sustainability

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The Impact of Uncertainty on State-Level Housing Markets of the United States: The Role of Social Cohesion

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Abstract: While considering the role of social cohesion, we analyse the impact of uncertainty on housing markets across the 50 states of the United States, plus the District of Columbia, using the local projection method for panel data. We find that both short-term and long-term measurements of macroeconomic and financial uncertainties reduce real housing returns, with the strongest effect originated from the macro-economic uncertainty over the long term. Moreover, the degree of social cohesion does not change the nature of the impact of uncertainty on real housing returns dramatically, but the size of the negative effects is relatively large for states with low social cohesion.

Keywords: social cohesion; uncertainty; U.S. housing markets; local projection method; impulse response functions

JEL Classification: C23; R31; P25

Citation: Dai, L.; Sheng, X. The Impact of Uncertainty on State-Level Housing Markets of the United States: The Role of Social Cohesion. *Sustainability* **2021**, *13*, 3065. https://doi.org/10.3390/su13063065

Academic Editor: Pierfrancesco De Paola

Received: 31 January 2021
Accepted: 8 March 2021
Published: 11 March 2021

1. Introduction

In recent years, there has been growing research interest in the linkage between uncertainty and economic activity, following an influential paper of Reference [1]. The important role of uncertainty in the economy has gained increasing attention from researchers and policymakers. In general, this strand of literature focuses on the macro-economic impacts of uncertainty and finds that uncertainty plays an important role in driving macro-economic fluctuations at the country-level (See Reference [2] for a review of the relevant literature). Existing literature overwhelmingly reports a negative influence of uncertainty on macroeconomic variables, such as output growth, interest rates, inflation, employment, and stock returns [3–7]. Moreover, realising that big heterogeneities are existing among different regions of a large economy, e.g., across the states in the United States (U.S.), recent studies [8,9] have also highlighted the negative effect of uncertainty on macroeconomic variables at the regional level.

In a related stream of literature, there has also been a surge of interest in studying the relationship between uncertainty and housing market returns, especially in the wake of the 2007 subprime mortgage crisis in the U.S. housing market, and the subsequent 2008–2009 Global Financial Crisis (GFC), in which a meltdown in the U.S. housing market acts as a catalyst for an economic and financial crisis that spreads globally [10–16]. It is noteworthy that existing studies mainly examine the link of uncertainty and housing markets at the aggregate country level and mostly use a news-based measure of uncertainty, such as the economic policy uncertainty (EPU) index of Reference [17].

Given uncertainty is a latent variable, it requires an appropriate measurement of uncertainty to study the effect of uncertainty. Besides various news-based measures of uncertainty (see References [17,18]) that are constructed based on the search results in newspapers for keywords related to uncertainty, another stream of literature has employed the econometric approach to measure uncertainty (see Reference [19]). This approach computes uncertainty based on estimation from the structural vector autoregression models

(SVAR) and overcomes the shortfalls of the news-based measures, which typically have a high bar for news coverage. The news-based measures may not be able to fully capture uncertainty when news editors fail/neglect to cover the relevant uncertainty events [20]. In contrast, the uncertainty measures of Reference [19] provide estimates of macroeconomic and financial uncertainties as average time-varying variances in the unpredictable components of the real and financial variables including 134 macroeconomic time series and 148 measures of monthly financial indicators. This uncertainty measure provides a comprehensive portion of macroeconomic and financial uncertainties, which includes a rich information set.

