What was Washed Away and What Was Not:

An Assessment of the Impact of Hurricane Katrina on Index Crimes

Forthcoming in the Journal of Crime and Justice

ABSTRACT: A substantial body of research has found crime was lower in areas characterized by a stronger community, but research on the importance of community for post-disaster levels of crime suggests a more nuanced relationship. While much of the research on disasters and crime emphasized the importance of collective resources, few studies explicitly assessed the importance of collective resources for crime during the recovery period. Further, recent research suggests that crime-specific trends are differentially influenced by disasters. The current study contributes to research on the importance of community for post-disaster crime by examining the association of several forms of collective resources with six Part-1 crimes in New Orleans before, shortly after, and five years following Hurricane Katrina. Our results suggest that the relationship of community with crime is more nuanced than is often tested. We also found the association of neighborhood crime with forms of collective resources varied by crime type and temporally in ways that support some, but not other, existing theories on crime and disasters.

INTRODUCTION

Media depictions of disasters often highlight anecdotes about increased crime in the aftermath of disasters (Brezina and Kaufman 2008; Rodriguez, Trainor and Quarantelli 2006), but research suggests disaster survivors were more likely to pull together in cooperative efforts during the recovery period than to descend into a crime-ridden state of nature (Barton 1969; Fritz 1961/1996; Quarantelli and Dynes 1997; Solnit 2009). Subsequent research has expressed skepticism of this harmonious vision and argued certain types of crime may escalate after a disaster (Frailing and Harper 2010; Spencer 2017; Varano, Schafer, Cancino Decker, and Greene 2010) or may not substantively change at all (Leitner et al. 2011; Zahnow, Wickes, Haynes and Corcoran 2017). Underlying these debates is a notable set of parallels between disaster theory and criminological theory with a growing recognition that empirical research was held back by a scarcity of empirical data on social cohesion (Weil, Barton, Rackin, Valasik, and Maddox 2019).

Theories and research about the importance of the local community suggest many of the same processes that influence community recovery after a disaster may also affect the frequency of criminal events. For example, some recent disaster research found community cohesion may facilitate post-disaster recovery (Aldrich and Meyer 2014; Meyer 2018; Prelog 2016; Quarantelli and Dynes 1997; Weil, Rackin and Maddox 2018), while recent criminological research found community cohesion was linked with lower levels of neighborhood crime (Sampson 2012; Weil et al. 2019). Other studies found disasters accentuated inequalities by disproportionately harming vulnerable people while benefiting more advantaged groups (Bolin and Kurtz 2018; Elliott and Pais 2010; Shultz and Elliott 2013). Likewise, the routine activities perspective attests to social disruption may increase opportunities for crime and reduce

protections against crime (Cohen and Felson 1979; Felson 1987; Zahnow et al. 2017). Major disasters, like natural experiments, provide a unique opportunity to shed light on community processes that encourage or discourage crime.

Previous research on disasters and crime suffered from several notable limitations. First, these studies relied on proxy measures of community where research on community and crime emphasized measures of individual interaction such as social cohesion or trust (Bursik and Grasmick 1993; Hipp 2016; Sampson 2012). Second, analysis of county-level variation in community characteristics and crime potentially masked finer-grained dynamics highlighted in neighborhood-level research (e.g., see Prelog 2016; Zahran et al. 2009). Third, previous research either analyzed variation in aggregate crime rates (Prelog 2016; Weil et al. 2019; Zahnow et al. 2017; Zahran et al. 2009) or a single crime type (Doucet and Lee 2015). Analyzing aggregate crime rates potentially concealed variation in the relationship of community factors with different forms of crime, while analysis of homicide limited our knowledge to a serious, but less frequent criminal act (Frailing and Harper 2010; Spencer 2017; Varano et al. 2010).

Recent research by Weil et al. (2019) highlighted the differential importance of measures of collective resources for crime in New Orleans before and after Hurricane Katrina, but the aggregate nature of the dependent variable meant that variation in crime-specific trends was potentially masked. The current study builds upon Weil et al. (2019) by examining the relationship of collective resources with six Part-1 crime types (i.e., homicide, aggravated assault, robbery, burglary, theft, and motor vehicle theft) in New Orleans before and after Hurricane Katrina. Further, we investigate the relationships of social trust, bonding and bridging social ties, and civic engagement with each type of crime. Like Weil et al. (2019), we find only

certain forms of collective resources were associated with changes in particular types of neighborhood crime. Our results also support the research studying the relationship of collective resources for crime in general and for crime levels before and after a major disaster event, finding that the relationship between specific forms of collective resources varied by crime type.

THEORIES OF DISASTER AND CRIME

Efforts to explain how disasters may affect the etiology of crime typically draw upon three ecological frameworks: post-disaster altruism or conflict theory, social disorganization theory, and routine activities theory (Prelog 2016; Weil et al. 2019; Zahnow et al. 2017; Zahran et al. 2009).

