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U.S. HOUSING PRICES AND THE FOKUSHIMA NUCLEAR ACCIDENT: TO UPDATE, OR NOT TO UPDATE, THAT IS THE QUESTION

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U.S. housing prices and the Fukushima nuclear accident: To update, or not to update, that is the question

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Abstract

Did the nuclear catastrophe at Fukushima in March 2011 cause individuals to reappraise the risks they attach to nuclear power plants? We investigate the change in housing prices in the U.S. after the Fukushima event to test the hypothesis that house prices in the proximity of power plants fell due to an updated nuclear risk perception. Using a difference-in-differences approach we do not find evidence in support of the hypothesis that individuals reappraise the risks associated with nuclear power plants. House prices close to nuclear reactor sites did not fall relative to house prices at other locations in the U.S.

Keywords: Fukushima, nuclear accident, hedonic prices, housing, updating

JEL codes: D80, Q51, R31

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I. Introduction

In March 2011, the Tohoku undersea earthquake and the subsequent tsunami caused catastrophic damage to Japan's Fukushima Daiichi Nuclear Power Plant Complex. In the aftermath of the accident, worldwide public debates about the risks associated with nuclear power plants increased. Subsequently, some have argued that the Fukushima accident showed that the risks of nuclear power plants had been underestimated. For instance, in April 2011, Stiglitz (2011) suggested that the Fukushima accident proved nuclear industry experts wrong who had deluded the public that the nuclear risks had been all but eliminated. In May 2011, German Chancellor Angela Merkel remarked that the Fukushima accident changed the question of tolerable risks associated with energy generation (Merkel 2011). In line with the conjecture that the Fukushima accident revealed nuclear power plants to be more risky than previously thought, the governments of Germany, Switzerland, and Italy announced plans to phase out their nuclear reactors and the Chinese government decided to postpone approvals for new nuclear reactors (Davis 2012, 49).[1]

These assessments and policy decisions suggest that the Fukushima accident provided new information, leading individuals to update their priors regarding the riskiness of nuclear power plants. However, currently, to our knowledge there is no evidence suggesting that individuals have updated their priors, specifically evidence that is based on revealed preferences and supported by changes in behavior after the Fukushima nuclear accident.

We assess whether individuals in the U.S. reappraised the risks of nuclear power plants after the Fukushima event by studying the development of house prices. If, after the Fukushima accident, individuals who considered purchasing a house close to nuclear reactors revised their prior of a nuclear power plant accident upwards, house prices close to reactor sites are predicted to have fallen relative to house prices far away from reactor sites. Similarly, if those already residing in houses close to nuclear

[1] In Germany a reduction in nuclear power reactor runtime, with the last reactor going offline in 2022 instead of 2036, was signed into law in August 2011 (German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety 2011)

sites increased their priors regarding the probability of an accident, these owners of houses were willing to sell their houses at lower prices.

In this study we investigate residential house prices at the zip code level. We use a difference-in-differences approach to compare housing prices in areas relatively close to nuclear reactor sites with those in areas relatively far away from nuclear reactor sites, before and after the Fukushima accident.

Our paper is related to several other lines of research. One strand of research examines the effects of nuclear accidents on individuals' happiness (Berger 2010), cognitive abilities (Almond et al. 2009), and educational and professional achievement (Yemelyanau et al. 2012). Other strands analyze house prices at locations close to nuclear reactor sites (Nelson 1981; Clark et al. 1997; Folland and Hough 2000), changes in house prices after the installment of power plants nearby (Davis 2011), and the cleaning of adjacent contaminated sites (Greenstone and Gallagher 2008). Closely related to our study are the studies by Gayer et al. (2000) and Sanders (2012) who investigate how the release of experts' risk assessment concerning hazardous waste sites affects prices of nearby housing.

Investigating U.S. house prices provides a unique opportunity to test whether people revised their risk perception in light of the exogenous shock of the Fukushima accident. Our study is the first to use a difference-in-differences framework to analyze the effects of an exogenous nuclear event on the behavior of individuals, increasing our confidence that we identify a causal effect. Our findings show no systematic statistically significant difference in changes of house prices before and after the Fukushima accident in locations relatively close versus locations relatively far away from nuclear power plant sites. These findings support the hypothesis that the Fukushima accident did not provide individuals with information that led them to revise their priors regarding a nuclear accident. Rather, the evidence is consistent with the hypothesis that individuals were aware of risk of a nuclear accident and had already appropriately priced the likelihood of an accident into the prices of their homes.

II. Related Previous Studies

Numerous studies analyze the socio-economic consequences of nuclear accidents. Among them are papers studying the consequences of the 1986 Chernobyl accident on life satisfaction in Germany (Berger 2010), health risk perceptions of nuclear power plants by individuals living in Boston suburbs (Smith and Michaels 1987), cognitive abilities of Swedish students (Almond et al. 2009), and on the educational attainment, health, and job market performance of Belorussians (Yemelyanau et al. 2012). Recently, Yamamura (2012) analyzes surveys conducted after the Fukushima accident. He finds that the more a country's government limits citizens to express their opinions, the more these citizens tend to state they believe that their country's nuclear power plants are safe.

A few studies analyze the effect of nuclear reactor sites on house prices. Nelson (1981) finds that after the 1979 incidence at Three Mile Island, house prices in close proximity to the site neither decreased in absolute terms, nor fell relative to house prices farther away from the site. Investigating house prices close to two nuclear reactor sites in California between 1990 to 1994, Clark et al. (1997) find that residential house prices are not lower in closer proximity to these two sites. However, analyzing 494 market areas in the United States between 1945 to 1992, Folland and Hough (2000) document that at the time of the installment of a nuclear power plant, as well as following the installment, land prices in the proximity of that nuclear power plant fell.

Davis (2011) studies the effects of the openings of large non-nuclear power plants in the U.S. between 1993 and 2000. He finds that within a two mile radius of new plants, house prices decreased by four to seven percent and he further finds a small decrease in mean household income, the level of education, and the proportion of owner-occupied houses.

A related literature estimates the effects of hazardous waste on house prices. Greenstone and Gallagher (2008) find that Superfund cleanups have no statistically significant effects on residential property prices, property rental rates, supply of housing, and population size close to a Superfund site.[2] Gayer et al. (2000) find that housing prices rose after the EPA released its risk assessment for individual Superfund sites, a finding consistent with the hypothesis that individuals tended to overestimate the risks associated with Superfund sites. Sanders (2012) studies the effects of a change in the EPA's policy concerning the report requirements of toxic releases. In 1998, the EPA required additional industries to report on their toxin emissions in the publicly available Toxics Release Inventory. Sanders (2012) finds that house prices in zip code areas with newly reporting firms fell by two to three percent. Since the firm sites had been in operation prior to the reporting requirement, these results suggest that this new information alone had an effect on house prices.