Against this background, we aim to build on the existing research by examining the impact of uncertainty on U.S. housing markets at the state level and using the uncertainty measures of References [19,21]. Moreover, we consider the interaction between economic and social factors by studying the informational role of social cohesion in each state with the impact of uncertainty on U.S. housing markets. Social cohesion is the concept that has been used by policymakers since the 1990s in the developed economies and is often referred to as the "glue" to keep the societies together [22–24]. Up to now, there is no consensus on the formal definition of social cohesion in the academic literature. The theoretical discussions about the concept of social cohesion in an economic domain have attracted great attention from academic researchers and policymakers following an influential paper by Reference [25] (See Reference [24] for a review of relevant literature). Social cohesion is considered to be a key factor to promote people's well-being, a condition for social and political stability, a justification for government spending on social policies, and a source of the sustainable development of economic growth. Social cohesion can keep members of a social system together (e.g., the family or the neighbourhood or the society) [26]. If a society is less cohesive, it may display social inequality, social disorder and conflict, disparate moral values and less social interaction, and can negatively impact the economy of society [27]. Acket, S [28] also reports empirical evidence for strong and statistically significant correlations between social cohesion and macro-economic variables across 39 European countries.

From a socio-economic point of view, Reference [29] suggests that individual societies differ in their social cohesions, and more cohesive societies can benefit from a higher cooperation between economic agents, which is an advantage for the society and impacts its economic outcome. It is notable that, in theory, a society with high social cohesion is characterised by great social and political stability based on improved well-being, shared moral values, and high cooperation of its members instead of inequality, disorder, and conflict. Cohesive societies that are socially and politically stable can focus on the development of the business and economy in times of great uncertainty, which mitigates the impact of uncertainty on macroeconomic variables, including the housing market returns. Since individual U.S. states can be different in terms of their social cohesion, we analyse the heterogeneous impacts of the uncertainty on state-level real housing returns by estimating the impulse response functions (IRFs) using the local projection method for panel data and by making the IRFs contingent on the status of social cohesion in each state. We examine both linear and nonlinear impulse responses of real housing returns to uncertainty by using the local projection method of Reference [30]. The panel data-based local projection method allows for consideration of the heterogeneity and cross-sectional dependence among individual U.S. states and, thus, assists in deducing correct statistical inferences. Following the work of Reference [31], we use a switching variable to distinguish the social cohesion of U.S. states into high-regimes and low-regimes.

The objectives of this paper are two-fold. First, we investigate the impulse responses of U.S. real housing market returns to uncertainty using the local projection method for panel data across all 50 states, plus the District of Columbia, over a monthly period from December 1999to December 2019 Second, we also examine if the impact of uncertainty on state-level housing markets of the U.S. is contingent on the status of social cohesion in each state. To the best of our knowledge, this is the first paper in the literature to study the

effects of macro-economic and financial uncertainties on U.S. housing markets using a large panel dataset at the state level while considering the role of social cohesion in each state.

The remainder of the paper is organised as follows. Section 2 describes the data and methodology. Section 3 discusses the empirical results, and Section 4 concludes the paper.

2. Data and Methodology

2.1. Data

In terms of housing markets data, we employ the seasonally adjusted nominal housing price data for the 50 states of the U.S., plus Washington, D.C., derived from the monthly index values of the Freddie Mac House Price Indexes (The data are accessible from http://www.freddiemac.com/research/indices/house-price-index.page, accessed on 27 January 2021). The indexes are calculated based on a database of loans purchased by Freddie Mac/Fannie Mae and provide a measure for U.S. housing prices at the state level. The nominal price data are then deflated using the seasonally adjusted Consumer Price Index (CPI) downloadable from the Federal Reserve Bank of St. Louis database (The data can be found from https://fred.stlouisfed.org, accessed on 27 January 2021). To work with the stationarity data, we take the first log-difference of the data to obtain real housing returns. We use the State Social Capital Index derived from the U.S. Congress Social Capital Project as a measurement of social cohesion in each state (In an economic context, Reference [32] defines social cohesion as the depreciated stock of past social capital investment. Social capital is conceptually and closely related to social cohesion and can be used as a measurement of social cohesion [4]. See Reference [33] for the detailed theoretical discussions about the concepts of social cohesion and capital. (The data are available from https://www.jec.senate.gov/public/index.cfm/republicans/2018/4/the-geography-of-social-capital-in-america, accessed on 27 January 2021). To measure broader macro-economic and financial uncertainties in the U.S., we employ the Macro and Financial Uncertainty Indexes following the methodology described by References [19,21] using 134 macroeconomic time series and 148 measures of monthly financial indicators, respectively (The data are downloadable from www.sydneyludvigson.com/data-and-appendixes, accessed on 27 January 2021). The uncertainty data are computed based on the h-step-ahead forecasts from a vector autoregression (VAR) system at the 1-month and 12-month ahead forecast horizons so that uncertainty in the short-term and long-term can be both captured. We also use several macro-economic fundamental variables at the U.S. country level, including interest rates, industrial production growth rates, and inflation rates to control for the influence of macroeconomic fundamentals in affecting real housing returns across U.S. states (The data are available from https://fred.stlouisfed.org, accessed on 27 January 2021). Our panel dataset is constructed at a monthly frequency and ranged from December 1999 to December 2019 over a sample period of 20 years. We describe the variables used in this study in Table 1.