Post-Disaster Theories of Community

The theory of post-disaster altruism or the therapeutic community argued that "emergent" community organizations support survivors' efforts during recovery (Barton 1969; Fritz 1961/1996; Prelog 2016; Quarantelli and Dynes 1977; Solnit 2009). More recently, scholars have expressed this idea regarding social capital theory but noted that certain forms of social solidarity could be harmful (Meyer 2018). For example, particular social groups may absorb resources while excluding other groups, or some communities may organize to avoid shared burdens (Aldrich 2012; Meyer 2018; Nakagawa and Shaw 2004; Weil, Rackin, and Maddox 2018). Conversely, the vulnerability theory questions this notion and instead stresses the importance of inequality and conflict in the aftermath of disasters. Proponents of this view

argue recovery efforts disproportionately favor more advantaged groups, thereby magnifying historical inequalities (Bolin and Kurtz 2018; Elliott and Pais 2010; Schultz and Elliott 2013).

These competing theories guided much of the recent research investigating the relationship between post-disaster communities and patterns in crime (Curtis and Mills 2011; Frailing and Harper 2016; Prelog 2016; Spencer 2017; Weil et al. 2019; Zahnow et al. 2017; Zahran et al. 2009). Some researchers have hypothesized that an increased sense of community after a disaster will result in lower levels of crime because survivors were more altruistic, not only looking out for their own interests but also those of their neighbors (Doucet and Lee 2015; Leitner et al. 2011; Weil et al. 2019; Zahran et al. 2009). Alternatively, scholars have argued that disasters exacerbate inequality leading to higher levels of crime (Prelog 2016; Weil et al. 2019; Zahran et al. 2009). These divergent findings were partly explained by differences in the dependent variable used, as findings reported by Zahran and colleagues (2009) support both propositions.

The altruism theory has been more difficult to test due to limited data on measures of cohesion in a community following a disaster (Weil et al. 2018; 2019). As a result, most of these studies used the number of nonprofit organizations as a proxy measure of community. For instance, Prelog's (2016) national study of county-level crime patterns found that the number of nonprofits per county was not consistently associated with declines in property or violent crime. In contrast, Zahran and colleagues' (2009) found that total, property, and violent crime rates were negatively associated with the density of nonprofit organizations. Further, Doucet and Lee (2015) found New Orleans census tracts with higher rates of civic organizations were more likely to feature lower rates of homicide, but only for disadvantaged communities. While

an improvement over previous research, these studies acknowledge that nonprofit organizations remain an imperfect measure of local community cohesion (Doucet and Lee 2015; Prelog 2016; Zahran et al. 2009).

Weil et al. (2019) recently advanced research on the importance of community resources for post-disaster crime levels by assessing the relationship of violent crime with civic engagement, social trust, and bonding and bridging social networks. This study was critical because it measured collective resources in a fashion that more closely matched with the broader research on neighborhood and community correlates of crime (e.g., Bellair and Browning 2010; Sampson 2012; Wo et al. 2016), but also because the results showed different forms of collective resources were associated with post-disaster levels of violent crime.

Social Disorganization, Community, and Crime

The social disorganization framework predicts crime will be higher in neighborhoods characterized by greater concentrations of socioeconomic disadvantage, racial/ethnic heterogeneity, and residential mobility, because these characteristics are associated with weaker neighborhood communities and in turn decreased use of informal social controls (Bursik and Grasmick 1993; Sampson 2012; Sampson, Raudenbush, and Earls 1997). The importance of community for neighborhood crime has been well documented in research on neighborhood correlates of crime, but not always in the anticipated fashion (Bellair and Browning 2010; Sampson 2012; Weil et al. 2019). For instance, an individual's social networks that could very well increase collective efficacy among neighborhood residents could also protect criminals from punishment (Bellair and Browning 2010; Browning, Feinberg, and Dietz

2004; Warner 2007). This parallels ideas about "bonding" versus "bridging" social networks (Putnam 2000; Woolcock 1998) and Wilson's (1987) thesis about social isolation. Bonding social networks tend to emphasize local social resources and connections and tend to be more likely to develop in social isolation (Brown and Weil 2019). While communities with more "bridging" forms of social solidarity can reduce crime by connecting resources, contacts, and job opportunities to potential offenders and encouraging them to utilize legal pursuits (Grannovetter 1973).

Recent assessments of the disorganization framework highlighted the importance of the spatial concentration of crime. For example, Peterson and Krivo (2010) found white neighborhoods tended to be surrounded by neighborhoods characterized by factors that discourage crime, such as external community investment, while predominantly black neighborhoods tended to be surrounded by neighborhoods with higher rates of disadvantage and crime. Similarly, research found violent crime was higher in neighborhoods located near areas of concentrated disadvantage (Chamberlain and Hipp 2015; Mears and Bhati 2006). Thus, neighborhood crime levels were not only the product of features of focal neighborhoods but also features of adjacent or surrounding areas.

While the disorganization framework was widely used in research on the relationship of disasters with crime, most the assessments were unable to examine the importance of community (Lee and Doucet 2015; Prelog 2016; Weil et al. 2019; Zahran et al. 2009). Like the broader research on social disorganization, the studies found community was not always a protectant against crime. Prelog (2016) and Zahran et al. (2009) both used the number of nonprofit organizations as a proxy for collective efficacy. Prelog (2016) analyzed county-level

variation for the entire United States and found violent, and property crime levels were higher in counties with more nonprofit organizations. Zahran et al. (2009) analyzed variation among all the counties in Florida and found that nonprofit density was negatively associated with levels of violent and property crime. These studies advanced research on the importance of community for post-disaster crime, but the analysis of county-level variation potentially masked finer-grained dynamics highlighted in neighborhood-level research.

