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journal homepage: [www.elsevier.com/locate/jebo](http://www.elsevier.com/locate/jebo)U.S. housing prices and the Fukushima nuclear accident<sup>☆</sup>Alexander Fink<sup>a,\*</sup>, Thomas Stratmann<sup>b</sup><sup>a</sup> University of Leipzig, Department of Economics, Germany<sup>b</sup> George Mason University, Department of Economics, United States

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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 home prices in the U.S. after the Fukushima event to test the hypothesis that home 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 reappraised the risks associated with nuclear power plants. According to our results home prices close to nuclear reactor sites did not fall relative to home prices at other locations in the U.S.

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## 1. 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 and some have argued that the Fukushima accident showed that the risks of nuclear power plants had been underestimated. For instance, in April 2011, [Joseph Stiglitz \(2011\)](#) suggested that the Fukushima accident proved nuclear industry experts wrong who had deluded the public that 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](#)).

These assessments and policy decisions suggest that the Fukushima accident provided new information, leading some world leaders to update their perception regarding the riskiness of nuclear power plants. However, currently, to our

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knowledge the only evidence based on analyses of changes in behavior after the Fukushima accident is from Germany and points to falling offer prices for houses within 5 km of a nuclear power plant relative to other locations in Germany (Bauer et al., 2013).

We assess whether individuals in the U.S. reappraised the risks of nuclear power plants after the Fukushima event by studying the development of housing prices. If, after the Fukushima accident, individuals who considered purchasing a home close to nuclear reactors revised their prior of the risk of a nuclear power plant accident upwards, home prices close to reactor sites are predicted to have fallen relative to home prices farther away from reactor sites. Similarly, if those already residing in homes close to nuclear sites increased their priors regarding the risk of a nuclear accident, these owners of homes were willing to sell them at lower prices.

In this study, we investigate residential housing 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.

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. Whereas in Germany nuclear power plants were shut down within days after the Fukushima accident (Bauer et al., 2013), in the U.S. no immediate policy measures were taken. The U.S. government's inactivity gives us an opportunity to study the effect of the information about the nuclear accident at Fukushima in isolation from possibly confounding factors like changes in the economic prospects for a region due to the closure or a shortened operation time of a power plant site.

Our study is the first to use a difference-in-differences framework to analyze the effects of information about an exogenous nuclear event, which did not bring about changes in energy policy, on the behavior of individuals.

Our findings show no systematic statistically significant difference in changes of prices for housing before and after the Fukushima accident in locations relatively close versus locations relatively far away from nuclear power plant sites. Our results 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 the risk of a nuclear accident and had already appropriately priced the risk of an accident into the prices of homes.

## 2. 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).

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.

Other 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 and 1994, Clark et al. (1997) find that residential house prices were not lower in closer proximity to these two sites. However, analyzing 494 market areas in the United States between 1945 and 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 a nuclear power plant fell.

Davis (2011) studies the effects of 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 sites 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.<sup>1</sup> Gamper-Rabindran and Timmins (2013) use the entire distribution of proprietary Census-tract-level house value data instead of just the median. They find that cleanups led to house price appreciations that were more pronounced for the lower percentiles of the within Census-tract distribution of house values. 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.

<sup>1</sup> 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).

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