III. Model

We model individuals' risk perception of nuclear power plant sites as a learning process. The posterior risk perception is a weighted average of the prior risk perception and the updated risk perception after the arrival of new information.[3] We consider the new information that comes from a nuclear accident that did not directly affect individuals through exposure to radiation, but might affect their risk perception. We represent the prior risk perception associated with nuclear power plants by p. The informational weight placed on p is φ_0. φ_0 determines how strong the influence of the prior risk perception is on the posterior risk perception. Consumers update their posteriori risk perception according to newly arrived information of a nuclear accident by n. The informational weight placed on the new source of information is v_0. The posterior risk perception is

(1) $$r(p,n) = \frac{\varphi_0 p + v_0 n}{\varphi_0 + v_0}.$$

Denoting the fraction of the total informational content of the two informational sources by

[2] The 1980 Comprehensive Environmental Response, Compensation, and Liability Act became known as Superfund. It enabled the U.S. EPA (Environmental Protection Agency) to initiate cleanups at sites that the EPA considered to endanger the public and the environment (Greenstone and Gallagher (2008, 952)).

[3] The model presented here is a modified version of the models discussed in Gayer et al. (2000, 2002) and Gayer (2000).

$\varphi = \varphi_0/(\varphi_0 + \upsilon_0)$ and $\upsilon = \upsilon_0/(\varphi_0 + \upsilon_0)$ gives the posteriori risk perception

(2) $r(p,n) = \varphi p + \upsilon n$

Like Gayer et al. (2000), we assume that individuals maximize utility over two states of the world. In the bad state, which occurs with the subjective probability $r(p,n)$, the consumer suffers from the consequences of nuclear radiation and obtains utility U_1. In the good state, which occurs with subjective probability $1 - r(p,n)$ individuals do not suffer any consequences from nuclear radiation and obtain utility U_2. We assume that for all levels of income $U_2 > U_1$. Utility in both states of the world is a function of the characteristics of the house, z, and a composite good, x. The consumer's income is y and every consumer buys one house at price h. The house price is a function of the characteristics of the house (Rosen 1974) and the risk perception. The individuals maximize expected utility V:

(3) $\text{Max } V = r(p,n)U_1(z,x) + [1 - r(p,n)]U_2(z,x)$

subject to

(4) $y = x + h\big(z, r(p,n)\big).$

We assume that the individuals' risk perception $r(p,n)$ is an increasing function of p and n. In equilibrium the price of housing equalizes expected utility across all locations. Where the perceived risk of suffering from nuclear radiation is relatively high, individuals are compensated by lower house prices. The equilibrium conditions for the effect of an increase in the prior risk perception p, and the effects of an increase in the risk perception on house prices h induced by newly arrived information concerning a nuclear accident n are:

(5) $\frac{\partial h}{\partial p} = \frac{(U_1 - U_2)\frac{\partial r}{\partial p}}{r\frac{\partial U_1}{\partial x} + [1-r]\frac{\partial U_2}{\partial x}} < 0$

and

(6) $$\frac{\partial h}{\partial n} = \frac{(U_1 - U_2)\frac{\partial r}{\partial n}}{r\frac{\partial U_1}{\partial x} + [1-r]\frac{\partial U_2}{\partial x}} < 0.$$

Equations (5) and (6) indicate that the marginal house price (the partial derivate of h with respect to p or n) is equal to the marginal willingness to pay for an incremental decrease in risk. Because $\partial h/\partial p = (\partial h/\partial r)(\partial r/\partial p)$ and $\partial h/\partial n = (\partial h/\partial r)(\partial r/\partial n)$, equations (5) and (6) can be simplified as

(7) $$\frac{\partial h}{\partial r} = \frac{(U_1 - U_2)}{r\frac{\partial U_1}{\partial x} + [1-r]\frac{\partial U_2}{\partial x}} < 0.$$

This equation shows that individuals face a trade-off between a lower subjective nuclear risk perception and higher house prices. Whereas their risk preference is assumed to be given, individuals can choose their exposure to subjectively perceived nuclear risk. As the marginal willingness to pay for an increase in risk is negative, our model predicts that if a nuclear accident increases the risk perception $r(p, n)$, house prices will fall in areas that individuals perceive to be more risky after the accident.

IV. Data

In 2011, 104 nuclear power reactors at 65 sites operated in the United States. Thirty-five of these were boiling-water reactors and 69 were pressurized-water reactors (U.S. NRC 2012, 28). The number of active nuclear power reactors had not changed since 1996 when the last license was issued by the Nuclear Regulatory Commission for the operation of the reactor 'Watts Bar 1' in Tennessee (U.S. NRC 2012, 32). Between one to three reactors operate per site.

Data on the location of power plant sites and U.S. zip codes are from Esri.[4] The location of zip code areas is defined by their centroids, their geometric centers. The data set contains over 29,763 U.S. zip codes.[5]

[4] Esri is a developer of geographic information systems that also provides geographic data.
[5] Not counted are zip codes of P.O. Boxes, unique zip codes for organizations that receive high volumes of mail, and zip codes that serve the function of making the patchwork of zip code areas complete (e.g. national parks, wilderness). We use the January 2012 version of this data set.

We obtained housing prices from Zillow®.[6] Zillow® provides a Home Value Index that gives a monthly estimated median value for all single-family houses within a zip code, using a calculation method proprietary to Zillow®.[7] These monthly house value data cover 10,419 zip codes and are available for all months in 2011. The data from Zillow include 123 zip codes that are not included in the location data for zip code area centroids, reducing the number of zip codes available for our analysis to 10,296. Our unit of observation is a zip code in a month in 2011.

Based on the zip code data we calculate the distances of the centroids of the 10,296 zip code areas to all power plant sites in the U.S. Using those distance measures we create several indicator variables. One of those is the indicator variable $Ring5$, equaling one when at least one nuclear power reactor is located within a 0-to-5-mile ring, and zero otherwise. We also define the indicator variable $Ring10$ which equals one if the reactor is located within an 5-to-10-mile ring, and create additional indicators variables for each 5-mile increment up to $Ring25$, which equals one if at least one nuclear power reactor is located within the 20-to-25-mile ring around a zip code's centroid, and zero otherwise. We also define the indicator variable $Radius25$. This indicator equals one when at least one nuclear power plant site is located within the 25-mile radius of a zip code's centroid, and zero otherwise. Table 1 provides descriptive statistics for our data.

V. Econometric specification and Results

On 12 March 2011, the Japanese government ordered evacuation within a 13-mile radius of the accident site and on 15 March it additionally advised people within a 13 to 19-mile ring to stay indoors (Japanese Government 2011, Attachment V-3). On 16 March 2011, the U.S. Nuclear Regulatory

[6] Mian and Sufi (2009) used data provided by Fiserv®'s Case-Shiller-White home price index, an alternative to the Zillow® Home Value Index, for their analysis of the recent U.S. mortgage default crisis. Mian and Sufi (2009, 1456-1457) state that for 2,248 zip codes, house price changes as reported by Zillow® and Fiserv® have a correlation coefficient of 0.91.