Lee and Doucet (2015) and Weil et al. (2019) analyzed the importance of community for post-disaster crime levels with tract-level data from New Orleans. Lee and Doucet (2015) measured community with a measure of whether individuals were engaged in civic institutions. The authors found that civic engagement was negatively associated with homicide post-Katrina, but only in disadvantaged neighborhoods. Weil et al. (2019) examined the relationship of four measures of collective resources with violent crime levels before and after Katrina and found social trust and bridging social networks were negatively associated with violence, bonding social networks was positively associated with violence and no association of civic engagement with violent crime.

Routine Activities

Research on the relationship of disasters with crime was also often grounded in the routine activities perspective (Prelog 2016; Spencer 2017; Zahnow et al. 2017). This theory argues that the potential for crime exists when a motivated offender and suitable target converge in space and time in the absence of capable guardianship (Cohen and Felson 1979; Felson 1987). Accordingly, property crime may be less likely to occur in more disadvantaged

neighborhoods because of fewer and/or less lucrative opportunities, but violence may be more likely to occur because violent crimes are more likely to occur near familiar places (Chamberlain and Hipp 2015; Cohen and Felson 1979). Like the social disorganization tradition, this framework includes a spatial dimension (Chamberlain and Hipp 2015; Mears and Bhati 2006). For example, research by Chamberlain and Hipp (2015) found that property crime rates were higher in less disadvantage neighborhoods located near more disadvantaged areas. Chamberlain and Hipp (2015) suggest this was due to the greater prevalence of suitable targets in less disadvantaged neighborhoods, which made it easier to abscond with property obtained through theft or burglary.

The routine activities perspective is more consistent with disaster theories that emphasize inequality or vulnerability because it predicts post-disaster confusion and inequality provide greater opportunities or incentives for criminal activity. For instance, evacuations in the immediate wake of a disaster increase the availability of suitable targets (e.g., abandoned properties, isolated residents) and decrease the number of capable guardians (e.g., police, neighborhood residents). Research on post-disaster crime supports this proposition. For example, Thornton and Voigt (2007) reported women residing in shelters in New Orleans after Hurricane Katrina were at increased risk of sexual assault due to limited guardianship. Frailing and colleagues (Frailing 2010; Frailing 2016; Frailing, Harper and Serpas 2015) note that disruptions to the New Orleans Police Department, such as damaged communications technology, desertions, and officer malfeasance correlated with increased levels of burglary and homicides in post-Katrina New Orleans.

Further, disasters may create areas of high crime because recovery may not be distributed evenly, resulting in the higher prevalence of physical structures able to conceal illegal activities (Curtis and Mills 2011) or because neighborhood differences in property damage may affect the availability of suitable targets (Zahnow et al. 2017). Research on post-Katrina New Orleans, for example, found crime was higher in areas such as the Lower Ninth Ward that featured greater concentrations of disadvantaged residents or more blight and abandonment (Curtis, Curtis, Kennedy, and Kulkarni 2013; Curtis and Mills 2011; Doucet and Lee 2015).

Disasters, Neighborhoods and Crime

To summarize, research on the importance of disasters for crime was most often grounded in altruism theory, the social disorganization framework, or routine activities. The current study is not intended to be a test of each of the theories. Instead we draw broadly from these frameworks to highlight the importance of disruptions to community characteristics for neighborhood crime before and after a major disaster. Accordingly, disruptions to local communities resulting from a disaster such as Hurricane Katrina may result in short-term increases in crime (Frailing and Harper 2016; Weil et al. 2019; Varano et al. 2010). Following a short-term spike, neighborhood crime is expected to return to pre-disaster patterns after the local community recovers. Data limitations prevented most of the previous research from assessing the importance of disruptions to social solidarity and the few studies able to incorporate measures of the community either used proxies of community or analyzed

variation among units of analysis that were substantially larger than traditionally used neighborhood areas (Weil et al. 2019).

HYPOTHESES

Our analyses build upon the broader literature on the relationship of disaster with crime trends by extending recent research by Weil et al. (2019) to investigate the relationship of neighborhood-level collective resources with trends in six types of crime in New Orleans before and after Katrina. We draw upon a combination to the altruism, social disorganization, and routine activities framework to test the following hypotheses:

- **Hypothesis 1**. Concentrated disadvantage will be associated with neighborhood crime level.
    - **Hypothesis 1a**. Crime will be higher in neighborhoods characterized by greater intensity of concentrated disadvantage as predicted by the social disorganization framework.
    - **Hypothesis 1b**. As the routine activities framework predicts, crime will be lower in disadvantaged neighborhoods because fewer suitable targets are present.
- **Hypothesis 2**. The concentration of disadvantage in neighboring areas will help predict crime levels in focal neighborhoods.
    - **Hypothesis 2a** draws upon the social disorganization framework to predict crime will be higher in neighborhoods located near areas of greater concentrated disadvantage (Chamberlain and Hipp 2015; Mears and Bhati 2006).
    - **Hypothesis 2b** draws upon the routine activities perspective to predict property crime rates will be higher in low disadvantage neighborhoods that are proximate to neighborhoods with greater concentrations of disadvantaged residents (Chamberlain and Hipp 2015; Zahnow et al. 2017).
- **Hypothesis 3**. Neighborhoods with higher levels of social trust will feature lower levels of crime.
- **Hypothesis 4**. Levels of crime will be lower in neighborhoods where bridging social capital was stronger and higher in neighborhoods where bonding social capital is stronger (Browning et al. 2004; Bursik and Grasmick 1993; Warner 2007).
- **Hypothesis 5**. Levels of crime will be lower in neighborhoods with higher levels of civic engagement (Brown et al. 2014; Lee and Thomas 2010: Slocum, Rengifo, Choi, and Herrmann 2013).
- **Hypothesis 6**. The predictors of neighborhood crime will vary before and after Hurricane Katrina.

