disasters). Keeping in line with Funke et al. (2016) we term these rare disasters as non-financial macro disasters. They are disasters as they are those non-financial recessions which experience higher than average GDP decline during financial recessions (a decline of more than 3.35 in pre-WWII and 2.55 in post-WWII periods). A list of these disasters are offered in Appendix Table A5.

3. Data

This paper makes use of three very recently available historical databases: 1) macro-financial data set due to Jordá et al. (2015); 2) house price dataset offered by Knoll et al. (2017) and 3) political dataset by Funke et al. (2016). The combined database covers 17 countries over a period of 1870 to 2013. Hence, it includes the recent global financial crisis and its aftereffects. Fig. 1 plots consumer price index, house prices and stock prices for individual countries. A quick glimpse of these trend lines offers four important insights: 1) trends in all of these series are different between pre- and post-Second World War; 2) after World War II, all these series show steeper upward trends for most of the countries; 3) there are heterogeneity of these increasing trends among countries depending on the time periods of beginning of upward swings during the second half of twentieth century; and 4) equity prices are generally more volatile than house prices.

One of the explanations for house prices being more persistent than equity prices could be the land component of house prices. This study analyses both land and construction cost components of house prices, too. Variables employed and their descriptions with sources are provided in Appendix Table A1. By adding up three long historical databases enable us to get 1855 country-year house and 2139 country-year

equity prices, in particular, this research gets arguably the largest historical asset price dataset of its kind. As summary statistics of all these variables are provided in Appendix Table A2.

The macro-finance-political data set that this study put together offer some favourable features under important circumstances: 1. models presumably based on universal economic mechanisms of the business cycle must account for patterns observed across time and space, 2. a very long-run perspective facilitates capturing enough rare events such as major financial dislocations and macroeconomic disasters to robustly analyse their impacts on the volatility and persistence of real business cycles, 3. the political database includes more than 800 elections enabling our model to control for a Government's political strength which is pivotal to successful implementation of macro-financial policies. However, even though political dataset of Funke et al. (2016) consists data for 20 countries, we had to sacrifice 3 country's data during the data merging process.

4. Empirical Design

At the outset, we extensively analyze dependent variables of our study *i.e.* house prices, equity prices, construction costs and residential land prices through summary statistics, a visual scrutiny, and a basic ordinary least square (OLS) regression. Afterwards we perform our main statistical exercise through local projection technique due to Jordá (2005), subsequently adopted in Jordá et al. (2015) and Jordá et al. (2016). We finally provide a battery of robustness checks to examine our results.

Following Mian et al. (2014), we start our diagnosis of dependent variables by comparing their values in pre-crisis with post-crisis spells. In this regard, we use similar method to Funke et al. (2016) as we restrict the sample to a full five year pre- and post- of a financial crisis excluding the crisis year itself. In case of sequel crises, where five-year pre- and post-crisis periods overlap, we exclude subsequent crises as we consider them as the after-effect of the preliminary crisis. We further omit crisis events coinciding with global wartime periods from 1914 to 1918 and from 1939 to 1949. After removing all the crisis periods, we consider 63 out of 96 periods from Appendix Table A3 for our descriptive analysis.

[Figure 1]

We then perform fixed effect panel regression of our full sample to compare crisis times to non-crisis times. This enables us to tease out post-crisis deviations from the long-run historical average over more than 140 years of data. Particularly, we undertake a very basic model where our dependent variables, *i.e.* house prices and equity prices are regressed on post-crisis indicator variable, as:

$$Y_{it} = \alpha + \beta \times post_{it} + \mu_i + \varepsilon_{it}, \tag{1}$$

where,the indicator variable $post_{it}$ take the value of 1 in each of the five years after a crisis event. Unlike our descriptive analyses, post-crisis years include all years within five years after a financial crisis event. Hence, we include 90 out of 96 crisis periods for our OLS analysis as indicated by Appendix Table A3. We remove all the crisis and follow-ups that began during global wartime.

After these two preliminary diagnostics of dependent variables, we enter our main empirical analysis to calculate dynamic multipliers by implementing local projection method due to Jordá (2005). These days, local projection method is gaining popularity for some of its definite favourable properties. This technique can tackle asymmetries, nonlinearities and richer data structures with great convenience (Funke et al., 2016). The method is more robust to misspecification, provide appropriate inference (point-wise and joint) that does not require asymptotic delta-method approximations or numerical techniques for its calculation, and can easily accommodate experimentation with flexible specifications that may be impractical in a multivariate context (Jordá, 2005). Following Funke et al. (2016) and Jordá et al. (2013), we distinguish between financial and non-financial recessions (without major financial disruption). Since financial crisis and recessions are usually coupled, we might fail to understand that the housing and equity market environment that a country experiences after a financial crisis are mainly a function of the recession and independent of financial crisis as such. Hence, as can be seen from Appendix Table A4, in chronology of business cycle, we distinguish between non-financial business cycle peaks denoted as N, with peaks associated with systematic financial crisis represented by F. A reduced form of this table is separately presented in Appendix Table A5, which includes a subsample of crisis connected with severely non-financial recessions *i.e.* macro disasters. In these regards, likewise earlier instances, we exclude wartime periods.

A major limitation of the fixed effect regressions presented above is that it considers every crisis identically. Nonetheless, since economies are complicated dynamic entities, such approach may not provide sufficient economic intuition. Therefore, we undertake local projection technique as this set-up controls for macroeconomic contexts of the countries, which might affect their post-crisis trajectory. As a proxy for overall macroeconomic condition, we control for growth in per capita GDP, CPI inflation and long and short run interest rates. Historical data for macroeconomic variables are collected from Jordá et al. (2015). Since effectiveness of any stabilization policy in countries are dependent on political strength of a government, we

also control for government vote share in earlier election. Data of this political variable is salvaged from Funke et al. (2016). By controlling for macroeconomic and political factors with greater array of data and dynamics, we make it far less likely that financial crisis *per se* are an independent driver of asset market reactions and not a function of economic conditions. Following Funke et al. (2016), we calculate response from house and equity prices, construction costs and residential land prices by estimating the following fixed-effects panel model with discrete treatment depending on whether the recession is financial or not (F, N):

$$\Delta_h y_{it+h}^k = \alpha_i^k + \theta_N^k N + \theta_F^k F + \theta_D^k D + \sum_{j=0}^{p} \Gamma_j^k Y_{it-j} + u_{it}^k; k = 1, ..., K; h = 1, ..., H, \tag{2}$$

where, treatment variables, θ_N^k, θ_F^k and θ_D^k are the occurrence of a normal recession (N=1), financial recession (F=1) and non-financial disasters (D=1), respectively. It is worth noting here that, the term treatment does no way be interpreted in a causal sense. While N and T represent cross sectional and time dimensions of the panel, Y_{it} is a vector of above-mentioned macroeconomic and political variables. These controls are introduced in the model with their lagged values and α_i^k are country fixed effects. For any dependent variable like, house prices, construction costs, residential land prices or equity prices we will estimate the change in that variable from beginning of the recession (previous peak) at time t to time $t+h$ through $\Delta_h y_{it+h}^k$.

4.1. Local projections technique

This paper constructs impulse responses of equation (2) through local projections method. Impulse responses (IRFs) within Vector Autoregressive (VAR)-type models measures the reaction of the system to a shock of interest. Unfortunately, when the underlying data generating process (DGP) cannot be well approximated by a VAR(p) process, IRFs derived from such model will be biased and misleading. Jordá (2005) introduced an alternative method for computing IRFs based on local projections that do not require specification and estimation of the unknown true multivariate dynamic system itself. A distinct advantage of this approach is the incorporation of nonlinear endogenous variable terms that can still be estimated by ordinary least squares. Its linear version is immediately comparable to a given VAR setting. It entails estimating:

$$Y_{t+h} = \alpha^s + \Lambda_1^{h+1} y_{t-1} + \Lambda_2^{h+1} y_{t-2} + ... + \Lambda_p^{h+1} y_{t-p} + u_{t+h}^h, \tag{3}$$

at alternative horizons $h = 0, \ . \ . \ . \ , H$, where, again, the local-projections model may be augmented by the presence of exogenous terms, x. Jordá (2005) then shows that impulse responses in the local projection framework are given by the coefficient matrices $\Psi_h = \Lambda_1^s$ while normalizing the impact response to be, again, $\Psi_0 = I$.

5. Post-Crisis House and Equity Prices

In this section, we present our findings from basic descriptive analysis, ordinary least square estimations and local projection followed by some robustness checking exercises. In doing so, we will compare our sample/findings between pre- and post-crisis, as well as between pre- and post-World War II.

[Figure 2]

5.1. Basic descriptive analyses of dependent variables

A simple basic descriptive statistics provide us evidence that the consumer price index rises significantly within five years of a financial crisis as expected due to governments stabilization effort through expansionary policies. However, Fig. 2 also suggest that there is very little changes in post-crisis house and stock prices for the whole period. However, as we have previously identified from Fig. 1 that both house and stocks prices reveal differing trends between pre- and post-WWII. Hence, we perform basic OLS regressions of post-crisis prices before and after WWII.