[7] Zillow® takes publicly available information, such as the information from county records, and user-reported house characteristics into consideration to provide value estimates for every house registered on Zillow®. More than 100 million houses throughout the U.S. are currently registered. For more information, see: http://www.zillow.com/wikipages/What's-the-Zillow-Home-Value-Index/

Commission advised Americans in the Fukushima region to move to locations outside of a 50-mile radius (U.S. NRC 2011). We analyze the effect of the Fukushima accident on house prices in the U.S. within a difference-in-differences framework, using Ordinary Least Squares.

(8) $$Logvalue_{mz} = \alpha Month + \gamma(Month * Radius25_z) + \theta_z + \mu_{mz}$$

The dependent variable $Logvalue_{mz}$ is the natural log of the median house value for month m in zip code area z as reported by Zillow®.

We are interested in the change in house prices between February 2011, the month prior to the Fukushima accident and the months following this accident. We estimate separate specifications for the months from April 2011 to September 2011, while all specifications contain the baseline month February. For instance, when we compare house prices from February 2011 with those of April 2011, the indicator $Month$ takes on the value one if the observation is from April and zero if the observation is from February.

As mentioned above, the indicator variable $Radius25_z$ equals one if at least one nuclear power site is located within a 25-mile radius of the centroid of zip code z, and zero otherwise. We focus on the 25-mile radius as it falls between the Japanese and U.S. recommendation of how much distance to keep from the accident site.

The variable $(Month * Radius25_z)$ is an interaction term of the indicator $Month$ and the indicator $Radius25_z$. The focus of this test is on the coefficient γ. This coefficient measures the change in house prices after the nuclear accident in zip codes within twenty-five miles of the nuclear reactor sites relative to zip codes farther away from nuclear reactor sites. θ_z is a time invariant zip code fixed effects term. We denote the stochastic error term as μ_{mz}.

Table 2 presents the results for the first set of specifications using observations from 10,296 zip code areas. Columns 1 to 6 show regression results, each comparing February 2011 median house prices to median house prices in one of the months between April 2011 to September 2011. For instance, column 1 of Table 2 shows the results of the regression that compares February 2011 house prices to April 2011 house prices. In each column of Table 2, the point estimate for the variable $Month$ is negative and statistically significant on the one percent level, suggesting lower house prices in the months between April 2011 and September 2011, as compared to February 2011. The coefficients for the interaction terms ($Month * Radius25$) are positive and statistically significant on the one percent level in all specifications. The results suggest that after the Fukushima incident in March 2011 house prices within a 25-mile radius of nuclear reactor sites rose relative to house prices farther away from nuclear reactor sites. For instance, the coefficient in Table 2, Column 4 suggests that house prices rose by 0.37 percent from February 2011 to July 2011. This finding is not consistent with the hypothesis that the Fukushima accident provided individuals with information that made individuals living close to reactor sites believe that the probability of a nuclear accident was more likely. One story that is consistent with the finding is that individuals living farther away from the nuclear reactor site revised their priors, but this is unlikely to be reflected in a decrease in their house prices because they live too far away from the nuclear reactor to be significantly affected by an accident that is similar as the Fukushima accident.

Next, we use more fine-grained measures for the distance, allowing for variation of effects of the nuclear accident on house prices prices within the 25-mile radius. We estimate the regression

$$(9) \quad Logvalue_{mz} = \alpha Month + \gamma_5(Month * Ring5_z) + \cdots + \gamma_{25}(Month * Ring25_z) + \theta_z + \mu_{mz}$$

where $Ring5_z$ to $Ring25_z$ measure whether at least one nuclear power reactor is located within the respective 5-mile ring of the centroid of zip code z. The variable $Month$ is defined as above and thus its definition depends on house prices of which month between April and September 2011 are compare to prices in February 2011. The variables ($Month * Ring5_z$) to ($Month * Ring25_z$), with five mile intervals are interaction terms of the indicator $Month$ and the indicators $Ring5_z$ to $Ring25_z$. The focus of this test is on the coefficients on these interaction terms, γ_5 to γ_{25}. They allow for testing the hypothesis that changes in house prices after the nuclear accident are more pronounced in areas closer to nuclear reactor sites.

Table 3 reports results from estimating equation (9). As in Table 2, each of the columns from 1 to 6 shows the results for a regression that compares house prices between February 2011 to house prices for each month, one month per column, from April to September 2011. The coefficients of the interaction terms $(Month * Ring5)$, $(Month * Ring10)$, and $(Month * Ring20)$ are mostly positive and not statistically significant.

The coefficients of the interaction term $(Month * Ring15)$ are positive and statistically significant on at least the 10 percent level for the months May to August 2011. Further, the coefficients on the interaction term $(Month * Ring25)$ are positive and statistically significant for the months from May to September 2011. These findings suggest that the statistically significant effect identified in Table 2 for house prices within a 25-mile radius of a nuclear power plant is driven primarily from the development of house prices in the 10-to-15 and 20-to-25-mile rings. The results do not provide any support for the hypothesis that house prices in areas relatively close to nuclear reactor sites fell relative to house prices relatively far away from nuclear reactor sites.

Next, we include indicators for nine Census Regions in the U.S. to allow for regional variation in changes of house prices over time and in response to the Fukushima accident.[8] For this, our specification is:

[8] Descriptive statistics on the nine Census Regions can be found in Table 1.

$$(10)\quad Logvalue_{mz} = \alpha Month + \beta(Month * Radius25_z) + \gamma_1(Month * Newengland_z) + \gamma_2(Month * Middleatlantic_z) + \gamma_3(Month * Southatlantic_z) + \gamma_4(Month * Eastsouthcentral_z) + \gamma_5(Month * Westsouthcentral_z) + \gamma_6(Month * Eastnorthcentral_z) + \gamma_7(Month * Westnorthcentral_z) + \gamma_8(Month * Mountain_z) + \delta_1(Month * Radius25_z * Newengland_z) + \cdots + \delta_8(Month * Radius25_z * Mountain_z) + \theta_z + \mu_{mz}$$

The focus of these tests is on the coefficient β of the interaction term $Month * Radius25_z$ and the eight coefficients $\delta_1$to δ_8 on the interaction terms $Month * Radius25_z * Region$, where $Region$ stands for any of the eight U.S. geographic regions that we use in this analysis. Thus, these variables indicate whether or not a zip code is located in a certain region. We use the Census Region "Pacific" as the base region. The results from this specification are reported in Table 4.

The coefficients on the interaction term $Month * Radius25_z$ have negative signs and are not statistically significant for all months except for April 2011 (Table 4). In this latter case, the corresponding point estimate has a negative sign and is statistically significant on the 10 percent level. These results suggest that when controlling for regions house prices at locations within a 25-mile radius of nuclear power plants did not change significantly different from house prices at locations farther away.