Table 1. Descriptions of variables.

Name of Variable	Description	Unit of Measure	Source
$R_{i,t}$	The real housing returns of U.S. states calculated by taking the first log difference of monthly index values of the Freddie Mac House Price Indexes, deflated by using the seasonally adjusted Consumer Price Index (CPI).	In percentage	www.freddiemac.com/research/indices/house-price-index.page (accessed on 27 January 2021)
MU_t	Uncertainty for the broader macroeconomy in the U.S.	In percentage	www.sydneyludvigson.com/data-and-appendixes (accessed on 27 January 2021)
FU_t	Uncertainty for the financial sector in the U.S.	In percentage	www.sydneyludvigson.com/data-and-appendixes (accessed on 27 January 2021)
$X_{i,t}$	A vector of control variables for macro-economic fundamentals in the U.S., including interest rates, industrial production growth rates, and inflation rates.	In percentage	https://fred.stlouisfed.org (accessed on 27 January 2021)

2.2. Methodology

The linear model for computing impulse response functions (IRFs) following the Local Projection (LP) method of Reference [21] can be specified as follows:

$$R_{i,t+s} = \alpha_{i,s} + \beta_s U_t + \epsilon_{i,t+s}, \quad \text{for } s = 0, 1, 2, \ldots H \tag{1}$$

where $R_{i,t}$ is the real housing returns of state i at time t, s is the length of forecast horizons up to the maximum forecast horizon H (The maximum length of forecast horizons is set to 12 months in this research, corresponding to a one-year forecast horizon), $\alpha_{i,s}$ captures the fixed effect, and β_s measures the responses of housing returns at time $t + s$ to the uncertainty measure (denoted by U_t) at time t. The LP IRFs are computed as a series of β_s, which are calculated separately at each horizon (s) (Let us consider an univariate process for generating the IRF of R_t to a unit increase in the shock U_t. At the time of the shock, $E[R_t] = R + U_t$, where R is the mean average. For the sake of simplicity, assuming two lags are selected, the IRF function in the next period is then calculated by regressing $R_t = \alpha + \beta_1 R_{t-1} + \beta_2 R_{t-2} + U_t$. The IRF estimate for the period after the shock is: $E[R_{t+1}] = \alpha + \beta_1(\overline{R} + \overline{U}) + \beta_2 \overline{R}$, and the confidence intervals are obtained using the standard errors of the regression coefficients. $E[R_{t+2}]$ is formed using a separate ordinary least squares (OLS) regression in each subsequent period. See Reference [21] for more detailed discussions about the local projection method).