- **Hypothesis 6a** draws upon the altruism and social disorganization perspectives and predicts the association between the forms of collective resources (social trust, social networks, and civic engagement) and each crime type will strengthen from before to after the storm (Doucet and Lee 2015; Leitner et al. 2011; Zahran et al. 2009).
- **Hypothesis 6b** draws upon the conflict and routine activities perspectives to predict the influence of concentrated disadvantage on crime will increase after the storm due to shifts in the availability of suitable targets and capable guardians (Curtis and Mills 2011; Voigt 2007; Zahnow et al. 2017).

NEW ORLEANS AS A CASE STUDY OF DISASTER AND CRIME

New Orleans provides an ideal case study site for the current study for three reasons. First, much has been written about how Hurricane Katrina impacted New Orleans, including a plethora of studies about crime in post-Katrina New Orleans (Brezina and Kaufman 2008; Curtis et al. 2013; Doucet and Lee 2015; Frailing et al. 2015; Thornton and Voigt 2007; Weil et al. 2019). Most of this research focused on post-Katrina crime levels or was limited in the ability to measure changes in social cohesion. The current study builds upon previous research on crime in New Orleans by extending Weil et al.'s (2019) analysis of pre- and post-Katrina neighborhood crime levels to include the examination of several crime types.

Second, despite being one of the largest cities in the U.S. South, little empirical research has examined neighborhood-level variation in crime in New Orleans. A frequently cited report by the Department of Justice did not focus specifically on the effects of Hurricane Katrina but did document crime trends in New Orleans before and after the storm (Wellford, Bond and Goodman 2011). The results indicated most forms of crime, including aggregate property crime and violent crime, were not markedly above national rates, but homicide was substantially higher than in most American cities. Noting an apparent divergence between levels and trends of homicide in New Orleans compared with other forms of violent crime, some press reports

questioned whether New Orleans Police Department and other authorities suppressed reports of violent crime (Asher 2015; Burns and Thomas 2015). We recognize this as a limitation of our data, but do not believe this is especially problematic for the current study as our goal is to examine variation in crime among New Orleans neighborhoods rather than across cities.

A second reason New Orleans is an ideal case study site for the relationship of community characteristics with crime following a major disaster is the availability of data on neighborhood-level collective resources (Weil et al. 2018; Weil et al. 2019). Most of the assessments of the relationship of community characteristics with crime surrounding major disaster events were forced to use proxies of community or had to use larger units of analysis such as counties (Lee and Doucet 2015; Prelog 2016; Zahran et al. 2009). In contrast, our data allowed us to examine the relationship of collective resources with crime in New Orleans before and after Hurricane Katrina at the tract level, which was a more commonly used unit of analysis in research about neighborhood correlates of crime. The following section provides more information about the data used in this study.

DATA AND MEASURES

Dependent Variables

Our crime data were collected from the New Orleans Police Department (NOPD). The raw data included geographic information on incidents of aggravated assault, homicide, robbery, burglary, theft, and motor vehicle theft that occurred between January 1, 2000, and December 31, 2014. Incidents were geocoded and aggregated to Census 2010 boundaries to determine tract-level counts of each crime type per year. We accounted for annual fluctuations

in crime by computing three-year counts of each crime centered on 2002, 2009, and 2013. We chose these three cross-sections because of their timing in relation to Hurricane Katrina. Specifically, 2002 provided a three-year window before Katrina that did not include 2005, when the storm struck New Orleans. Similarly, 2009 was selected because post-Katrina crime reports were unreliable until 2007. The 2013 cross-section was selected because our crime data was only available through 2014.

Collective Resources

We test our hypotheses with a major survey we conducted and merged with government data from several sources. We conducted a large (N = 7000) survey of Hurricane Katrina survivors in Greater New Orleans beginning in June 2006, with most data collected from mid-2007 to April 2011, which measured collective resources, damage, and other factors in depth. The analyses in this manuscript only include respondents located in Orleans parish (i.e., the City of New Orleans; N=5,060), where we had crime data. The sample was representative of the population living in New Orleans after Hurricane Katrina, both demographically and geographically by neighborhood. The data do not deviate greatly from the joint age–gender–race/ethnic distributions for each parish (county) as reported in census population estimates for the year of the interview and we weighted our sample according to these census estimates. Our survey asked respondents their address or the intersection nearest their home at the time of the storm. This information was then used to geocode respondents into Census 2010 tract boundaries. We were not able to sample the pre-storm population or track evacuees wherever they went, but eighteen percent of respondents were still evacuees at the time of their

interview. The evacuee sample was demographically diverse and lived in neighborhoods throughout New Orleans before the storm, but we had no sampling frame with which to compare our evacuee sample.