The results for the eight coefficients from $\delta_1$to δ_8 show that house prices at locations within a 25-mile radius of nuclear power plants in the "Pacific" region did not develop differently compared to house prices at locations relatively close to nuclear power plants in the other regions. Only for the "Eastsouthcentral" and "Westsouthcentral" regions the coefficients are positive and statistically significant for more than one month from April 2011 to September 2011, indicating that house prices close to nuclear power plants in these two regions rose compared to house prices close to nuclear sites in the other regions.

As in previous tables, in Table 4, the coefficients on $Month$ are negative and statistically significant on the one percent level. This shows that compared to February 2011 house prices fell over the investigated period. The coefficients on the regional indicators, $\gamma_1$to γ_7 are almost all positive and statistically significant, indicating that house prices in the "Pacific" region fell relative to house prices in other regions. The exception to this pattern is the "Mountain" region.

For the more fine-grained distance measure of five mile rings around the centroids of zip code areas we estimate

$$(11)\quad Logvalue_{mz} = \alpha Month + \boldsymbol{\beta}(Month * \boldsymbol{Ring}) + \boldsymbol{\gamma}(Month * \boldsymbol{Region}) + \boldsymbol{\delta}(Month * \boldsymbol{Ring} * \boldsymbol{Region}) + \theta_z + \mu_{mz}$$

We again estimate separate specifications for the months from April 2011 to September 2011, comparing house prices from those months with prices from February 2011. The indicator $Month$ again takes on the value 0 if the observation is from February 2011 and one if otherwise. $\boldsymbol{Ring}$ is a vector of the five 5-mile rings $Ring5$ to $Ring25$. $\boldsymbol{\beta}$ is a vector of five coefficients that indicate the differences of house prices after the nuclear accident in zip codes located in rings relatively close to nuclear reactor sites and in zip code areas relatively far away from nuclear reactor sites. $\boldsymbol{Region}$ is a vector of the eight Census Regions detailed in (10) running from $Newengland$ to $Mountain$. $\boldsymbol{\gamma}$ is a vector of eight coefficients that indicate whether house prices developed differently in any of the eight regions compared to the base region "Pacific". Since we consider eight regions and five five-mile rings, $\boldsymbol{\delta}$ is a vector of 40 coefficients on the triple interaction term $Month * \boldsymbol{Ring} * \boldsymbol{Region}$. The $\boldsymbol{\delta}$ coefficients indicate whether the house prices in rings close to nuclear reactor sites developed differently in any of the eight regions compared to house prices close to nuclear reactor sites in the base region "Pacific".

Table 5 presents the results. Because the estimates of $\boldsymbol{\beta}$ are mostly statistically insignificant, these results suggest that the house prices after the Fukushima incident are not systematically influenced by the distance from nuclear power plant sites.

For the 0-5-mile ring $Ring5$ the coefficients on the interaction term $Month * \boldsymbol{Ring}$ are statistically significant at the one percent level. But whereas for the months of April 2011 and May 2011 the coefficients are positive, they are negative for the months of June 2011 to September 2011.

When combined with the results for the coefficients $\boldsymbol{\delta}$ on the triple interaction terms of $Month * \boldsymbol{Ring} * \boldsymbol{Region}$ again we find no systematic negative effect of the Fukushima accident on house prices at locations close to reactor sites. Whereas the results show a negative effect within a 5-mile ring, for instance, in the "Pacific" and "Middleatlantic" regions they show a positive effect within a 5-mile ring in the "Southatlantic" and "Westnorthcentral" regions for which the coefficients are positive and statistically significant for the months from June to September 2011.

The results for the coefficients on the triple interaction terms involving $Ring10$ to $Ring25$ show a similar picture. While mostly statistically insignificant, the results suggest that in some regions house prices fell at locations in some of the 5-mile rings. However, in other regions house prices rose at locations within some of the 5-mile rings.[9] Overall our results do not provide evidence in support of the hypothesis that following the Fukushima nuclear incidence in March 2011 individuals updated their priors regarding the riskiness of nuclear power plant sites.

[9] In alternative specifications we controlled for larger and smaller regions. The results remained fundamentally unchanged. Tables A1 and A2 report results for specifications that included four large Census Regions "Northeast", "South", "Midwest", and "West". Though not reported here due to space constraints, we also controlled for smaller regions by using the U.S. states without observing any fundamental changes in the results. Accoding to Dunbar and Weaver (2008, viii) the tsunami hazards facing the U.S. west coast are "high" whereas the tsunami hazards facing the U.S. Atlantic coast and the Gulf coast are "lor" or "very low to low". Only the two nuclear reactor sites in California are in the proximity of the ocean in the states on the U.S. west coast. We therefore specifically tested whether house prices in zip code areas within a 25-mile-radius of a nuclear plant site in the tsunami-prone areas of California changed differently compared to house prices close to nuclear plant sites in areas less likely to be hit by a tsunami while controlling for the four large Census Regions. Though not reported here, the results suggest that house prices close to nuclear reactor sites in tsunami-prone areas did not change differently compared to house prices close to nuclear reactor sites at other locations in the U.S.

VII. Concluding remarks

The accident at the Fukushima nuclear power plant site occurred in March 2011. This event provides the opportunity to use the development of house prices in a difference-in-differences framework to draw inferences on the potential effect of the accident on the nuclear risk perception of individuals. Using different measures for the distances of U.S. zip codes from U.S. nuclear power plant sites, we do not find evidence in support of the hypothesis that house prices at locations close to nuclear reactor sites fell compared to house prices at locations farther away from reactor sites. Our results therefore suggest that in the U.S. individuals did not reappraise the risks associated with nuclear power plant sites in the aftermath of the accident at the Fukushima power plant site.

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Table 1
Descriptive Statistics

Variable	Description	Obs	Mean	Std. Dev.	Min	Max
Radius25	Indicator: 1 if the zip code area's centroid is within the 25-mile radius of at least one nuclear power plant site	10296	.1402	.3473	0	1
Ring5	Indicator: 1 if the zip code area's centroid is within the 0 to 5-mile ring of at least one nuclear power plant site	10296	.0053	.0729	0	1
Ring10	Indicator: 1 if the zip code area's centroid is within the 5 to 10-mile ring of at least one nuclear power plant site	10296	.0160	.1256	0	1
Ring15	Indicator: 1 if the zip code area's centroid is within the 10 to 15-mile ring of at least one nuclear power plant site	10296	.0291	.1682	0	1
Ring20	Indicator: 1 if the zip code area's centroid is within the 15 to 20-mile ring of at least one nuclear power plant site	10296	.0396	.1951	0	1
Ring25	Indicator: 1 if the zip code area's centroid is within the 20 to 25-mile ring of at least one nuclear power plant site	10296	.0564	.2308	0	1
Newengland	Indicator: 1 if zip code is from Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, or Vermont	10296	.0895	.2855	0	1
Middleatlantic	Indicator: 1 if zip code is from New Jersey, New York, or Pennsylvania	10296	.1961	.3971	0	1
Southatlantic	Indicator: 1 if zip code is from Delaware, D.C., Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, or West Virginia	10296	.2145	.4105	0	1
Eastsouthcentral	Indicator: 1 if zip code is from Alabama, Kentucky, Mississippi, or Tennessee	10296	.0417	.1998	0	1
Eastnorthcentral	Indicator: 1 if zip code is from Indiana, Illinois, Michigan, Ohio, or Wisconsin	10296	.1484	.3555	0	1
Westnorthcentral	Indicator: 1 if zip code is from Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, or South Dakota	10296	.0400	.1960	0	1
Westsouthcentral	Indicator: 1 if zip code is from Arkansas, Louisiana, Oklahoma, or	10296	.0404	.1969	0	1