5.2. Post-crisis effects on housing and equity prices

To extend our anecdotal observations from descriptive study, we have undertaken a very basic fixed-effect panel regression for house and equity prices on a post-crisis dummy (taking a value of 1 for each of the five years after the financial crisis). We include all non-crisis years as we wanted to tease out any deviation in prices from their long run averages. From results provided in Table 1, we can find that post-crisis stock price increases are around 3.25 after the financial crisis and significant for the whole sample period but insignificant for either pre- or post-WWII periods. House price increases are significant at one percent level with a very small magnitude of 0.26 percent points after the WWII. However, a basic panel fixed effect regression suffers

from severe identification issues. Hence, these results can be considered as a very preliminary step. This warrant a deeper analyses of the post-crisis price paths in these asset markets.

[Table 1]

Fig. 3 displays local projections of the cumulative changes in the house price index for years 1-5 after the financial recession (red solid line), controlling for GDP growth rate and CPI inflation (and their lags). The shaded region represents a 90% confidence interval. Likewise OLS regression, left panel shows cumulative projection for the whole sample with middle and right panels displaying projections for pre- and post-WWII periods. Both for the whole and post-WWII panels, there is a consistent downward trend in house price index. The same can be observed in corresponding findings about trends in house prices from Table 4 in the text afterwards. On average for full sample period, house price index decreases by more than 7% (not percentage points) five years after the financial recession. While there is very little change in post-financial crisis house prices prior to WWII, in post-WWII sample house prices drops down to more than 14 percent by the fifth year after a crisis. This might be due to heightened house prices often resulting in bubbles during post-WWII periods in the developed world Jordá et al. (2015).

[Figure 3]

We now turn our focus to projecting equity prices. According to Fig. 4, irrespective of periods covered *i.e.* for full sample, pre-WWII and post-WWII, stock prices display a consistent downward trend after financial crises. This proves that unlike house prices, stock prices show similar trend in both pre- and post-WWII indicating absence of "bubble" like recent events in equity market. Fama (2014) points out the absence of "bubbles" in equity market in his Nobel Lecture. In that seminal Lecture, he defines "bubbles" as an "irrational strong price increase that implies a predictable strong decline" (Fama, 2014, pp.1475). As revealed by corresponding results in Appendix Table A6, stock prices decline by more than 7% after two and five years of the financial crisis events for the full and post-WWII periods, respectively. Our results are robust to adding more control variables like, government vote share, long and short run interest rates. We include vote share to allow for governments strength in decision-making and implementation as far as stabilization policies are concerned.

[Figure 4]

Fig. 5 provides kernel density of house prices, stock prices, construction costs and residential land prices for the five years prior to financial crisis (black broken line) and five years afterwards (red solid line).

The figure documents notable changes in the responses from prices to crisis over last 143 years. In the contemporaneous sample after WWII, house prices show a downward trend in post-crisis periods relative to pre-crisis times. In contrast, the densities are less clear in the pre-WWII period.

[Figure 5]

Now we endeavour to dig deeper into projecting both of the components of house prices. Results from our fixed effect OLS regressions with regards to construction costs and residential land prices are presented in Table 2. As the table suggests, while the residential land prices (the bigger component of house prices) have not experienced any change, there is a very little increase of only 0.09 percent in the level of construction costs five years after crisis in post-WWII period. Fig. 6 displays local projection of these two components. Likewise local projection results for house prices, both construction costs and residential land prices experience constant decline even after five years of the financial crisis. However, while the decrease is immediate in constructions cost, residential land prices drops sharply 4 years after the crisis. Results from corresponding Table A7 and A9 suggests that on average construction cost drops by -2.18% after three years, whereas residential land price falls by more than -31% five years after in the post-World War II sample.

[Table 2]

[Figure 6]

We present OLS results for our three major control variables in Table 3. While there is not much happening in short and long term interest rates, post-crisis government vote share reduces significantly since World War II indicating the declining political power of the incumbent government which is also indicative to weak policy implementation regimes. This is consistent with the findings of Funke et al. (2016).

[Table 3]

5.3. How Persistent are these effects in prices?

How long lasting are these housing and equity market aftershocks from financial crises? Do these negative effects fade out with time and stabilization efforts? To find out answers of these questions we extend the time frame of our local projection exercises to ten years after the crisis event. Fig. 7 presents the post-crisis path of house prices, stock prices, construction costs and residential land prices over a 10 year horizon. The graphs reveal that both stock prices and construction costs effects are temporary and diminish over time. For overall sample, stock prices takes about eight years and construction costs requires a bit more than ten

years to get back to their pre-crisis levels. However, impacts on house and residential land prices seemed to be quite persistent.

As indicated by projections of stock prices in second top panel, stock prices get back to pre-crisis level earlier in post-WWII than pre-WWII times. With regards to pre-World War II data, it takes almost nine years for stock prices to get back to their pre-crisis level, while in post-WWII periods they get back to their level within only six years. This might be due to greater interventions by governments in recent years, *i.e.* post-WWII periods. Another reasoning could be the increased ease and frequency in equity market operations due to rapid advancement in electronic transactions.

Before WWII there seems to be no effect of financial crises on house prices and its components. However after WWII, all three of these series experience decreasing trends. While house and residential land prices are far below the pre-crisis level even after 10 years, construction costs are almost back to pre-crisis level just after twelve years. This could also be due to the fact that any expansionary policy transmits relatively quickly in row material and supply markets than in bigger chunks of wealth component *i.e.* land prices. To sum up, the equity market consequences of financial crisis start to rebound by almost six to eight years after beginning of the crisis but housing market implications are more persistent. Both house and residential land prices do not get back to their pre-crisis levels even ten years after the crisis, effects in construction costs seem to die down around that time horizon.

[Figure 7]

5.4. Normal recessions and non-financial macro disasters

In previous section we have documented that financial crisis precedes substantial drop in both house and equity prices. It is now well represented in literature that financial crisis are typically accompanied by economic recessions (Jordá et al., 2013, 2015, 2016; Funke et al., 2016). In this section, we compare these price declines from financial crisis with other episodes of economic downturns. In doing so, in our local projections we will subject the economy to three different "treatments": recessions associated with a systemic financial crisis, normal recessions, and other (non-financial) macro disasters [1]. Table 4 offers local projection of house price index during these three economic crisis periods.

[Table 4]

[1]Section 2 of this paper already offered a discussion on these three types of crisis. In this regard we follow Jordá et al. (2015) and Funke et al. (2016) in that non-financial disasters are more severe than the typical financial crisis recession, *i.e.*, the annualized percentage decline in GDP per capita exceeds the respective thresholds of 3.35% (pre-World War II sample) and 2.55% (post-World War II sample). Financial crisis recessions are all recessions that coincide with a systemic financial crisis. All other recessions are called normal recessions.

Table 4 indicates that house prices react differently to each of these three distinct crisis periods. Financial recessions are followed by significantly larger decreases in house prices than either normal recessions or non-financial macro-disasters. While house prices decline significantly after all of the three crisis types in post-WWII period; there has been very little movements during any of these crisis periods before World War II regimes. This certainly have macro-economic reasoning. This might be associated with too much leverage in our financial system in recent years in post-WWII periods. During this period, the F-statistics rejects the null of equal coefficient for all crises at most horizons. The only exception is inter-war period, where there has been very little price movements with regards to any of the crisis periods.

Table 5 presents coefficients for all three types of crisis concerning each of the dependent variable. We only provide projections for post-World War II period to conserve space. The full set of results are offered in Appendix Table A6 through A8. As the table shows, stock price index decreases sharply just after financial recession and then the impact rebounds quickly within four years, while two other crisis types, *i.e.* normal and disasters, do not have any impact on equity prices at all. With respect to construction costs, likewise house prices they also get a negative shock in response to all three types of crisis. However, the most significant and persistent decline comes from non-financial disasters. Residential land prices decrease substantially after 5 years of financial recession. This might indicate the fact that since residential land prices are the biggest component of housing wealth and as they are traded infrequently, the lag for actualizing of effect of a financial crisis in land prices is larger than any other asset price counterparts.

To sum up from Table 5, first, financial recessions are the most detrimental crisis causing substantial decrease in house prices, stock prices and construction costs. Second, stock prices drop significantly immediately after financial crisis and such detrimental impacts fade away within four years, while shocks to house prices are persistent. Third, in normal recessions and non-financial macro-disasters, stock prices and residential land prices stay stable, whereas house prices and construction costs fall down persistently. Fourth, negative effects of financial crises are experienced in residential land prices with a lag of approximately five years.

As the results suggest, house prices are the most vulnerable against any type of crisis: financial and normal recessions as well as non-financial disasters. The house prices effects may be persistent as the sheer size and complexity of housing market restrict expansionary policies like lowering interest rates, increasing money supply and more recently implemented quantitative easing initiatives to have immediate impact on prices. The time lag between crisis and policy result realization is relatively large in housing market compared to equity market. Since the sole purpose of equity investment is different from housing investment

and equity trading requires relatively smaller commitment within a relatively quicker trading window, any shock casts immediate impact and any monetary and fiscal policy initiative gets immediate response, too.