Our sampling and interviewing procedures made it difficult to collect such a large sample quickly, and it took us several years to complete our interviewing, going neighborhood by neighborhood. Telephone interviewing was largely unavailable because landline telephones were generally down during the first years after the storm struck New Orleans, and most cell phone plans charged by the minute, making it difficult to interview low-income respondents. To overcome these challenges, we established partnerships with over two hundred neighborhood associations, community groups, and faith-based organizations and employed a range of data collection strategies with them. For instance, some neighborhood associations publicized and endorsed the survey, distributed questionnaires to every nth residence in their neighborhoods, and received completed questionnaires for us to pick up; some organizations with useful membership email lists did the same with the online version of the survey. Since we all had an interest in obtaining representative samples, data collection usually went well, except where a lack of literacy prevented some populations from filling out questionnaires without assistance.

Door-to-door interviewing was also conducted, which addressed the issue of literacy, was slowed by a requirement set by our funders. Our funding required us to use undergraduate interviewers from our university, which is located an almost four-hour round-trip drive from New Orleans. We could only make the trip on weekend days, and the outdoor interviewing was often hot and rainy. As a result, it was challenging to recruit and retain a large team of undergraduate interviewers. Our target became about thirty or forty interviews per trip, but we

could not always achieve that. We could have cut data collection time substantially if we had the flexibility to hire and supervise local interviewers as was done by Kaiser Family Foundation (2007) and the Nielson Company (Palutis 2008) whom each conducted door-to-door surveys of about 1500 respondents in a few months during the time of our data collection.

Some of the items used to measure collective resources were replicated directly from Putnam's Social Capital Benchmark Survey (Saguaro Seminar 2000); however, some items, such as civic engagement, were combined differently in some cases to produce different scales than Putnam used. We aggregated our survey data by census tract so that we could match our measures of collective resources with neighborhood-level crime data and census controls. Tracts averaged 21 respondents, which is within a range commonly reported in aggregate neighborhood studies (Auspos 2012; Sampson et al. 2002).

Our *social trust* scale is a mean score of: "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people? Most people can be trusted, Can't be too careful;" "How much do you trust the following groups of people? trust them a lot, trust them some, trust them only a little, trust them not at all, does not apply: 'People in your neighborhood,' 'People you work with,' 'People at your church or place of worship,' and 'People who work in the stores where you shop.'" All items load on a single principal components factor. This is an exact replication of Putnam's (2000) social trust scale.

Our *bonding* and *bridging social capital* scales are principal components factors from: "About how many family and close friends do you have in each of these groups? (People you are close enough to, that you would visit each other at home.) About 0-5, About 5-15, About 15-50, About 50-100, About 100 or more." Bonding social capital: 'Family and friends who live

in your New Orleans neighborhood,' 'Family and friends of your faith who live in Greater New Orleans,' 'Family and friends of your race who live in Greater New Orleans.'" Bridging social capital: 'Family and friends who live in a different neighborhood in Greater New Orleans,' 'Family and friends of a different faith who live in Greater New Orleans,' 'Family and friends of a different race who live in Greater New Orleans.'"

Our *civic engagement* scale is a single principal component factor from: "Have you taken part in activities with the following groups and organizations in the past 12 months (Yes, No)? 'A neighborhood association, like a block association, a homeowner or tenant association, or a crime watch group;' 'A charity or social welfare organization that provides services in such fields as health or service to the needy;' 'A professional, trade, farm, or business association;" "About how often have you done the following? (Every week or more often, Almost every week, Once or twice a month, A few times per year, Less often than that, Never)? 'Attended a club meeting,' 'Attended any public meeting in which there was a discussion of town or school affairs;'" and "In the past twelve months, have you served as an officer or served on a committee of any local club or organization? (Yes, No)". This scale uses items from Putnam's (2000) questionnaire but combines them into a new scale.

Control Variables

Tract-level census data for Census 2000 was downloaded from the Neighborhood Change Database (NCDB) (GeoLytics 2013). The NCDB standardizes tract level data from previous census to Census 2010 boundaries to facilitate temporal tract level changes. Additional tract-level census data was collected from the 2006-2010 and 2010-2014 American

Community Survey 5-Year estimates (U.S. Census Bureau 2016). These data were used to create an index of concentrated disadvantage unique to each cross-section. Confirmatory factor analyses showed that the percent of female-headed households, percent receiving public assistance, percent below poverty, and percent unemployed loaded highly on the same factor at each period. The final measure of concentrated disadvantage for each cross-section was created by computing the average of the standardized values of the component items.

Our analyses also controlled for the spatial autocorrelation of a concentrated disadvantage because recent research highlighted this as an essential predictor of neighborhood crime (Chamberlain and Hipp 2015; Krivo and Peterson 2010; Zahnow et al. 2017), which required the selection of a spatial weights matrix, which was influenced by our data and relevant theory (Anselin 2002). We decided upon a queen's continuity weights matrix given the distribution of census tracts in Orleans Parish. Results of Moran's I analyses indicated significant spatial clustering of concentrated disadvantage for all three cross-sections, so our analyses incorporated a spatial lag of concentrated disadvantage that was computed for each cross-section.