	Texas					
Mountain	Indicator: 1 if zip code is from Arizona, Colorado, Idaho, New Mexico, Montana, Utah, Nevada, or Wyoming	10296	.0529	.2239	0	1
Pacific	Indicator: 1 if zip code is from Alaska, California, Hawaii, Oregon, or Washington	10296	.1764	.3812	0	1
	Data for February 2011					
Value	Median $ value of single-family houses within a zip code area (Source: Zillow® (www.zillow.com))	10296	220108	178609	22800	2355200
Logvalue	Natural logarithm of the Median value of single-family houses within a zip code area	10296	12.0757	.6521	10.0345	14.6721

Table 2
House value developments at locations within a 25-mile radius of at least one nuclear power plant site[a, b]

	OLS					
	(1)	(2)	(3)	(4)	(5)	(6)
	April 2011	May 2011	June 2011	July 2011	August 2011	September 2011
Month	-0.0121***	-0.0173***	-0.0215***	-0.0251***	-0.0293***	-0.0334***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Month*Radius25	0.00177***	0.00282***	0.00403***	0.00373***	0.00441***	0.00483***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Zip Code Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,592	20,592	20,592	20,592	20,592	20,592
R-squared	0.21	0.223	0.229	0.236	0.251	0.267

[a] The dependent variable is the log of home prices. All standard errors (denoted in parentheses) are corrected for heteroskedasticity. *, **, and * indicate statistical significance at the 1, 5, and 10% level respectively.**
[b] We compare the development of house prices at locations within the 25-mile radius of at least one nuclear power site with the development of house prices at locations further away from nuclear power sites. The interaction term is the variables of interest. It is an indicator variable of the respective month and a dummy that indicates whether or not the centroid of a zip code is within the 25-mile radius of at least one nuclear power plant. For instance, the coefficient on the interaction term in column (3) indicates the difference in the development of house prices in the 25-mile radiuses around nuclear power plants with the development of house prices at locations outside of the 25-mile radiuses of nuclear power plants from February 2011 to June 2011.

Table 3
House value developments at locations within 5-mile rings of at least one nuclear power plant site[a, b]

	OLS					
	(1) April 2011	(2) May 2011	(3) June 2011	(4) July 2011	(5) August 2011	(6) September 2011
Month	-0.0121***	-0.0172***	-0.0215***	-0.0250***	-0.0292***	-0.0333***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Month*Ring5	0.00141	0.00152	0.0028	0.00401	0.0047	0.00378
	(0.003)	(0.004)	(0.005)	(0.006)	(0.006)	(0.007)
Month*Ring10	0.00154	0.00122	0.000705	-0.00132	-0.000882	-0.000963
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Month*Ring15	0.00183	0.00276*	0.00442**	0.00430*	0.00441*	0.00346
	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Month*Ring20	0.00176*	0.00169	0.00221	0.000403	0.000612	0.00109
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)
Month*Ring25	0.00124	0.00307**	0.00456***	0.00497***	0.00625***	0.00722***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Zip Code Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,592	20,592	20,592	20,592	20,592	20,592
R-squared	0.21	0.223	0.229	0.236	0.251	0.267

[a] The dependent variable is the log of home prices. All standard errors (denoted in parentheses) are corrected for heteroskedasticity. *, **, and * indicate statistical significance at the 1, 5, and 10% level respectively.**
[b] We compare the development of house prices at locations within 5-mile rings of at least one nuclear power site with the development of house prices at locations further away from nuclear power sites. The interaction terms are the variables of interest. They are interaction terms of an indicator variable of the respective month and a dummy that indicates whether or not the centroid of a zip code is within a certain 5-mile ring of at least one nuclear power plant. For instance, the coefficients on the interaction terms in column (3) indicate the difference in the development of house prices in the respective 5-mile ring around nuclear power plants with the development of house prices at locations outside of the 25-mile radiuses of nuclear power plants from February 2011 to June 2011.

Table 4
House value developments at locations within a 25-mile radius of at least one nuclear power plant site: Accounting for nine Census Regions[a, b, c]

	OLS					
	(1) April 2011	(2) May 2011	(3) June 2011	(4) July 2011	(5) August 2011	(6) September 2011
Month	-0.0167***	-0.0261***	-0.0344***	-0.0416***	-0.0469***	-0.0516***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Month*Radius25	-0.00397*	-0.003	-0.00354	-0.00501	-0.00508	-0.00186
	(0.002)	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)
Month*Newengland	0.00988***	0.0180***	0.0268***	0.0335***	0.0350***	0.0333***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Month*Middleatlantic	0.00801***	0.0135***	0.0211***	0.0271***	0.0311***	0.0347***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Month*Southatlantic	0.00192**	0.00739***	0.0108***	0.0138***	0.0126***	0.0117***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Month*Eastsouthcentral	0.00899***	0.0150***	0.0206***	0.0244***	0.0266***	0.0277***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Month*Westsouthcentral	0.0113***	0.0175***	0.0241***	0.0321***	0.0383***	0.0424***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Month*Eastnorthcentral	0.00674***	0.0104***	0.0141***	0.0188***	0.0196***	0.0201***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Month*Westnorthcentral	0.00175	0.00926***	0.0154***	0.0191***	0.0195***	0.0199***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Month*Mountain	0.000961	0.00182	0.00193	0.00225	0.00327	0.00374
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Month*Radius25*Newengland	-0.000459	-0.00315	-0.00378	-0.000647	-0.00148	-0.00711
	(0.003)	(0.004)	(0.005)	(0.005)	(0.006)	(0.006)
Month*Radius25*Middleatlantic	0.00435*	0.00374	0.00322	0.00265	0.00204	-0.00195
	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)
Month*Radius25*Southatlantic	0.00687**	0.00558	0.00826*	0.0074	0.00916	0.008
	(0.003)	(0.004)	(0.005)	(0.005)	(0.006)	(0.006)
Month*Radius25*Eastsouthcentral	0.0229***	0.0232***	0.0229***	0.0219**	0.0183*	0.0123
	(0.006)	(0.007)	(0.008)	(0.010)	(0.010)	(0.012)
Month*Radius25*Westsouthcentral	0.00696	0.00975	0.0148*	0.0261***	0.0299**	0.0312**
	(0.006)	(0.008)	(0.009)	(0.010)	(0.012)	(0.015)
Month*Radius25*Eastnorthcentral	0.00377	0.0031	0.000673	-0.000942	-0.000445	-0.00297
	(0.003)	(0.004)	(0.005)	(0.006)	(0.007)	(0.007)
Month*Radius25*Westnorthcentral	0.00568*	-0.0000729	-0.0029	-0.00287	-0.00157	-0.00706
	(0.003)	(0.005)	(0.006)	(0.006)	(0.007)	(0.008)
Month*Radius25*Mountain	-0.0162	-0.0218	-0.0139	-0.0103	-0.00401	-0.00911
	(0.022)	(0.025)	(0.025)	(0.021)	(0.018)	(0.013)