We also test if the impacts of uncertainty on real housing returns are contingent on the status of social cohesion in each state. Equation (1) can be respecified into a regime-dependent model in which IRFs are depending on the social cohesion profile of each state [31]. A switching variable that distinguishes states with high social cohesion from those with low social cohesion can be incorporated into a nonlinear model defined as follows:

$$R_{i,t+s} = (1 - D)\left[\alpha_{i,s}^{high} + \beta_s^{high} U_t\right] + D\left[\alpha_{i,s}^{low} + \beta_s^{low} U_t\right] + \epsilon_{i,t+s}, \quad \text{for } s = 0, 1, 2, \ldots H \tag{2}$$

where D is a switching variable that takes a value of 1 if state i has low social cohesion, and 0 otherwise. Superscripts *high* and *low* denote high-social and low-social cohesion states, respectively (The states with high social cohesion in our dataset are based on the state social capital index derived from U.S. Congress Social Capital Project 2018. There are 22 states include Alaska, Colorado, Connecticut, Idaho, Indiana, Kansas, Maine, Massachusetts, Minnesota, Montana, Nebraska, New Hampshire, North Dakota, Oregon, Rhode Island, South Dakota, Utah, Vermont, Virginia, Washington, Wisconsin, and Wyoming. Understandably, the remaining 28 states, plus the District of Columbia, are characterized as states with low social cohesion). The model distinguishes the responses of real housing returns to uncertainty in high social cohesion states from low social cohesion states.

To test the robustness of our results, we also consider several control variables that can affect housing returns at the U.S. country level. The model specified in Equation (2) can be extended as follows.

$$R_{i,t+s} = (1 - D)\left[\alpha_{i,s}^{high} + \beta_s^{high} U_t\right] + D\left[\alpha_{i,s}^{low} + \beta_s^{low} U_t\right] + X_t \gamma_s + \epsilon_{i,t+s}, \quad \text{for } s = 0, 1, 2, \ldots H \tag{3}$$

where $X_{i,t} = [X_{1,t}, X_{2,t}, X_{3,t}]'$ is a vector of control variables for the U.S. macro-economic fundamentals. $X_{1,t}$, $X_{2,t}$, and $X_{3,t}$ represent the U.S. interest rates, industrial production growth rates, and inflation rates, respectively.

3. Empirical Results

Figure 1 shows the impact of macro-economic and financial uncertainties at the 1-month and 12-month ahead forecast horizons (i.e., short-term and long-term uncertainties) on the state-level real returns in the U.S. housing markets. The figure indicates the linear impulse response functions calculated by the local projection method to a 1-unit increase of the uncertainty on the future path of real housing returns for 1-month to 12-month-ahead, along with the 95% confidence bands.