Finally, most of our data – from the ACS, our survey, and the Part-1 crime types – are multi-year aggregations to reduce the variation of a single year's data or due to the period of data collection. While we employ three pooled cross-sections for social structure and the crime types, our survey data only allow for a single cross-sectional measurement of collective resources. For this reason, we do not attempt to build full time-series models. To evaluate associations, we enter the collective resources data as a constant across the three periods. This approach enables us to assess possible changes in the associations of collective resources at

different periods. To make some allowance for time differences, we utilized questions on our survey that asked where the respondent lived before and after Hurricane Katrina. For our pre-storm models, we computed the aggregations of respondents according to their pre-storm locations. For post-storm models, we computed the aggregations of respondents according to their post-storm locations. This procedure does not change results substantively. Also, we controlled for the mean date of the survey interviews per tract. These controls showed no significant effects, nor did they substantially change other coefficients in the model (comparative results for both tests are available on request).

ANALYTIC STRATEGY

Our survey data were collected at the individual level, but we could not match specific incidents of crime with survey responses, so we aggregated our survey and crime data to the neighborhood level. Our crime data were over-dispersed, so we used negative binomial regressions to predict tract-level counts of each crime type over three periods: pre-Katrina (2001-2003); shortly after Katrina (2008-2010); and long after Katrina (2012-2014). Results were not sensitive to moving the time window up or down a year or using four-year time windows. We predicted the number of aggravated assaults, homicides, robberies, burglaries, thefts, and motor vehicle thefts in each period separately. We also tested whether the association of each covariate differed over time by using a model that included all time periods and interactions with time while clustering standard errors to account for multiple observations per tract. Significant differences from the first period at the .05 level have bolded coefficients, and marginally significant differences from the first period at the .10 level are italicized.

RESULTS

Descriptive Analyses

Descriptive statistics for each cross-section are presented in Table 1. The statistics show counts of nearly all crime types were substantially lower after Katrina. The population was also smaller shortly after the storm, so part of this decline may be a function of fewer potential offenders and/or potential victims (Wellford, Bond, and Goodison 2011). For this reason, we focus on changes in the correlates of crime pre- and post-Katrina rather than aggregate crime trends. Descriptive statistics for the measures of collective resources showed little variation between cross-sections due to our sampling method as we only had information on collective resources from our pooled period. The descriptive statistics for concentrated disadvantage also show little change because the index was an average of the standardized values of the component items.

<Insert Table 1 about here>

Violent Crimes

Table 2 presents the results of the multivariate analyses of violent crime types. Hypothesis 1a predicted that crime would be higher in neighborhoods with greater levels of concentrated disadvantage. Homicides and aggravated assaults were significantly higher in disadvantaged neighborhoods; however, the disadvantage was negatively associated with robbery. All these relationships were relatively constant over time, though there was evidence of a weakening for assaults. While the results for homicide and assault are consistent with the social disorganization framework, the results for robbery suggest support for the routine

activities theory as the number of suitable targets may have been less prevalent in more disadvantaged neighborhoods.

<Insert Table 2 about here>

Hypothesis 2a drew upon the social disorganization framework to predict that crime in neighboring areas would be positively associated with crime in the focal neighborhood. Results in Table 2 support this hypothesis, especially for assault and robbery. Results for homicide analyses indicate that the spatial concentration of disadvantage was critical during the first post-Katrina period but was not significant for the pre-Katrina period or during the later recovery period.

Hypothesis 3 predicted that crime would be lower in neighborhoods where residents had greater trust in their neighbors. Our results support this hypothesis. Social trust was associated with significantly lower levels of homicide and assault for all three periods, and lower levels of robbery post-Katrina. The negative effect of trust on all types of violent crime was significantly stronger after Katrina than before the hurricane. The relationship with homicide and assault became stronger, but the relationship with robbery changed from non-significant to significant.

Hypothesis 4 posited communities with high levels of bonding ties will have higher crime, while those with greater levels of bridging social capital will have lower crime. We find evidence for both expectations, but stronger support for bridging rather than bonding social ties. Bonding capital was associated with higher levels of assault for the pre-Katrina and second post-Katrina periods and with higher levels of homicide during both post-Katrina periods. Bonding social capital was not significantly associated with robbery at any time. By contrast, neighborhoods with stronger bridging social ties featured significantly fewer homicides and

robberies at all three cross-sections and fewer assaults during both recovery periods. These results suggest having a greater number of ties outside of a neighborhood inhibited violent crimes while having more ties within a neighborhood increased the likelihood of violent crime. Further, the association of bridging ties with crime was more often stronger than the association of bonding ties.

Hypothesis 5 predicted that crime would be lower in neighborhoods with stronger levels of civic engagement. The results of our violent crime analyses indicate modest support for this hypothesis. Neighborhoods with higher civic engagement had significantly fewer homicides before Hurricane Katrina and marginally significant fewer assaults before and after the storm. We do not examine collective efficacy, but our findings are not inconsistent with Sampson (2012), who found the effect of civic engagement on crime was mediated by collective efficacy.

Hypothesis 6a drew on the altruism hypothesis to predict the relationships of the collective resource measures with each crime type would be stronger after Hurricane Katrina. Our results indicate this was mainly correct for social trust. The bolded and italicized coefficients in Table 2 show the relationship of social trust with each type of violent crime strengthened significantly after the storm. This increase occurred in the first post-Katrina period for all violent crimes and maintained for the second post-Katrina period for robbery. The associations of bonding and bridging networks showed no significant changes from before to after Katrina.