[Table 5]

Our results also reveal that financial crises provoke greater disruptions in house and equity prices. As revealed by Funke et al. (2016), this is also true for political disturbances like increased extremism. This could be due to large degree of uncertainty associated with financial crises. Unlike normal recessions and non-financial disasters, financial crisis events call for greater unprecedented policies. Furthermore, compared to normal recessions due to factors like oil price shocks and nonfinancial disasters like cyclone, financial recessions attract greater media coverage.

6. Conclusion

This study projects post-crisis (including, financial, normal recessions and non-financial disaster) responses from housing and equity prices in 17 countries over 143 years. Our analyses suggest that financial crisis, normal recessions and non-financial disasters put immediate downward pressure on house prices, stock prices and construction costs and lagged declining effect on residential land prices. However, the magnitude and persistence of these negative impacts vary across time and asset classes. These findings have insightful implications as discussed in order.

First, we find that both house prices and construction costs are more vulnerable to crises only after World War II, while post-crisis stock price declines are detected throughout the whole sample period, *i.e.* in both pre- and post-WWII. This difference in timing of impacts between housing and equity market could be due to recent increased leverage in housing sectors in developed countries, as Jordá et al. (2015) indicate most of these financial crises are proceeded by bubble bursting.

Second, with regards to severity of impacts, financial crisis seems to be the most detrimental among the three types of crises causing substantial decreases in house prices, stock prices and construction costs. This could be a result of the fact that financial crises diffuse more uncertainty about the economic outlook and attracts greater media speculation. These blurry images about future lead to declines in both of these asset prices and construction costs.

Third, stock prices drops significantly immediately after financial crisis and rebounds within four to six years time, while shocks to house prices are persistent and the declining trend exists even after ten years horizon. This contrast in persistence could be a result of differences in investor intentions in these two

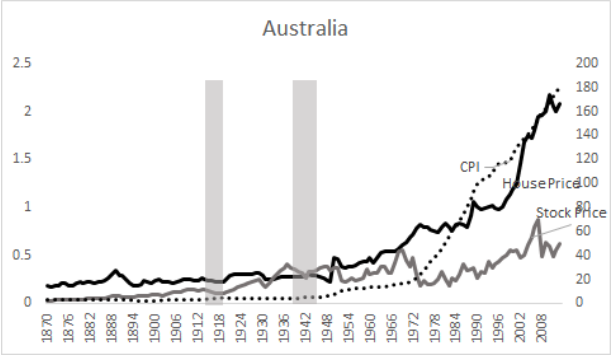
separate asset markets. Housing investors have a longer-term view than equity market operators. Since equity trading requires relatively smaller commitment within relatively quicker trading window, any macro-financial shock produces immediate impact. For the same reason, any monetary and fiscal policy initiative gets immediate response from stock market. Whereas, the persistence of downward pressure in house prices may also be due to the sheer size and complexity of housing market which restricts expansionary policies like lowering interest rate, increasing money supply and more recently quantitative easing initiatives to have immediate impact on prices. Therefore, the time lag between crisis and policy result realization is relatively large in housing market compared to other asset markets.

In terms of housing and wealth, the recovery from the recessions may have a social inequality slant, with upper class families rebounding through quick stock market recovery, lower middle class families could be persistently burdened, years later. Families of low-middle income are more likely to have their wealth wrapped up in a home, and less in financial investments like stocks. They conventionally are more likely to be pushed into risky mortgages, and thus into foreclosure, and far more likely to be targeted by predatory lenders. Controlling for all other factors, the interest rates that low and middle-income families pay for their mortgages are in many instances higher than those of higher income families. Thus, recession and subsequent stabilization efforts may amplify wealth gap and inequality thereof.

Fourth, in periods after Second World War, both house prices and their construction costs drop in response to all three types of crisis. However, as far as magnitude is concerned while house prices react substantially after financial recessions, construction costs fall down most after non-financial disasters. This could be a result of the fact that house prices are more susceptible to uncertainty during adverse financial events, whereas construction costs are more prone to supply disruptions during non-financial disasters like war, transportation or weather related disruptions.

Fifth, financial crisis put substantial downward pressure on residential land prices but with a lag of four to five years. This decline seems to be persistent afterwards. A probable reasoning might be that since residential land prices are the biggest component of housing wealth and they are traded infrequently, the negative effects from the crisis are actualized after larger lags than other asset price counterparts.

Figures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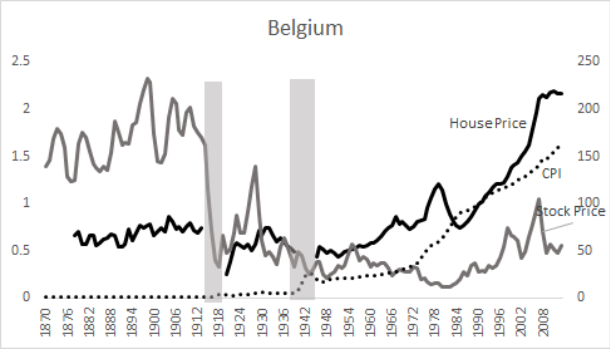
House Price
Stock Price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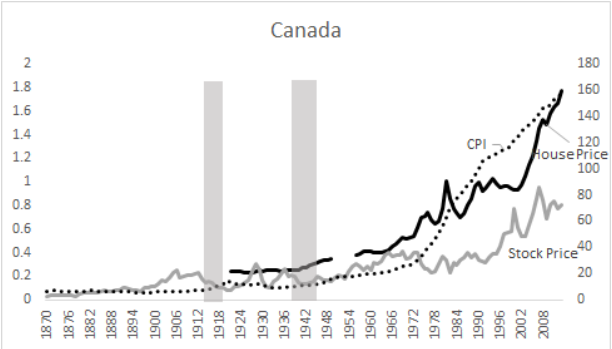
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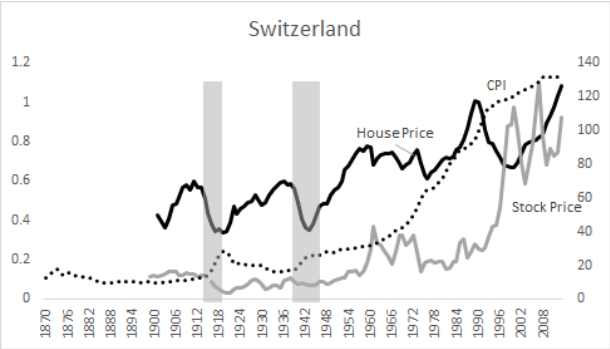
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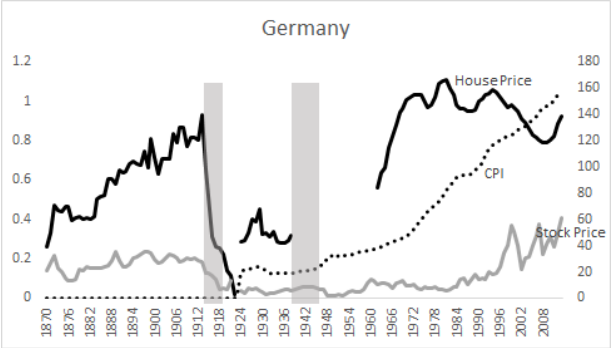
CPI
House Price
Stock Price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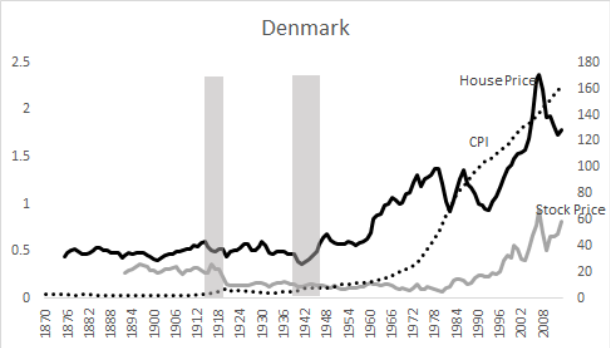
House Price
CPI
Stock Price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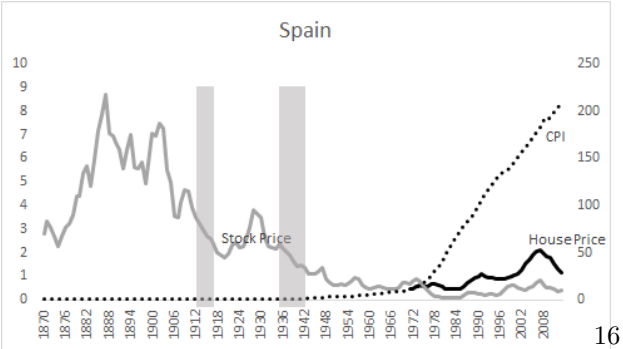
House Price
CPI
Stock Price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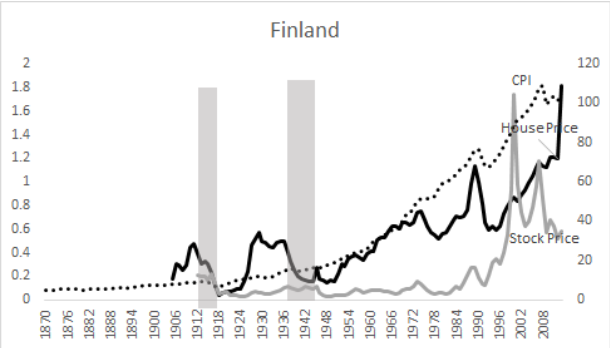
Stock Price
House Price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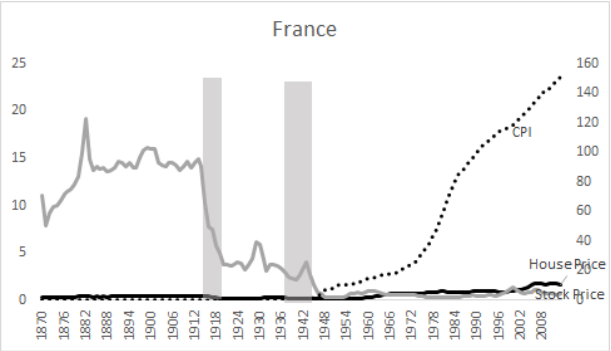
House Price
Stock Price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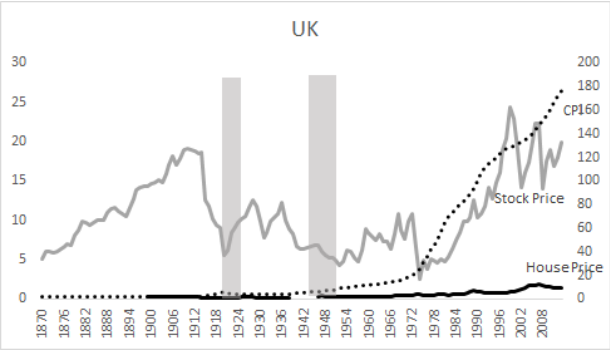
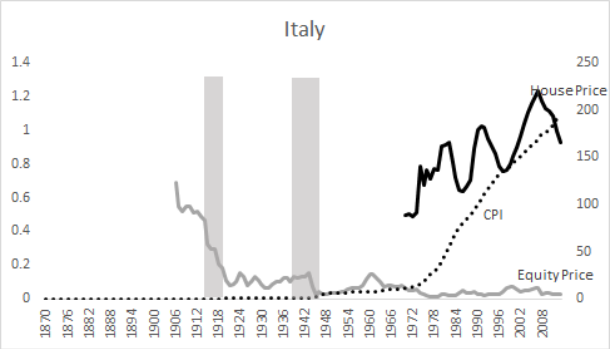
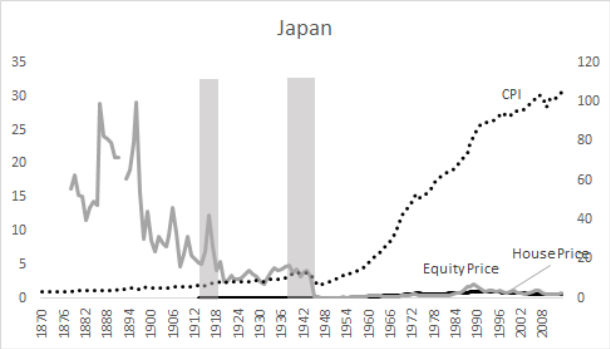
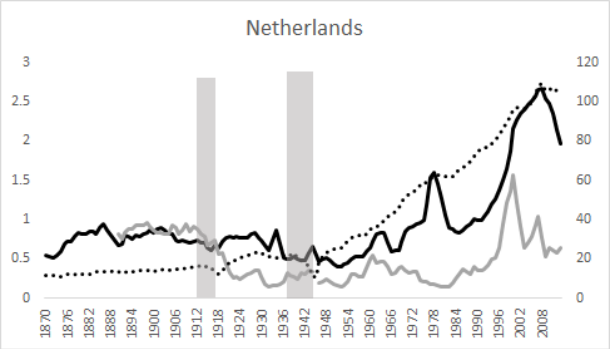