Zip Code Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,592	20,592	20,592	20,592	20,592	20,592
R-squared	0.231	0.249	0.266	0.282	0.296	0.31

[a] The dependent variable is the log of home prices. All standard errors (denoted in parentheses) are corrected for heteroskedasticity. *, **, and * indicate statistical significance at the 1, 5, and 10% level respectively.**
[b] The base Census Region is "Pacific"
[c] We compare the development of house prices at locations within the 25-mile radius of at least one nuclear power site with the development of house prices at locations further away from nuclear power sites, while accounting for nine Census Regions. The interaction term Month*Radius25 in combination with the triple interaction terms is of interest. The triple interaction term interact an indicator variable of the respective month, a dummy that indicates whether or not the centroid of a zip code is within the 25-mile radius of at least one nuclear power plant, and an indicator variable for one of the nine Census Regions. For instance, the coefficients on the triple interaction terms in column (3) indicate the difference in the development of house prices in the 25-mile radiuses around nuclear power plants in the respective region with the development of house prices at locations within the 25-mile radiuses of nuclear power plants in the Census Region "Pacific" from February 2011 to June 2011.

Table 5
House price developments at locations within 5-mile rings of at least one nuclear power plant site: Accounting for nine Census Regions[a, b, c]

	OLS					
	(1) April 2011	(2) May 2011	(3) June 2011	(4) July 2011	(5) August 2011	(6) September 2011
Month	-0.0167***	-0.0261***	-0.0344***	-0.0416***	-0.0469***	-0.0516***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Month*Ring5	0.00238***	0.00281***	-0.00840***	-0.0157***	-0.0246***	-0.0240***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Month*Ring10	-0.00409*	-0.000297	0.00265	0.000527	-0.00012	-0.00433
	(0.002)	(0.005)	(0.005)	(0.003)	(0.003)	(0.005)
Month*Ring15	-0.0168***	-0.0195**	-0.0181*	-0.0148	-0.00839	-0.00113
	(0.005)	(0.008)	(0.011)	(0.011)	(0.013)	(0.012)
Month*Ring20	-0.00283	-0.00409	-0.00642	-0.011	-0.0129	-0.0107
	(0.004)	(0.006)	(0.007)	(0.008)	(0.008)	(0.009)
Month*Ring25	0.000579	0.00446	0.00434	0.00364	0.00262	0.00653
	(0.004)	(0.005)	(0.006)	(0.007)	(0.008)	(0.009)
Month*Newengland	0.00988***	0.0180***	0.0268***	0.0335***	0.0350***	0.0333***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Month*Middleatlantic	0.00804***	0.0136***	0.0212***	0.0272***	0.0313***	0.0349***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Month*Southatlantic	0.00200***	0.00752***	0.0109***	0.0140***	0.0128***	0.0120***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Month*Eastsouthcentral	0.00901***	0.0150***	0.0207***	0.0244***	0.0266***	0.0277***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Month*Westsouthcentral	0.0113***	0.0175***	0.0241***	0.0321***	0.0383***	0.0424***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Month*Eastnorthcentral	0.00672***	0.0104***	0.0140***	0.0187***	0.0195***	0.0200***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Month*Westnorthcentral	0.00175	0.00926***	0.0154***	0.0191***	0.0195***	0.0199***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Month*Mountain	0.000961	0.00182	0.00193	0.00225	0.00327	0.00374
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Month*Ring5*Newengland	-0.0152**	-0.0229*	-0.0137	-0.00307	0.00409	0.00136
	(0.008)	(0.013)	(0.015)	(0.012)	(0.011)	(0.010)
Month*Ring5*Middleatlantic	-0.0067	-0.00931	-0.002	0.0005	0.0071	0.00483
	(0.005)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
Month*Ring5*Southatlantic	0.0140*	0.0135	0.0270**	0.0355***	0.0470***	0.0477***
	(0.008)	(0.011)	(0.011)	(0.012)	(0.013)	(0.014)
Month*Ring5*Eastnorthcentral	-0.00683	-0.0074	0.00235	0.0125	0.0238	0.0217
	(0.006)	(0.009)	(0.014)	(0.017)	(0.021)	(0.026)