Hypothesis 6b states that if the conflict and routine activities hypotheses are correct, then the association of concentrated disadvantage with each crime type will be higher after Hurricane Katrina. Our results did not support this prediction, as we found concentrated

disadvantage showed no change of association with homicide and was significantly lower during the second post-Katrina period for both assault and robbery. Thus, our analyses of violent crime give support to the altruism hypothesis, but not to conflict or routine activities theories.

Property Crimes

The results of our property crime analyses are presented in Table 3. Hypothesis 1b drew upon the routine activities perspective to predict that property crime would be lower in disadvantaged neighborhoods due to fewer suitable targets being present. Our results suggest mixed support for this hypothesis. As predicted, theft was significantly lower in disadvantaged neighborhoods across all three periods. Auto theft was also lower before and immediately after Katrina, but not during the later recovery period. Additionally, burglary was not significantly associated with concentrated disadvantage at any of the time periods. Thus, no consistent overall pattern emerges to support this hypothesis.

<Insert Table 3 about here>

Hypothesis 2b drew upon routine activities theory to predict property crimes would occur more frequently in neighborhoods that bordered areas of greater concentrated disadvantage. We found mixed support for this hypothesis. Our results show that burglary was higher in neighborhoods that bordered areas of greater concentrated disadvantage during both post-Katrina periods. This is expected given the decreased guardianship of homes in these areas and because repopulation of neighborhoods in or near the hardest-hit areas, which were also the most socioeconomically disadvantaged, occurred slowly over many months and years. The

results for theft and auto-theft indicate that the spatial lag of disadvantage was only a significant predictor during the pre- and second post-Katrina period.

Hypothesis 3 predicted that crime would be lower in neighborhoods where residents had more trust in their neighbors. Our results mostly support this hypothesis. Trust was significantly associated with burglary before Katrina, but not after. Levels of theft were significantly lower in neighborhoods characterized by greater social trust during both post-Katrina periods. Further, auto thefts were less common in neighborhoods with greater social trust during all three periods.

Hypothesis 4 posited property crime would be higher in neighborhoods with stronger bonding capital and lower in communities with stronger bridging capital. We find limited evidence for the importance of bonding social ties in a community. Explicitly, our results indicate that burglaries, thefts, and auto thefts were less common in neighborhoods with greater levels of bonding social capital before Katrina, but these relationships were not significant after the storm. In comparison, we found strong support for the importance of bridging social ties. Neighborhoods with greater bridging social capital featured fewer thefts and auto thefts for all three periods and fewer burglaries before Katrina as well as during the later recovery period. These results suggest that ties outside of a neighborhood and/or social group were more important for controlling crime than ties within the neighborhood and/or social group. It is also important to note that the importance of bridging social capital was relatively consistent across crime types, while the importance of bonding social capital was more varied.

Hypothesis 5 predicted that neighborhoods with stronger civic engagement would have lower levels of property crime. Our results do not support this hypothesis. Civic engagement was not significantly associated with any type of property crime. This finding differs from our earlier findings on violent crime types, where civic engagement had a modest negative effect (see Table 2). This result again shows the importance of disaggregating both the different types of crime and the different types of collective resources.

Hypotheses 6 predicted that Hurricane Katrina changed the associations of concentrated disadvantage and collective resources with neighborhood crime. Hypothesis 6a predicted that the impact of collective resources on property crime would increase after the storm. We found little support for this hypothesis. Only the relationship of bridging social networks with auto theft was significantly different after Katrina, and that relationship was revealed to be weaker instead of stronger. Thus, we find neither much support nor much disconfirmation for the altruism thesis with regards to property crime.

We also found limited support for hypothesis 6b, which posited that concentrated disadvantage would be associated with higher levels of property crime after the storm. None of the associations of concentrated disadvantage were significantly different immediately after the storm. The impact of concentrated disadvantage strengthened in the last period for theft, but it was not in the hypothesized direction. The relationship of the spatial lag of concentrated disadvantage with burglary was significantly different after Katrina, which indicates burglaries were significantly more common in neighborhoods located near areas of concentrated disadvantage after the storm. This may suggest that neighborhoods recovered more quickly were more likely to attract burglary offenders. The evidence for this hypothesis is weak as

Hurricane Katrina was more likely to decrease the impact of disadvantage on violent crime than on property crime.

SUMMARY AND DISCUSSION

Disaster and criminological research have produced parallel theories about how neighborhoods and communities respond to disasters. On one side, social cohesion might facilitate disaster recovery and discourage crime (Doucet and Lee 2015; Prelog 2016; Weil et al. 2019; Zahran et al. 2009). On the other side, increases in inequality and social conflict after a disaster may generate criminal activity (Prelog 2016; Weil et al. 2019; Zahran et al. 2009; Zahnow et al. 2017). Both explanations highlight the importance of local community, but most of the previous studies were only able to examine the relationship of proxy measures like nonprofit organizations with crime (Doucet and Lee 2015; Prelog 2016; Zahran et al. 2009).

Furthermore, much of the existing research analyzed variation in aggregate crime types, which potentially masked disparities in specific types of crime (Spencer 2017; Varano et al. 2010; Weil et al. 2019; Zahnow et al. 2017). The current study addresses both limitations by examining the relationship of several types of collective resources with neighborhood levels of six Part-1 crime types in New Orleans before and after Hurricane Katrina. Our findings provide new insights into the implications of collective resources for different crime types, particularly in the context of a major disaster.