UK
CPI
Stock Price
House Price


Italy
House Price
CPI
Equity Price


Japan
CPI
Equity Price
House Price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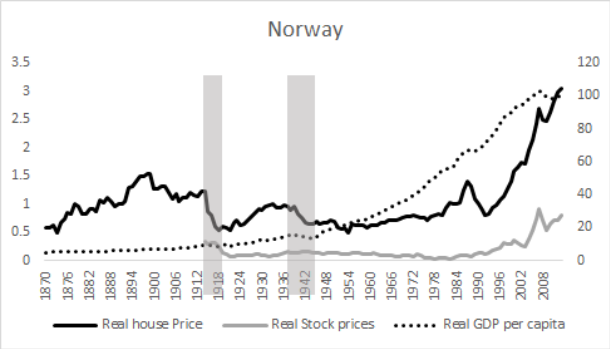
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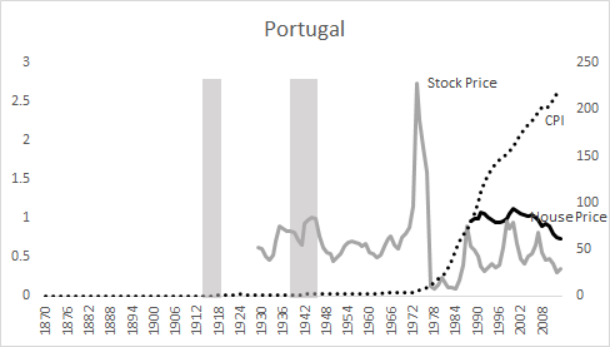
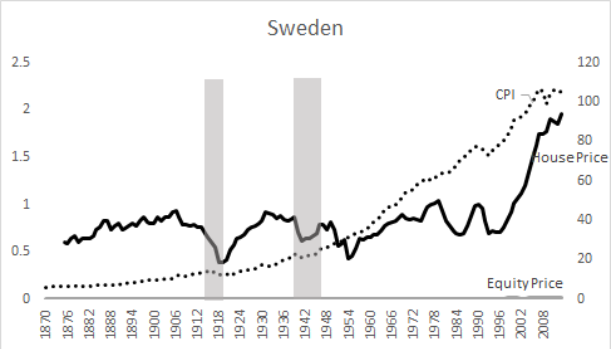
Real house Price
Real Stock prices
Real GDP per capita


Portugal
Stock Price
CPI
House Price


Sweden
CPI
House Price
Equity Price

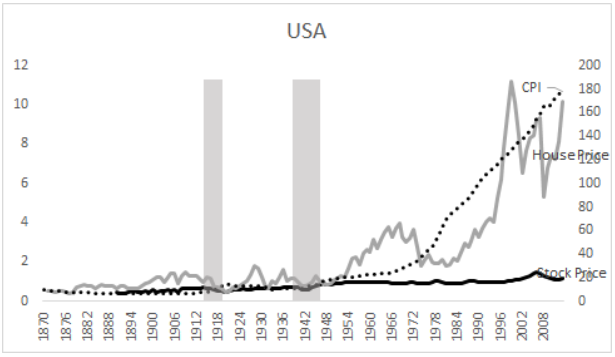


Figure 1: Real house prices, equity prices and CPI in the long run.
Note: Nominal house and equity price indexes are divided by consumer price index to get real house prices.

The years of two World Wars are shown with shading

Figure 2: Pre- and Post-Crisis House, stock and consumer price indexes.
Note: The left panel refers to average house, stock and consumer price indexes in the five year before the start of a financial crisis, while the right panel reflects average prices five years after.

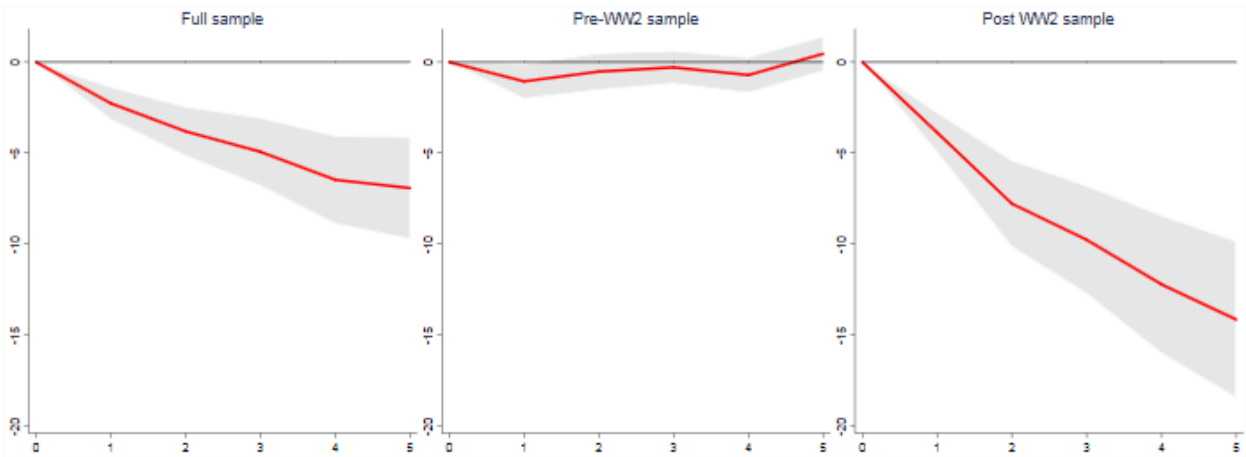


Figure 3: House Price Index (local projection).