Month*Ring5*Westnorthcentral	0.00602	0.0113	0.0378**	0.0547***	0.0692***	0.0633**
	(0.006)	(0.009)	(0.016)	(0.020)	(0.025)	(0.028)
Month*Ring10*Newengland	-0.00693	-0.0153*	-0.0207**	-0.0150*	-0.0135*	-0.0118
	(0.005)	(0.009)	(0.010)	(0.008)	(0.007)	(0.009)
Month*Ring10*Middleatlantic	0.00808**	0.00234	-0.00594	-0.00762	-0.00767	-0.00411
	(0.004)	(0.006)	(0.007)	(0.006)	(0.006)	(0.008)
Month*Ring10*Southatlantic	0.0063	0.0034	0.0028	0.00258	0.00662	0.0145*
	(0.004)	(0.006)	(0.007)	(0.006)	(0.006)	(0.008)
Month*Ring10*Eastsouthcentral	0.0143**	0.00859	0.0063	0.00705	0.00242	-0.00116
	(0.007)	(0.013)	(0.015)	(0.008)	(0.007)	(0.018)
Month*Ring10*Eastnorthcentral	-0.000233	-0.00965	-0.0185**	-0.0275***	-0.0323***	-0.0334***
	(0.006)	(0.008)	(0.009)	(0.010)	(0.011)	(0.012)
Month*Ring10*Westnorthcentral	0.0158***	0.0128*	0.0105	0.0127**	0.0135	0.0152
	(0.005)	(0.007)	(0.007)	(0.006)	(0.009)	(0.012)
Month*Ring10*Mountain	-0.0619***	-0.0755***	-0.0659***	-0.0537***	-0.0423***	-0.0306***
	(0.002)	(0.005)	(0.005)	(0.004)	(0.004)	(0.006)
Month*Ring15*Newengland	0.0121**	0.0141	0.0134	0.0135	0.00668	-0.00244
	(0.005)	(0.009)	(0.012)	(0.012)	(0.014)	(0.013)
Month*Ring15*Middleatlantic	0.0182***	0.0214***	0.0194*	0.0147	0.00604	-0.00387
	(0.005)	(0.008)	(0.011)	(0.012)	(0.013)	(0.013)
Month*Ring15*Southatlantic	0.0190***	0.0214**	0.0221*	0.0159	0.0115	0.00544
	(0.005)	(0.008)	(0.011)	(0.012)	(0.013)	(0.013)
Month*Ring15*Eastsouthcentral	0.0272***	0.0265**	0.0284**	0.0218	0.00165	-0.0224
	(0.006)	(0.011)	(0.014)	(0.015)	(0.016)	(0.016)
Month*Ring15*Westsouthcentral	0.0380***	0.0437***	0.0333***	0.0328***	0.0246	0.0193
	(0.012)	(0.012)	(0.011)	(0.013)	(0.017)	(0.025)
Month*Ring15*Eastnorthcentral	0.0188***	0.0232**	0.0216	0.0154	0.00596	-0.00534
	(0.007)	(0.011)	(0.014)	(0.016)	(0.017)	(0.017)
Month*Ring15*Westnorthcentral	0.0196***	0.0155*	0.00963	0.00563	0.00287	-0.0043
	(0.005)	(0.009)	(0.012)	(0.014)	(0.016)	(0.016)
Month*Ring15*Mountain	-0.00265	-0.0071	-0.00881	-0.0101	-0.00738	-0.0128
	(0.005)	(0.008)	(0.011)	(0.011)	(0.013)	(0.012)
Month*Ring20*Newengland	-0.00261	-0.00524	-0.00634	-0.00214	-0.00245	-0.00672
	(0.005)	(0.007)	(0.009)	(0.010)	(0.010)	(0.011)
Month*Ring20*Middleatlantic	0.00281	0.00405	0.00486	0.00577	0.00618	0.00298
	(0.004)	(0.006)	(0.008)	(0.009)	(0.009)	(0.010)
Month*Ring20*Southatlantic	0.00436	0.00329	0.00764	0.00895	0.0126	0.0104
	(0.005)	(0.007)	(0.008)	(0.009)	(0.010)	(0.011)
Month*Ring20*Eastsouthcentral	0.0482**	0.0400**	0.0207*	0.0059	0.00753	0.0172
	(0.023)	(0.018)	(0.011)	(0.009)	(0.012)	(0.024)
Month*Ring20*Westsouthcentral	0.00513	0.00851	0.0157	0.0305*	0.0378*	0.0423
	(0.008)	(0.012)	(0.015)	(0.017)	(0.020)	(0.026)
Month*Ring20*Eastnorthcentral	0.00534	0.00791	0.00826	0.0102	0.0105	0.0115
	(0.005)	(0.007)	(0.009)	(0.010)	(0.011)	(0.012)

Month*Ring20*Westnorthcentral	0.00478	-0.00102	-0.00493	-0.0023	0.00322	0.00102
	(0.005)	(0.007)	(0.010)	(0.011)	(0.014)	(0.016)
Month*Ring20*Mountain	0.0276***	0.0320***	0.0443***	0.0431***	0.0438***	0.0268***
	(0.004)	(0.006)	(0.008)	(0.008)	(0.009)	(0.009)
Month*Ring25*Newengland	-0.00185	-0.00539	-0.00549	-0.00331	-0.00306	-0.00979
	(0.004)	(0.006)	(0.007)	(0.008)	(0.009)	(0.010)
Month*Ring25*Middleatlantic	-0.00129	-0.00411	-0.00365	-0.00353	-0.00195	-0.00569
	(0.004)	(0.005)	(0.006)	(0.007)	(0.008)	(0.009)
Month*Ring25*Southatlantic	0.00121	-0.00263	-0.00103	-0.00295	-0.00115	-0.00208
	(0.004)	(0.006)	(0.007)	(0.008)	(0.009)	(0.010)
Month*Ring25*Eastsouthcentral	0.00978*	0.0123	0.0166	0.0215	0.0241	0.0202
	(0.006)	(0.010)	(0.015)	(0.018)	(0.018)	(0.019)
Month*Ring25*Westsouthcentral	-0.00368	-0.000505	0.00889	0.0217**	0.0256**	0.0234*
	(0.010)	(0.011)	(0.010)	(0.010)	(0.011)	(0.014)
Month*Ring25*Eastnorthcentral	-0.00149	-0.00463	-0.00737	-0.00654	-0.000866	-0.00254
	(0.005)	(0.006)	(0.008)	(0.009)	(0.010)	(0.011)
Month*Ring25*Westnorthcentral	-0.00434	-0.0143**	-0.0200**	-0.0234**	-0.0243**	-0.0325***
	(0.006)	(0.007)	(0.009)	(0.010)	(0.011)	(0.012)
Zip Code Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,592	20,592	20,592	20,592	20,592	20,592
R-squared	0.234	0.251	0.268	0.285	0.298	0.312

[a] The dependent variable is the log of home prices. All standard errors (denoted in parentheses) are corrected for heteroskedasticity. *, **, and * indicate statistical significance at the 1, 5, and 10% level respectively.**
[b] The base Census Region is "Pacific"
[c] We compare the development of house prices at locations within 5-mile rings of at least one nuclear power site with the development of house prices at locations further away from nuclear power sites, while accounting for nine Census Regions. The interaction terms Month*Ring in combination with the triple interaction terms are of interest. The triple interaction terms interact an indicator variable of the respective month and a dummy that indicates whether or not the centroid of a zip code is within a certain 5-mile ring of at least one nuclear power plant, and an indicator variable for one of the nine Census Regions. For instance, the coefficients on the triple interaction terms in column (3) indicate the difference in the development of house prices in the respective 5-mile ring around nuclear power plants in the respective region with the development of house prices at locations within the 25-mile radiuses of nuclear power plants in the Census Region "Pacific" from February 2011 to June 2011.

Table A1
House value developments at locations within a 25-mile radius of at least one nuclear power plant site: Accounting for four Census Regions[a, b, c]

	OLS					
	(1) April 2011	(2) May 2011	(3) June 2011	(4) July 2011	(5) August 2011	(6) September 2011
Month	-0.0165***	-0.0257***	-0.0339***	-0.0411***	-0.0461***	-0.0507***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Month*Radius25	-0.00506*	-0.00456	-0.00467	-0.006	-0.00589	-0.00304
	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Month*Northeast	0.00840***	0.0146***	0.0225***	0.0287***	0.0316***	0.0334***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Month*South	0.00420***	0.00966***	0.0139***	0.0176***	0.0179***	0.0179***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Month*Midwest	0.00552***	0.00975***	0.0139***	0.0183***	0.0188***	0.0192***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Month*Radius25*Northeast	0.00405	0.00319	0.00213	0.00233	0.00166	-0.00202
	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Month*Radius25*South	0.00678**	0.00604	0.00766	0.00651	0.00677	0.0051
	(0.003)	(0.004)	(0.005)	(0.005)	(0.005)	(0.006)
Month*Radius25*Midwest	0.00494	0.00361	0.000873	-0.000498	0.000016	-0.00302
	(0.003)	(0.004)	(0.005)	(0.005)	(0.006)	(0.006)
Zip Code Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,592	20,592	20,592	20,592	20,592	20,592
R-squared	0.223	0.243	0.26	0.275	0.287	0.3