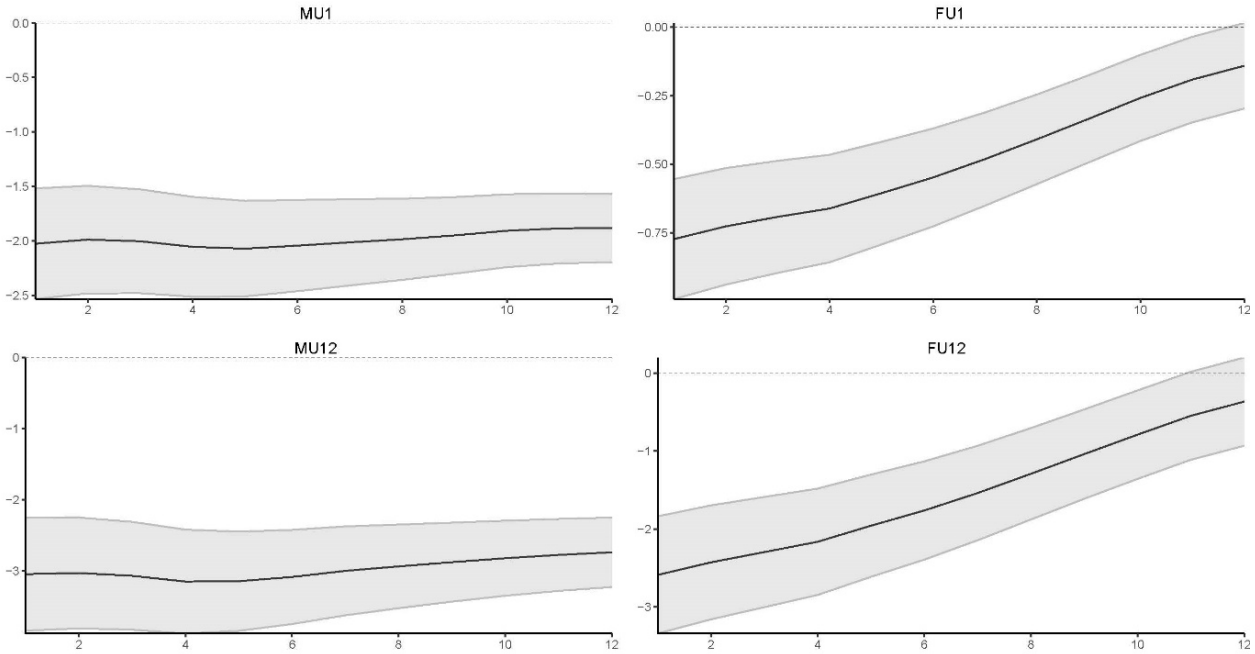

Figure 1. Responses of state-level real housing returns to macroeconomic uncertainty (MU) and financial uncertainty (FU).

The figures display the impulse responses of state-level real returns in the U.S. housing markets to a 1 unit increase in various measures of uncertainty. The shaded areas are the 95% confidence intervals. MU1 and MU12 represent macro-economic uncertainty at the 1-month and 12-month ahead forecast horizons (i.e., short-term and long-term macroeconomic uncertainties). FU1 and FU12 represent financial uncertainty at the 1-month and 12-month ahead forecast horizons (i.e., short-term and long-term financial uncertainties).

The first pattern that we can observe is that both types of uncertainties have a statistically significant and negative impact on real housing returns over the 12-month horizon, but macro-economic uncertainty exerts a relatively bigger influence comparing to their financial uncertainty counterparts. Moreover, we find that long-term uncertainties have a larger negative impact in size on housing returns than short-term uncertainties for both macro-economic and financial uncertainties with the strongest negative effect originating from the macro-economic uncertainty in the long term. The negative impact of uncertainty on housing returns can be explained by the decrease of demand in housing markets associated with low economic activity and high macro-economic and financial uncertainties. Our results are in line with country evidence in the literature about the negative linkage between uncertainty and housing market returns [11,15].

In Figure 2, we re-analyse the effect of uncertainty with a non-linear impulse response functions contingent on the social cohesion of individual U.S. states, derived based on the nonlinear version of the model described in Equation (2). We find that responses of real housing returns in U.S. states with both high-social and low-social cohesion are very similar to those derived from the linear model, as shown in Figure 1. The degree of social cohesion does not change the nature of the impact of uncertainty on real housing returns dramatically.