Note: Each path shows local projections of the cumulative change relative to peak (in%, y-axis) for years 15 of the recession/recovery period (x-axis).The red line refers to the average path in financial crisis recessions and the shaded region is a 90% confidence interval. The controls are contemporaneous and 1-year lagged values of the growth rate of GDP per capita and the CPI inflation rate at peak. The left panel covers the years 1919-2014, excluding World War II, the middle panel 1919-1938, and the right panel 19502014. Table A4 shows the recessions included. The dependent variable is the house price index. For the corresponding regression results see Table 4 in the text below.

Figure 4: Stock Price Index (local projection).

Note: Each path shows local projections of the cumulative change relative to peak (in%, y-axis) for years 15 of the recession/recovery period (x-axis).The red line refers to the average path in financial crisis recessions and the shaded region is a 90% confidence interval. The controls are contemporaneous and 1-year lagged values of the growth rate of GDP per capita and the CPI inflation rate at peak. The left panel covers the years 1919-2014, excluding World War II, the middle panel 1919-1938, and the right panel 19502014. Table A4 shows the recessions included. The dependent variable is the stock price index. For the corresponding regression results see Appendix Table 6 in the text below.

Figure 5: Kernel Densities of Prices.

Note: The figure presents kernel densities (vertical axes) of four different asset price indexes (horizontal axes), illustrated by each row of panels. The black dashed line refers to the five years before a financial crisis and the red line to the five years after a financial crisis. The left panels cover crises in the years 1870-2014, the middle panels 18701938, and the right panels 1950-2014. Periods of global war (19141918 and 1939-1949) are excluded. Table A3 details which crises are included.

Figure 6: House Price Components- Construction Cost and Residential Land Prices (Local Projections): Financial Crisis Recessions.

Note: Each path shows local projections of the cumulative change relative to peak (in%, y-axis) for years 15 of the recession/recovery period (x-axis).The red line refers to the average path in financial crisis recessions and the shaded region is a 90% confidence interval. The controls are contemporaneous and 1-year lagged values of the growth rate of GDP per capita, the CPI inflation rate and government vote share at peak. The left panels cover the years 1870-2014, the middle panels 1870-1938, and the right panels 1950-2014. The periods of global war (19141918 and 1939-1949) are excluded. Table A4 shows the recessions included. For the corresponding regression results refer to Appendix Table E2 and E3.

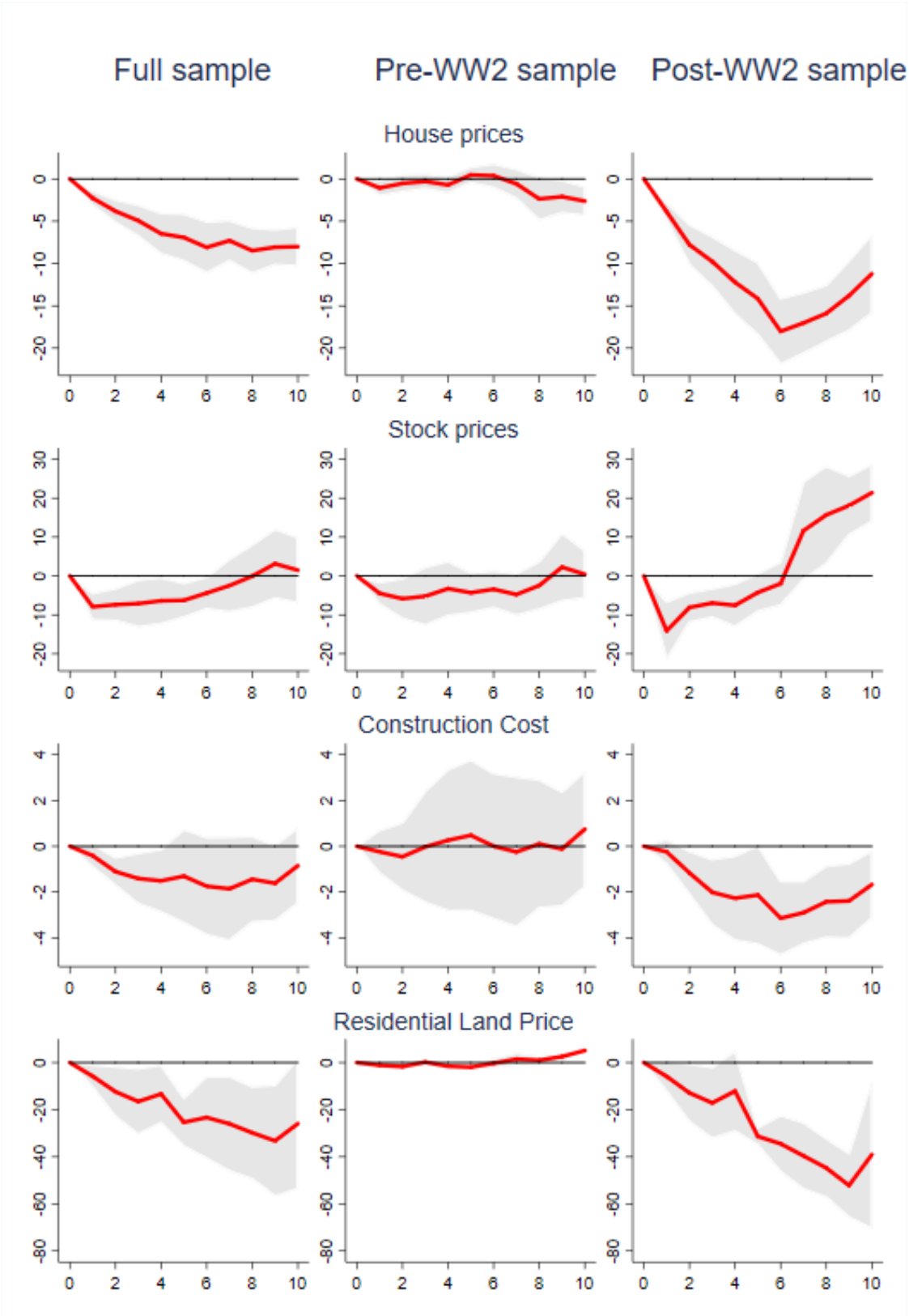


Figure 7: 10-year Local Projections: Financial Crisis Recessions.
Note: Each path shows local projections of the cumulative change in the house prices, stock prices, construction costs and residential land prices relative to peak (in%, y-axis) for years 110 of the recession/recovery period (x-axis). The red line refers to the average path in financial crisis recessions and the shaded region is a 90% confidence interval. The controls are contemporaneous and 1-year lagged values of the growth rate of GDP per capita, the CPI inflation rate, long run interest rate, short run interest rate and government vote share at the peak.

Tables

Table 1: **House Price and Stock Index: Post-Crisis Years versus Normal Years**

	(a) Full Sample	(b) Pre-WWII	(c) Post-WWII
	House Price Index		
Post-crisis	0.024	0.027	0.262*****
	(0.044)	(0.017)	(0.083)
R^2	0.012	0.033	0.041
Obs.	1663	672	991
	Stock Price Index		
Post-crisis	3.276*	-2.101	1.852
	(1.574)	(2.317)	(1.575)
R^2	0.005	0.003	0.008
Obs.	1917	829	1088

Note: This table compares the post-crisis levels of house price and stock price indexes to their average levels. The time window for post-crisis is five years. Robust standard errors (clustered by country) are in parentheses. The results are similar when controlling for economic fundamentals, such as the growth rate of GDP per capita and the CPI inflation rate (not reported).The left panel covers the years 1870 2013, excluding World War II, the middle panels 1870 - 1938, and the right panels 1950 - 2013. Table A3 shows the crises included. * p <0.10, ** p <0.05, *** p <0.01.

Table 2: **Construction Costs and Residential Land Prices: Post-Crisis Years versus Normal Years**

	(a) Full Sample	(b) Pre-WWII	(c) Post-WWII
	Construction Cost		
Post-crisis	-0.079	-0.001	0.091**
	(0.046)	(0.009)	(0.027)
R^2	0.015	0.001	0.035
Obs.	1326	444	882
	Residential Land Price		
Post-crisis	1.519	0.029	1.315
	(1.716)	(0.027)	(1.232)
R^2	0.001	0.001	0.001
Obs.	293	48	245

Note: This table compares the post-crisis levels of Construction Costs and Residential Land Prices to their average levels. The time window for post-crisis is five years. Robust standard errors (clustered by country) are in parentheses. The results are similar when controlling for economic fundamentals, such as the growth rate of GDP per capita and the CPI inflation rate (not reported).The left panel covers the years 1870 2013, excluding World War II, the middle panels 1870 - 1938, and the right panels 1950 - 2013. Table A3 shows the crises included. * p <0.10, ** p <0.05, *** p <0.01.

