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MODELING AND MAPPING THE SPATIAL-TEMPORAL DYNAMICS OF BUSINESS RECOVERY IN NEW ORLEANS AFTER HURRICANE KATRINA

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BACKGROUND

Although most cities have proven through history to be extremely resilient to natural disasters, there is an increasing concern that cities and places that are subject to frequent natural and human disturbance will reach certain "tipping points" such that they are no longer resilient and recovery may not be possible. Understanding the complex environmental system dynamics, the cause-and-effect relationship, and the interactions between human and natural components are critical to preventing the reaching of the tipping points and ensuring sustainable development of cities and regions, especially when they are faced with the threats of both long-term climate change and short-term large-scale disturbance. Until recently most of the research in the field of post disaster recovery has been focused on households or whole communities. They seldom studied the business sector and business decision-making in a highly uncertain environment, such as how businesses responded after the catastrophic event of Hurricane Katrina in New Orleans in 2005. We need empirical studies of business decision making so that models can be developed to understand and predict economic recovery. Such studies require fine-scale empirical observations collected in a timely manner, coupled with other GIS and socioeconomic data layers, so that quantitative relationships and models can be developed and validated.

OBJECTIVES

We have launched a research project to examine the factors that influenced business decisions to return to New Orleans after Hurricane Katrina made landfall on August 29, 2005. In this project, three rounds of telephone surveys of business owners in New Orleans were conducted to track the responses of businesses and their opening status over a two-year period. In addition to the telephone surveys which include businesses from the entire Orleans Parish, further detailed information was gathered by a periodic street survey of businesses along three major streets. These data provide the basis for spatial-temporal analysis and modeling. The purpose of this paper is to identify and map significant business openings predictors and their changing dynamics using the telephone survey data.

METHODS

Using the survey result of the question on "how long (in months) was your business closed following Katrina", we can identify the location of the business, its opening status, surrounding socioeconomic variables and flood depth, and the number of months the business closed after Katrina. We tabulated business reopening status into six time periods, the first month immediately after Katrina (September 2005), three-month intervals in the first year (December 2005, March, 2006, June 2006, September 2006), and one-year after until October 2007. We then utilized GIS methods to compute the number of businesses that opened in each time period to represent the neighborhood effect. The spatial probit model was applied to extract the significant predictors and estimate their effects in terms of increasing or decreasing probabilities of re-opening. The results were mapped and visualized and the probabilities of each predictor were estimated.

RESULTS

The results show that the most important reopening predictors immediately after Katrina were the flood depth at the business location, the business size, and the number of neighboring firms that had reopened. Larger businesses had better reopening probabilities than smaller ones, whereas greater flood depth decreased further the reopening probabilities. For a given business the return of neighboring firms had a strong positive effect on its reopening probabilities immediately after Katrina. However, such spatial effect was not significant in the subsequent months. Instead, one-year after Katrina, the neighborhood effect turned negative.

CONCLUSIONS

The results from this study reveal the business recovery pattern and the underlying decision making process after a major disaster, which have seldom been documented in the literature. The reopening probabilities derived from this analysis can be used as input in future computer simulation using an agent-

based modeling technique. The results will also allow decision makers to identify specific temporal windows when the aid would be more effective and how the aid should be spatially distributed.