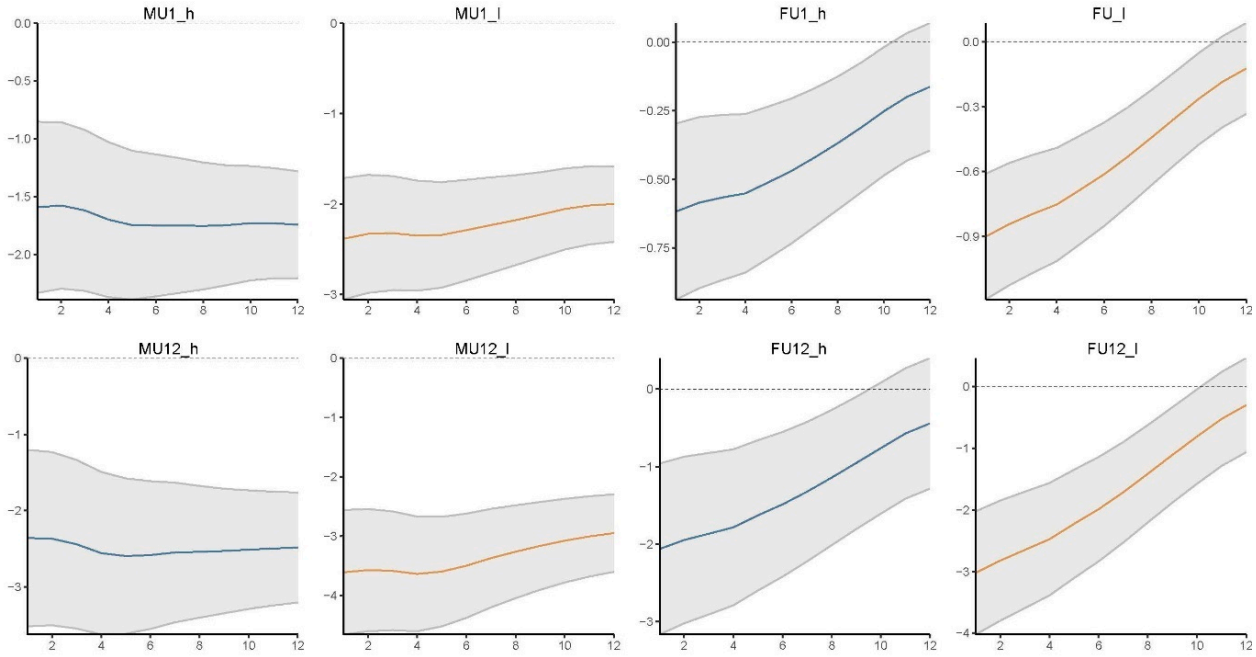

Figure 2. Responses of state-level real housing returns to macroeconomic uncertainty (MU) and financial uncertainty (FU) contingent on high (h) and low (l) social cohesion. **Note:** See Notes to Figure 1. _h and _l denote U.S. states with high and low social cohesion, respectively.

More importantly, we find that the impact of uncertainty on real housing returns is state-contingent on the social cohesion of individual U.S. states. Our results show that an increase in uncertainty tends to reduce real housing returns in a bigger magnitude in low-social cohesion states than high-social cohesion states. The relatively large negative influence of uncertainty on the real housing returns of the low-social cohesion states is in line with a socioeconomic intuition. In states with high social cohesion, the society tends to be more inclusive, people are more likely to have a high level of trust and engage with strong local community life, and the level of violent crimes tends to be lower. These social factors could contribute to mitigating the negative effects of uncertainty on housing markets.

In Figure 3, we find that housing return responses to uncertainty are robust to the influence of U.S. economic fundamentals in both high-social and low-social cohesion states. The patterns of IRFs are qualitatively the same as the ones reported in Figure 2. In comparison with Figure 2, the impulse responses presented in Figure 3 show that the negative effects of macro-economic and financial uncertainties on housing market returns have slightly increased in size for both high-social and low-social cohesion states when U.S. interest rates, industrial production growth rates, and inflation rates have been included in our model specified in Equation (3) as control variables.