Table 3: **Control Variables: Post-Crisis versus Normal Years**

	(a) Full Sample	(b) Pre-WWII	(c) Post-WWII
	Short-term interest rate		
Post-crisis	-0.590*	-0.272	0.073
	(0.317)	(0.169)	(0.517)
R^2	0.071	0.046	0.365
Obs.	2121	1041	1063
	Long-term interest rate		
Post-crisis	-0.513*	-0.200	0.678
	(0.290)	(0.291)	(0.517)
R^2	0.077	0.022	0.342
Obs.	2239	1151	1071
	Government Vote		
Post-crisis	-1.713	-0.178	-3.617***
	(1.562)	(1.566)	(1.111
R^2	0.013	0.015	0.042
Obs.	1705	661	1027

Note: This table compares the post-crisis levels of Construction Costs and Residential Land Prices to their average levels. The time window for post-crisis is five years. Robust standard errors (clustered by country) are in parentheses. The results are similar when controlling for economic fundamentals, such as the growth rate of GDP per capita and the CPI inflation rate (not reported).The left panel covers the years 1870 2013, excluding World War II, the middle panels 1870 - 1938, and the right panels 1950 - 2013. Table A3 shows the crises included. * p <0.10, ** p <0.05, *** p <0.01.

Table 4: **Local Projections of House Price Index**

(a) Full Sample	Year1	Year2	Year3	Year4	Year5
Financial Recession	-2.38***	-3.91***	-5.07***	-6.68***	-7.14***
	(0.55)	(0.84)	(1.15)	(1.47)	(1.70)
Normal Recession	-1.60***	-2.17***	-3.00***	-3.61***	-3.69***
	(0.28)	(0.37)	(0.51)	(0.51)	(0.63)
Non-financial Disaster	-1.57**	-1.39	-3.50***	-4.48***	-3.78***
	(0.58)	(1.12)	(1.15)	(1.03)	(1.33)
H_0: Financial=Normal;p-value	0.18	0.04	0.06	0.04	0.05
H_0: Financial=Disaster;p-value	0.38	0.15	0.36	0.24	0.15
R^2	0.164	0.159	0.153	0.147	1.444
Obs.	1687	1665	1644	1623	1602
(a) Pre-WWII Sample	Year1	Year2	Year3	Year4	Year5
Financial Recession	-1.01	-0.30	-0.08	-0.56	0.60
	(0.60)	(0.67)	(0.62)	(0.62)	(0.64)
Normal Recession	-0.86**	-0.77*	-1.13*	-1.31*	-0.83
	(0.36)	(0.40)	(0.60)	(0.68)	(0.71)
Non-financial Disaster	-0.05	0.52	0.01	-0.62	-0.22
	(0.66)	(0.92)	(0.99)	(1.07)	(0.95)
H_0: Financial=Normal;p-value	0.83	0.56	0.23	0.41	0.16
H_0: Financial=Disaster;p-value	0.26	0.55	0.92	0.82	0.44
R^2	0.103	0.158	0.203	0.245	0.291
Obs.	718	713	709	705	701
(a) Post-WWII Sample	Year1	Year2	Year3	Year4	Year5
Financial Recession	-4.11***	-8.05***	-10.02***	-12.46***	-14.36***
	(0.68)	(1.46)	(1.83)	(2.32)	(2.61)
Normal Recession	-1.95***	-2.31***	-2.57***	-2.54***	-2.11*
	(0.34)	(0.69)	(0.71)	(0.78)	(1.01)
Non-financial Disaster	-3.31**	-2.43	-5.61**	-5.32**	-1.89
	(1.28)	(3.31)	(2.52)	(2.43)	(3.86)
H_0: Financial=Normal;p-value	0.00	0.00	0.00	0.00	0.00
H_0: Financial=Disaster;p-value	0.66	0.20	0.19	0.06	0.03
R^2	0.339	0.323	0.317	0.321	0.346
Obs.	969	952	935	918	901

Note: Robust standard errors (clustered by country) are in parentheses. Results correspondent to local projections of cumulative change in 100 times the logged variable relative to peak for year 1–5 of the financial recession(first row), normal recession (second row), and non-financial macro disaster (third row). The top panel (a) covers the periods during 1870–2014 excluding World War II years (1939–1949), the middle panel (b) ranges the years 1870–1938, and the bottom panel (c) covers years 1950–2014. Financial = normal (disaster) tests the null that coefficients for each type of recession are the same with regards to intercept terms in the first and second (third) rows. In each instance, p-value is provided. The controls are contemporaneous and 1-year lagged values of the growth of GDP per capita and the CPI inflation rate at peak (coefficients are not reported). See text.* p <0.10, ** p <0.05, *** p <0.01.

Table 5: **Local Projections of all Dependent Variables, Post-World War II Sample**

	Year1	Year2	Year3	Year4	Year5
			House Price Index		
Financial Recession	-4.11***	-8.05***	-10.02***	-12.46***	-14.36***
	(0.68)	(1.46)	(1.83)	(2.32)	(2.61)
Normal Recession	-1.95***	-2.31***	-2.57***	-2.54***	-2.11*
	(0.34)	(0.69)	(0.71)	(0.78)	(1.01)
Non-financial Disaster	-3.31**	-2.43	-5.61**	-5.32**	-1.89
	(1.28)	(3.31)	(2.52)	(2.43)	(3.86)
H_0: Financial=Normal;p-value	0.00	0.00	0.00	0.00	0.00
H_0: Financial=Disaster;p-value	0.66	0.20	0.19	0.06	0.03
			Stock Price Index		
Financial Recession	-14.32***	-8.40***	-7.11***	-7.76**	-4.32
	(4.58)	(2.30)	(2.28)	(3.48)	(3.13)
Normal Recession	-2.01**	-2.73**	-1.42	-2.14	-0.69
	(0.93)	(1.07)	(1.14)	(2.25)	(2.40)
Non-financial Disaster	-5.62*	-6.61	-10.35	-13.50	-13.88
	(3.03)	(4.98)	(6.47)	(9.13)	(8.10)
H_0: Financial=Normal;p-value	0.01	0.04	0.02	0.07	0.16
H_0: Financial=Disaster;p-value	0.15	0.78	0.57	0.48	0.21
			Construction Costs		
Financial Recession	-0.32	-1.32**	-2.18**	-2.44*	-2.30
	(0.35)	(0.60)	(0.89)	(1.15)	(1.34)
Normal Recession	-0.69**	-1.51***	-1.79***	-1.79***	-1.87*
	(0.23)	(0.47)	(0.51)	(0.58)	(0.61)
Non-financial Disaster	-1.57***	-3.77***	-3.76***	-4.02**	-3.90**
	(0.45)	(1.17)	(1.17)	(1.45)	(1.56)
H_0: Financial=Normal;p-value	0.27	0.76	0.63	0.54	0.74
H_0: Financial=Disaster;p-value	0.05	0.07	0.26	0.38	0.44
			Residential Land Prices		
Financial Recession	-5.89	-12.89	-17.13	-12.08	-31.27***
	(3.95)	(7.55)	(9.23)	(10.42)	(2.21)
Normal Recession	-0.19	0.26	-0.15	0.55	1.23
	(0.52)	(1.25)	(1.53)	(1.72)	(2.09)
Non-financial Disaster	-0.47	1.02	2.65	3.49	4.15
	(0.47)	(0.73)	(2.11)	(3.16)	(2.92)
H_0: Financial=Normal;p-value	0.22	0.16	0.15	0.32	0.00
H_0: Financial=Disaster;p-value	0.22	0.10	0.06	0.09	0.00

Note: Robust standard errors (clustered by country) are in parentheses. Results correspondent to local projections of cumulative change in 100 times the logged variable relative to peak for year 1–5 of the financial recession(first row), normal recession (second row), and non-financial macro disaster (third row). The data covers years 1950–2014. Financial = normal (disaster) tests the null that coefficients for each type of recession are the same with regards to intercept terms in the first and second (third) rows. In each instance, p-value is provided. The controls are contemporaneous and 1-year lagged values of the growth of GDP per capita and the CPI inflation rate at peak (coefficients are not reported). See text.* p <0.10, ** p <0.05, *** p <0.01.