[a] The dependent variable is the log of home prices. All standard errors (denoted in parentheses) are corrected for heteroskedasticity. *, **, and * indicate statistical significance at the 1, 5, and 10% level respectively.**
[b] The base Census Region is "West"
[c] We compare the development of house prices at locations within the 25-mile radius of at least one nuclear power site with the development of house prices at locations further away from nuclear power sites, while accounting for nine Census Regions. The interaction term Month*Radius25 in combination with the triple interaction terms is of interest. The triple interaction term interact an indicator variable of the respective month, a dummy that indicates whether or not the centroid of a zip code is within the 25-mile radius of at least one nuclear power plant, and an indicator variable for one of the nine Census Regions. For instance, the coefficients on the triple interaction terms in column (3) indicate the difference in the development of house prices in the 25-mile radiuses around nuclear power plants in the respective region with the development of house prices at locations within the 25-mile radiuses of nuclear power plants in the Census Region "West" from February 2011 to June 2011.

Table A2
House price developments at locations within 5-mile rings of at least one nuclear power plant site: Accounting for four Census Regions[a, b, c]

	OLS					
	(1) April 2011	(2) May 2011	(3) June 2011	(4) July 2011	(5) August 2011	(6) September 2011
Month	-0.0165***	-0.0257***	-0.0339***	-0.0411***	-0.0461***	-0.0507***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Month*Ring5	0.00215***	0.00239***	-0.00885***	-0.0162***	-0.0254***	-0.0249***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Month*Ring10	-0.0165	-0.0155	-0.0106	-0.0103	-0.00869	-0.0106
	(0.011)	(0.014)	(0.012)	(0.010)	(0.007)	(0.006)
Month*Ring15	-0.0172***	-0.0204***	-0.0193**	-0.0162	-0.00957	-0.00292
	(0.004)	(0.007)	(0.010)	(0.010)	(0.011)	(0.011)
Month*Ring20	-0.00137	-0.00253	-0.00415	-0.00887	-0.0109	-0.00983
	(0.004)	(0.006)	(0.007)	(0.008)	(0.008)	(0.009)
Month*Ring25	0.000353	0.00404	0.00389	0.00311	0.00185	0.00566
	(0.004)	(0.005)	(0.006)	(0.007)	(0.008)	(0.009)
Month*Northeast	0.00842***	0.0146***	0.0226***	0.0288***	0.0317***	0.0335***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Month*South	0.00424***	0.00975***	0.0140***	0.0178***	0.0180***	0.0181***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Month*Midwest	0.00549***	0.00970***	0.0138***	0.0182***	0.0187***	0.0191***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Month*Ring5*Northeast	-0.00867**	-0.0125**	-0.00486	-0.000394	0.00682	0.00503
	(0.004)	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)
Month*Ring5*South	0.0117	0.0112	0.0239**	0.0318***	0.0418***	0.0416***
	(0.008)	(0.011)	(0.011)	(0.012)	(0.013)	(0.014)
Month*Ring5*Midwest	-0.00258	0.000281	0.0167	0.0293**	0.0418**	0.0385*
	(0.005)	(0.007)	(0.012)	(0.014)	(0.017)	(0.020)
Month*Ring10*Northeast	0.0165	0.0126	0.00311	0.000827	-0.000867	0.000299
	(0.011)	(0.014)	(0.013)	(0.010)	(0.009)	(0.008)
Month*Ring10*South	0.0169	0.0165	0.0132	0.00973	0.00977	0.014
	(0.012)	(0.014)	(0.013)	(0.011)	(0.009)	(0.009)
Month*Ring10*Midwest	0.0168	0.0129	0.00472	-0.00317	-0.00847	-0.0109
	(0.012)	(0.015)	(0.014)	(0.012)	(0.011)	(0.011)
Month*Ring15*Northeast	0.0169***	0.0202***	0.0186*	0.0152	0.00712	-0.00156
	(0.005)	(0.007)	(0.010)	(0.011)	(0.012)	(0.011)
Month*Ring15*South	0.0186***	0.0215***	0.0217**	0.0152	0.00877	0.00158
	(0.005)	(0.008)	(0.010)	(0.011)	(0.012)	(0.011)
Month*Ring15*Midwest	0.0187***	0.0215**	0.0188	0.0135	0.00619	-0.00279
	(0.005)	(0.009)	(0.012)	(0.013)	(0.014)	(0.014)

Month*Ring20*Northeast	-0.0001	-0.000118	-0.000565	0.00118	0.0018	-0.0000705
	(0.004)	(0.006)	(0.008)	(0.008)	(0.009)	(0.009)
Month*Ring20*South	0.00257	0.00141	0.00422	0.00582	0.00907	0.00826
	(0.005)	(0.007)	(0.008)	(0.009)	(0.010)	(0.011)
Month*Ring20*Midwest	0.00374	0.00467	0.00352	0.00571	0.00728	0.00861
	(0.005)	(0.007)	(0.008)	(0.009)	(0.010)	(0.011)
Month*Ring25*Northeast	-1.25E-03	-0.00418	-0.0039	-0.00323	-0.00162	-0.00577
	(0.004)	(0.005)	(0.006)	(0.007)	(0.008)	(0.009)
Month*Ring25*South	0.000219	-0.00299	-0.00143	-0.00301	-0.0021	-0.00406
	(0.004)	(0.006)	(0.007)	(0.008)	(0.009)	(0.010)
Month*Ring25*Midwest	-0.00231	-0.00661	-0.00999	-0.0103	-0.00634	-0.0096
	(0.005)	(0.006)	(0.007)	(0.008)	(0.009)	(0.010)
Zip Code Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,592	20,592	20,592	20,592	20,592	20,592
R-squared	0.224	0.244	0.261	0.276	0.288	0.301

[a] The dependent variable is the log of home prices. All standard errors (denoted in parentheses) are corrected for heteroskedasticity. *, **, and * indicate statistical significance at the 1, 5, and 10% level respectively.**
[b] The base Census Region is "West"
[c] We compare the development of house prices at locations within 5-mile rings of at least one nuclear power site with the development of house prices at locations further away from nuclear power sites, while accounting for nine Census Regions. The interaction terms Month*Ring in combination with the triple interaction terms are of interest. The triple interaction terms interact an indicator variable of the respective month and a dummy that indicates whether or not the centroid of a zip code is within a certain 5-mile ring of at least one nuclear power plant, and an indicator variable for one of the nine Census Regions. For instance, the coefficients on the triple interaction terms in column (3) indicate the difference in the development of house prices in the respective 5-mile ring around nuclear power plants in the respective region with the development of house prices at locations within the 25-mile radiuses of nuclear power plants in the Census Region "West" from February 2011 to June 2011.