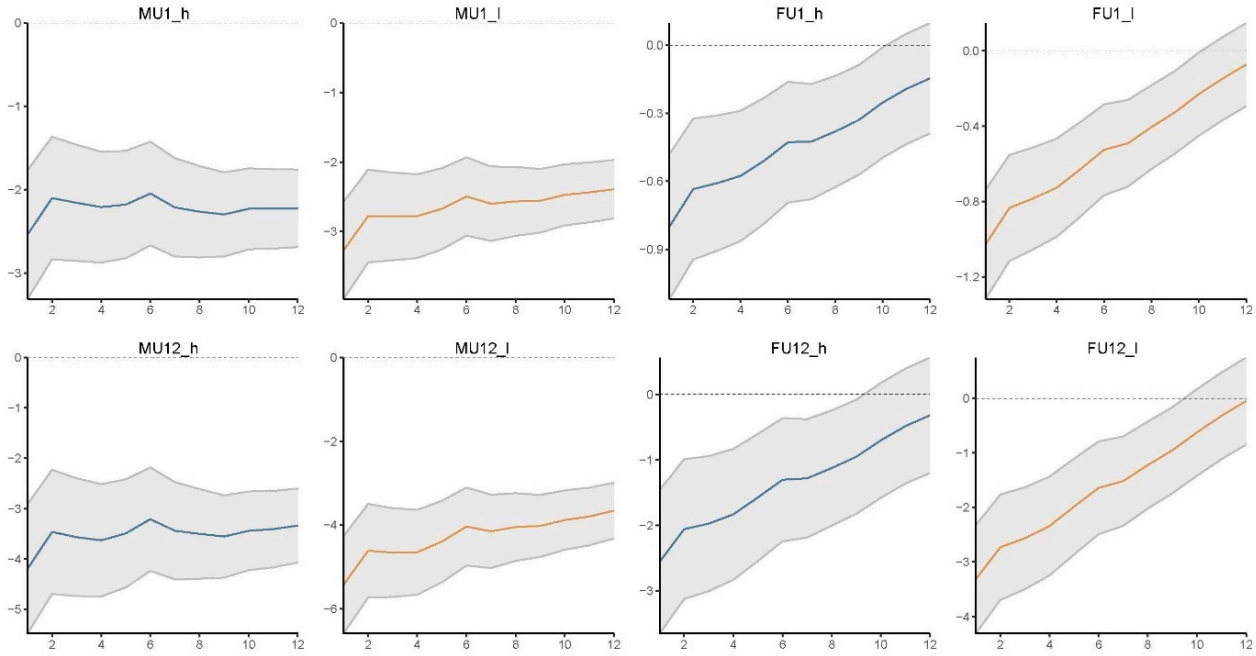

Figure 3. Responses of state-level real housing returns to macroeconomic uncertainty (MU) and financial uncertainty (FU) contingent on high (h) and low (l) social cohesion with control variables. **Note:** See notes to Figure 2.

4. Conclusions

This study investigates the impact of uncertainty on U.S. housing markets across all 50 states, plus the District of Columbia (Washington, D.C., USA) while considering the role of social cohesion in each state. The study contributes to the literature by examining both linear and nonlinear impulse responses of state-level housing returns to shot-term and long-term measurements of economic and financial uncertainties using the local projection method in a large panel dataset at the monthly frequency. We consider the heterogeneity of social cohesion in individual U.S. states and test if the responses of housing returns to uncertainty are regime-dependent on the status of social cohesion in each U.S. state. We find that both short-term and long-term measurements of macroeconomic and financial uncertainties reduce real housing returns, and the strongest impact originates from the macro-economic uncertainty over the long term. More importantly, we find that the effect of uncertainty on the housing markets is state-contingent on the social cohesion of individual U.S. states. Our results show that an increase in uncertainty tends to reduce real housing returns in a larger magnitude in low-social cohesion states than high-social cohesion states. Our study provides empirical evidence that social cohesion plays an important role in affecting the impact of uncertainty on real returns in the U.S. housing markets. The study highlights the important role of social cohesion with the impact of uncertainty on U.S. housing markets. Our results have great policy implications. It is important to policymakers to take into consideration the interplay between social and economic indicators when designing policies for the sustainable development of the real estate market, especially in times of great uncertainty. For future research, it would be useful to extend our analysis to an out-of-sample forecasting exercise. Moreover, our analysis can be extended to more countries, contingent on the limitation of data availability for uncertainty and social cohesion measurements at the regional level for other economies.

Author Contributions: Conceptualization, L.D.; Data curation, X.S.; Investigation, L.D.; Methodology, X.S.; Resources, L.D.; Supervision, L.D.; Writing—original draft, L.D. and X.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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