References

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Appendix

Table A1: **Main Variables: Description and Sources**

Variable	Description	Sources
Real House Price Index	Nominal house price index divided by consumer price index.	Knoll et al. (2017)
Real Construction Cost Index	Nominal construction cost index divided by consumer price index.	Knoll et al. (2017)
Real Residential Land Price Index	Nominal residential land price index divided by consumer price index.	Knoll et al. (2017)
Real Stock Price Index	Nominal stock price index divided by consumer price index.	Jordá et al. (2015)
Systematic Financial Crisis	Binary variable for financial crisis events since 1870.	Jordá et al. (2015)
Recessions	Binary variable for normal recessions since 1870. Financial recessions: financial crisis within +/-2 years around peak. Nominal recessions: all non-financial peaks. Non-financial macro-disasters: normal recessions with yearly real per capita GDP percentage loss is greater than average loss in financial recessions.	Funke et al. (2016)
GDP per capita	Real GDP per capita	Jordá et al. (2015)
Inflation	Consumer price index	Jordá et al. (2015)
Short Term Interest Rate	Short-term interest rate (nominal, percent per year)	Jordá et al. (2015)
Long Term Interest Rate	Long-term interest rate (nominal, percent per year)	Jordá et al. (2015)
Current Account	Current account (nominal, local currency)	Jordá et al. (2015).
Investment-to-GDP Ratio	Investment-to-GDP ratio	Jordá et al. (2015)
Government Expenditure	Government expenditure (nominal, local currency)	Jordá et al. (2015)
Total loans to non-Financial Private Sector	Total loans to non-financial private sector (nominal, local currency)	Jordá et al. (2015)
Total Loans to Households	Total loans to households (nominal, local currency)	Jordá et al. (2015)
Total Loans to Business	Total loans to business (nominal, local currency)	Jordá et al. (2015)
Government vote share	Vote share of governing party or coalition whichever appropriate in the most recent general elections to the national parliament (lower chamber).	Funke et al. (2016)

Table A2: **Summery Statistics**

Variable	Obs.	Mean	Std. Dev.	Min	Max
House Prices	1854	0.730718	0.436288	0.007481	3.04466
Stock Prices	2182	9.560855	27.17124	0.023980	232.7631
Construction Costs	1508	0.796783	0.259924	0.160421	1.4875
Residential Land Prices	321	4.116542	18.91574	0.140432	205.663
Real GDP Per Capita	2448	36.61966	30.93255	3.26308	113.343
Consumer Price Index	2448	34.97026	49.67926	1.10e–11	217.943
Short-Term Interest Rate	2285	4.912854	3.195364	0.000102	21.733
Long-Term Interest Rate	2.413	5.613159	3.026959	0.56	23.7154
Total Loans to Non-Financial Private Sector	2247	2262049	1.9e+07	7.6e–12	3.1e+08
Government Expenditure	2366	448444	2.8e+06	5.0e–13	4.5e+07
Total Loans to Business	1183	2363565	1.4e+07	0.2137	1.7e+08
Government Vote Share	1854	50.3444	14.3498	12.3	100

Note: Summary statistics refer to the raw data collected for all 17 countries and all years from 1870 to 2014, including non-democratic spells and periods of global war (1914 1918 and 1939 – 1949). Generally not considered in the empirical analysis of political variables are Austria and Ireland prior to World War I, and Australia prior to 1901 (no independent states). Finland prior to 1917, as an autonomous part of the Russian Empire, is considered.

Table A3: **Financial Crisis Events, 1870–2014**

Australia	1893	1989							
Belgium	1870	1885	1925	1931	1939*	2008			
Canada	1873	1907	1923						
Denmark	1877	1885	1908	1921	1931	1987	2008		
Finland	1878	1900	1921	1931	1991				
France	1882	1889	1907	1930	2008				
Germany	1873	1891	1901	1907	1931	2008			
Italy	1873	1887	1893	1907	1921	1930	1935*	1990	2008
Japan	1882	1900	1904*	1907	1913	1927	1992		
Netherlands	1893	1907	1921	1939*	2008				
Norway	1899	1922	1931	1988					
Portugal	1890	1920	1923*	1931	2008				
Spain	1883	1890	1913	1920	1924*	1931	1978	2008	
Sweden	1878	1907	1922	1931	1991	2008			
Switzerland	1870	1910	1931	1991	2008				
UK	1873	1890	1974	1984	1991	2007			
USA	1873	1884	1893	1907	1929	1984	2007		

Note: This table is reproduced from Funke et al. (2016) who has collated financial crisis events from Bordo et al. (2001), Reinhart and Rogoff (2009b), Laeven and Valencia (2008), Laeven and Valencia (2012), and Jord et al. (2013). These financial crisis events are systematic banking crisis that took place since 1870 in 17 countries of our sample. * = crises removed from OLS regressions. Italic = crises removed from the descriptive analysis.

Table A4: **Financial Recessions (F) and Normal Recessions (N), 1870-2014**

	N	1875	1878	1981	1883	1885	1887	1889	1896	1898	1900	1904
Australia		1910	1913	1926	1938	1943	1951	1956	1961	1973	1976	1981
		2008										
	F	1891	1894	1989								
	N	1872	1874	1887	1890	1900	1913	1916	1942	1951	1957	1974
Belgium		1980	1992	2011								
	F	1870	1883	1926	1930	1937	2008					
	N	1871	1877	1882	1888	1891	1894	1903	1913	1917	1928	1944
Canada		1947	1953	1956	1981	1989	2007					
	F	1874	1907									
	N	1870	1880	1887	1911	1914	1923	1939	1944	1950	1962	1973
Denmark		1979	1992	2011								
	F	1872	1876	1883	1920	1931	1987	2007				
	N	1870	1883	1890	1898	1907	1913	1916	1938	1941	1943	1952
Finland		1957	1975	2008	2011							
	F	1876	1900	1929	1989							
	N	1872	1874	1892	1894	1896	1900	1905	1907	1909	1912	1916
France		1920	1926	1933	1937	1939	1942	1974	1992	2012		
	F	1882	1929	2007								
	N	1879	1898	1905	1913	1922	1943	1966	1974	1980	1992	2001
Germany		2012										
	F	1875	1890	1908	1928	2008						
	N	1870	1883	1897	1918	1923	1925	1932	1939	1974	2002	2004
Italy		2010										
	F	1873	1887	1891	1929	1992	2007					
	N	1875	1877	1880	1887	1890	1892	1895	1898	1903	1919	1921
Japan		1929	1933	1940	1973	2001	2007	2010				
	F	1874	1901	1907	1913	1925	1997					
	N	1870	1873	1877	1889	1894	1899	1902	1913	1929	1957	1974
Netherlands		1980	2001	2011								
	F	1892	1906	1937	1939	2008						
	N	1876	1881	1885	1893	1902	1916	1923	1939	1941	1957	1981
Norway		2007	2012									
	F	1897	1920	1930	1987							
	N	1870	1873	1877	1888	1893	1900	1904	1907	1912	1914	1916
Portugal		1925	1927	1934	1937	1939	1941	1944	1947	1951	1973	1982
		1992	2002	2004	2010							
	F	1890	1923	1929	2007							
	N	1873	1877	1892	1894	1901	1909	1911	1916	1927	1932	1935
Spain		1940	1944	1947	1952	1958	1974	1980	1992	2011		
	F	1883	1889	1913	1925	1929	1978	2007				
	N	1873	1876	1881	1883	1885	1888	1890	1899	1901	1904	1913
Sweden		1916	1924	1939	1976	1980	2011					
	F	1878	1907	1920	1930	1990	2007					
	N	1875	1880	1886	1890	1893	1899	1902	1906	1912	1916	1920
Switzerland		1933	1939	1947	1951	1957	1974	1981	1994	2001		
	F	1871	1929	1990	2008							
	N	1875	1877	1891	1883	1896	1899	1902	1907	1918	1925	1929
UK		1938	1943	1951	1957	1979	2010					
	F	1873	1889	1973	1990	2007						
	N	1875	1887	1889	1895	1901	1909	1913	1916	1918	1926	1937
USA		1944	1948	1953	1957	1969	1973	1979	1981	1990	2000	
	F	1873	1882	1892	1906	1929	2007					

Note: This table is reproduced from Funke *et al.* (2016)

Table A5: **Non-financial Macro-Economic Disasters, 1870-2014**

Australia	1881	1889	1896	1926	1981			
Belgium	1913	1916	1942					
Canada	1877	1884	1913	1917	1928	1944	1953	1981
Denmark	1877	1884	1914	1916	1939	1944	1953	1981
Finland	1890	1913	1916	1938	2008	2011		
France	1892	1909	1912	1920	1939	1942	2012	
Germany	1879	1913	1922	1943				
Italy	1918	1939	1974	2010				
Japan	1880	1887	1890	1895	1898	1919	1929	1940
		1973	2007					
Netherlands	1873	1913						
Norway	1873	1916	1939	1941				
Portugal	1916	1927	1934	1939	1973			
Spain	1873	1877	1894	1909	1935			
Sweden	1916	1939						
Switzerland	1875	1890	1893	1916	1920	1939	1957	1974
UK	1907	1918	1925	1929	1943			
USA	1895	1913	1918	1937	1944	1957	1981	

Note: This table is reproduced from Funke et al. (2016). It shows a sub-sample of non-financial macro-economic disasters from the normal recessions listed in Table A4. Non-financial macro-economic disasters are defined as normal recessions where the yearly real per capita GDP percentage loss is higher than the average in financial crisis recessions. Thresholds are calculated separately for the pre-World War II sample (-3.35%) and the post-World War II sample (-2.55%).

Table A6: **Local Projections of Stock Prices Index**

(a) Full Sample	Year1	Year2	Year3	Year4	Year5
Financial Recession	-7.87***	-7.21***	-6.44	-5.25	-5.01
	(2.11)	(2.46)	(3.76)	(3.75)	(2.88)
Normal Recession	-1.62***	-2.64**	-1.87	-1.44	-1.39
	(0.50)	(0.97)	(1.09)	(1.72)	(1.74)
Non-financial Disaster	-0.93	-3.42	-4.79*	-2.88	-3.11
	(1.63)	(2.52)	(2.47)	(2.76)	(2.55)
H_0: Financial=Normal;p-value	0.01	0.15	0.26	0.31	0.25
H_0: Financial=Disaster;p-value	0.02	0.43	0.77	0.55	0.62
R^2	0.069	0.088	0.119	0.131	0.149
Obs.	1965	1945	1927	1910	1893
(a) Pre-WWII Sample	Year1	Year2	Year3	Year4	Year5
Financial Recession	-4.46**	-5.65*	-4.48*	-1.72	-2.94
	(1.76)	(3.15)	(4.94)	(5.06)	(3.99)
Normal Recession	-1.80*	-3.02**	-2.80	-1.71	-2.67
	(1.01)	(1.05)	(1.97)	(3.02)	(2.51)
Non-financial Disaster	1.21	-2.33	-3.27	-0.67	-0.35
	(2.83)	(1.81)	(2.15)	(3.23)	(2.19)
H_0: Financial=Normal;p-value	0.06	0.42	0.70	1.00	0.94
H_0: Financial=Disaster;p-value	0.12	0.53	0.88	0.56	0.37
R^2	0.088	0.132	0.177	0.187	0.203
Obs.	894	891	890	890	890
(a) Post-WWII Sample	Year1	Year2	Year3	Year4	Year5
Financial Recession	-4.32***	-8.40***	-7.11***	-7.76**	-4.32
	(4.58)	(2.30)	(2.28)	(3.48)	(3.13)
Normal Recession	-2.01**	-2.73**	-1.42	-2.14	-0.69
	(0.93)	(1.07)	(1.14)	(2.25)	(2.40)
Non-financial Disaster	-5.62*	-6.61	-10.35	-13.50	-13.88
	(3.03)	(4.98)	(6.47)	(9.13)	(8.10)
H_0: Financial=Normal;p-value	0.01	0.04	0.02	0.07	0.16
H_0: Financial=Disaster;p-value	0.15	0.78	0.57	0.48	0.21
R^2	0.134	0.148	0.201	0.250	0.283
Obs.	1071	1054	1037	1020	1003

Note: Robust standard errors (clustered by country) are in parentheses. Results correspondent to local projections of cumulative change in 100 times the logged variable relative to peak for year 1–5 of the financial recession(first row), normal recession (second row), and non-financial macro disaster (third row). The top panel (a) covers the periods during 1870–2014 excluding World War II years (1939–1949), the middle panel (b) ranges the years 1870–1938, and the bottom panel (c) covers years 1950–2014. Financial = normal (disaster) tests the null that coefficients for each type of recession are the same with regards to intercept terms in the first and second (third) rows. In each instance, p-value is provided. The controls are contemporaneous and 1-year lagged values of the growth of GDP per capita and the CPI inflation rate at peak (coefficients are not reported). See text.* p <0.10, ** p <0.05, *** p <0.01.

Table A7: **Local Projections of Construction Costs**

(a) Full Sample	Year1	Year2	Year3	Year4	Year5
Financial Recession	-0.52	-1.32***	-1.66**	-1.74*	-1.61
	(0.30)	(0.34)	(0.64)	(0.81)	(1.23)
Normal Recession	-0.97***	-1.87***	-1.92***	-1.77***	-2.30***
	(0.16)	(0.35)	(0.38)	(0.41)	(0.42)
Non-financial Disaster	-1.13***	-2.04***	-2.67***	-2.70***	-2.74***
	(0.30)	(0.58)	(0.60)	(0.70)	(0.72)
H_0: Financial=Normal;p-value	0.26	0.33	0.74	0.97	0.58
H_0: Financial=Disaster;p-value	0.07	0.17	0.17	0.31	0.35
R^2	0.101	0.099	0.107	0.119	0.143
Obs.	1345	1328	1311	1295	1279
(a) Pre-WWII Sample	Year1	Year2	Year3	Year4	Year5
Financial Recession	-0.40	-0.68	-0.32	0.01	0.12
	(0.55)	(0.81)	(1.31)	(1.74)	(1.94)
Normal Recession	-1.01***	-1.58***	-1.10**	-0.67**	-1.63**
	(0.34)	(0.53)	(0.37)	(0.24)	(0.58)
Non-financial Disaster	-0.48	-0.27	-1.02	-0.72	-0.73
	(0.38)	(0.49)	(0.86)	(0.85)	(0.83)
H_0: Financial=Normal;p-value	0.27	0.36	0.58	0.69	0.38
H_0: Financial=Disaster;p-value	0.65	0.80	0.51	0.66	0.59
R^2	0.135	0.180	0.191	0.203	0.240
Obs.	477	474	471	469	467
(a) Post-WWII Sample	Year1	Year2	Year3	Year4	Year5
Financial Recession	-0.32	-1.32**	-2.18**	-2.44*	-2.30
	(0.35)	(0.60)	(0.89)	(1.15)	(1.34)
Normal Recession	-0.69**	-1.51***	-1.79***	-1.79***	-1.87***
	(0.23)	(0.47)	(0.51)	(0.58)	(0.61)
Non-financial Disaster	-1.57***	-3.77***	-3.76***	-4.02**	-3.90**
	(0.45)	(1.17)	(1.17)	(1.45)	(1.56)
H_0: Financial=Normal;p-value	0.27	0.76	0.63	0.54	0.74
H_0: Financial=Disaster;p-value	0.05	0.07	0.26	0.38	0.44
R^2	0.189	0.214	0.240	0.258	0.278
Obs.	868	854	840	826	812

Note: Robust standard errors (clustered by country) are in parentheses. Results correspondent to local projections of cumulative change in 100 times the logged variable relative to peak for year 1–5 of the financial recession(first row), normal recession (second row), and non-financial macro disaster (third row). The top panel (a) covers the periods during 1870–2014 excluding World War II years (1939–1949), the middle panel (b) ranges the years 1870–1938, and the bottom panel (c) covers years 1950–2014. Financial = normal (disaster) tests the null that coefficients for each type of recession are the same with regards to intercept terms in the first and second (third) rows. In each instance, p-value is provided. The controls are contemporaneous and 1-year lagged values of the growth of GDP per capita and the CPI inflation rate at peak (coefficients are not reported). See text.* p <0.10, ** p <0.05, *** p <0.01.

Table A8: **Local Projections of Residential Land Price**

(a) Full Sample	Year1	Year2	Year3	Year4	Year5
Financial Recession	-5.83	-12.30	-16.40	-13.05	-24.69**
	(2.92)	(6.50)	(8.49)	(7.57)	(6.33)
Normal Recession	-0.80	-0.50	-1.18	-1.18	-0.75
	(0.48)	(1.08)	(1.19)	(1.46)	(1.98)
Non-financial Disaster	-0.51	1.50	-2.45	-3.53	-5.14
	(0.31)	(1.11)	(2.80)	(4.39)	(4.33)
H_0: Financial=Normal;p-value	0.16	0.13	0.16	0.21	0.03
H_0: Financial=Disaster;p-value	0.11	0.06	0.05	0.01	0.00
R^2	0.284	0.277	0.279	0.255	0.240
Obs.	269	263	257	251	245
(a) Pre-WWII Sample	Year1	Year2	Year3	Year4	Year5
Financial Recession	-1.33	-1.40	-0.29	-1.66	-1.46
	(0.82)	(0.99)	(0.08)	(0.63)	(0.67)
Normal Recession	-0.63	-0.84	-0.82	-0.32	1.34
	(0.19)	(0.37)	(0.76)	(1.54)	(0.89)
Non-financial Disaster	-1.16	0.95	-1.80	-4.12	-1.74
	(2.07)	(3.43)	(3.44)	(2.40)	(4.99)
H_0: Financial=Normal;p-value	0.47	0.17	0.58	0.38	0.05
H_0: Financial=Disaster;p-value	0.96	0.46	0.66	0.51	0.97
R^2	0.446	0.460	0.593	0.624	0.633
Obs.	47	47	47	47	47
(a) Post-WWII Sample	Year1	Year2	Year3	Year4	Year5
Financial Recession	-5.89	-12.89	-17.13	-12.08	-31.27***
	(3.95)	(7.55)	(9.23)	(10.42)	(2.21)
Normal Recession	-0.19	0.26	-0.15	0.55	1.23
	(0.52)	(1.25)	(1.53)	(1.72)	(2.09)
Non-financial Disaster	-0.47	1.02	2.65	3.49	4.15
	(0.47)	(0.73)	(2.11)	(3.16)	(2.92)
H_0: Financial=Normal;p-value	0.22	0.16	0.15	0.32	0.00
H_0: Financial=Disaster;p-value	0.22	0.10	0.06	0.09	0.00
R^2	0.308	0.326	0.355	0.361	0.383
Obs.	222	216	210	204	198

Note: Robust standard errors (clustered by country) are in parentheses. Results correspondent to local projections of cumulative change in 100 times the logged variable relative to peak for year 1–5 of the financial recession(first row), normal recession (second row), and non-financial macro disaster (third row). The top panel (a) covers the periods during 1870–2014 excluding World War II years (1939–1949), the middle panel (b) ranges the years 1870–1938, and the bottom panel (c) covers years 1950–2014. Financial = normal (disaster) tests the null that coefficients for each type of recession are the same with regards to intercept terms in the first and second (third) rows. In each instance, p-value is provided. The controls are contemporaneous and 1-year lagged values of the growth of GDP per capita and the CPI inflation rate at peak (coefficients are not reported). See text.* p <0.10, ** p <0.05, *** p <0.01.