Our first set of hypotheses made predictions about the importance of neighborhood disadvantage. Hypotheses 1a and 2a drew upon the social disorganization framework to predict violent crime would be more common in or near areas of greater concentration of

socioeconomic disadvantage. Our findings mostly supported these predictions but suggest certain theoretical refinements. As predicted by the social disorganization framework, tracts with greater concentrated disadvantage generally featured more homicides and aggravated assaults (Peterson and Krivo 2010; Sampson 2012). In contrast, we found that robberies were less common in disadvantaged neighborhoods. Drawing from routine activities, we believe this divergence was due to differences in motivation because robbery is a violent crime that results in the loss of property. This divergence in findings also supports arguments for the disaggregation of crime types (Mears and Bhati 2006; Prelog 2016; Weil et al. 2019; Zahran et al. 2009). Further, consistent with recent research, our results support Hypothesis 2a, which predicted violent crime would be more common in tracts located near disadvantaged areas (Chamberlain and Hipp 2015; Mears and Bhati 2006).

Hypotheses 1b and 2b drew upon the routine activities theory to predict property crimes would be less common in disadvantaged neighborhoods because of fewer suitable targets, but more common in neighborhoods adjacent to disadvantaged areas (Chamberlain and Hipp 2015; Mears and Bhati 2006; Zahnow et al. 2017). The results for theft supported these hypotheses, but support for burglary and auto theft was limited. Together, the results suggest suitable targets for property crimes were not evenly distributed throughout New Orleans. The significant increase in burglaries after Hurricane Katrina suggests the distribution of suitable targets was influenced by repopulation patterns (Weil et al. 2018; Zahnow et al. 2017). These findings also support arguments that crime types should be disaggregated (Mears and Bhati, 2006; Prelog 2016; Zahran et al. 2009).

Our second set of hypotheses drew upon a combination of disaster and criminological theories to predict that collective resources would be differentially associated with neighborhood crime levels. Our results supported the social disorganization perspective and post-disaster altruism theory. Social trust had the most consistent negative association with neighborhood crime. As predicted by social disorganization, social trust was associated with lower levels of violent and property crime (Bursik 1993; Sampson 2012). Further, as predicted by the altruism theory, the influence of social trust mostly strengthened after the storm in association with violent crime types (Doucet and Lee 2015; Leitner et al. 2011; Zahran et al. 2009). Together, these results suggest that neighborhoods with stronger social cohesion were better able to resist crime not only during routine times but also during periods of crisis and stress.

Our analyses of bonding and bridging social capital demonstrates associations that have sometimes been speculated about but not often observed directly. Previous research argued that both violent crime and property crime were lower in communities where bridging social capital was strong (Hipp 2010; Slocum et al. 2013; Warner, Swartz, and Hawk 2015), while violent crime and property crime levels were higher in communities with stronger bonding social capital (Beyerlein and Hipp 2005; Lee and Bartkowski 2004). Much of the prior research relied upon proxy measures of social capital (Beyerlein and Hipp 2005; Hipp 2010; Lee and Bartkowski 2004; Warner et al. 2015), while our survey included more direct measures of bridging (out-group) and bonding (in-group) capital. Our results indicate that bridging ties in a neighborhood were indeed associated with lower crime levels, while bonding ties were associated with higher levels of crime. These patterns exhibit little change in the aftermath of

Hurricane Katrina, and the few changes that occurred were in inconsistent directions. These findings support propositions in the literature neighborhoods with greater access to outside resources are better able to respond to social problems and system shocks (Bellair and Browning 2010; Brown and Weil 2019; Warner 2007).

Our survey also included a measure of civic engagement, which previous research suggested was weakly associated with crime (Doucet and Lee 2015; Sampson 2012; Slocum et al. 2013). Our results also indicate that civic engagement was weakly associated with violent crime types and not associated with any property crimes. Our results regarding homicide are consistent with Doucet and Lee (2015), who found that the rate of civic organizations was only significantly associated with neighborhood homicide rates in disadvantaged areas. Further, these results appear consistent with Sampson's (2012) finding that civic engagement was not directly associated with crime, but may instead work indirectly through collective efficacy.

Our last set of hypotheses sought to evaluate which of the competing theories predicts post-disaster crime better. The altruism and social disorganization theories predict that the influence of social cohesion in reducing crime will rise after a disaster, as survivors come together to recover (Aldrich, 2012; Meyer 2018; Nakagawa and Shaw, 2004; Weil et al. 2018). In contrast, both the vulnerability theory in disaster research and routine activities theory predicts that post-disaster recovery will disproportionately favor more advantaged groups and that this rising inequality will lead to increased levels of crime (Bolin and Kurtz 2018; Elliott and Pais, 2010; Schultz and Elliott, 2013). Our results give some support to the altruism and social disorganization theories, but little support for the vulnerability or routine activities theories.

Consistent with the altruism and social disorganization perspectives, occurrences of all forms of violent crime, theft, and motor vehicle theft were less common in neighborhoods characterized by greater levels of social trust or bridging social capital. Our results also showed the importance of social trust as a protective factor against violent crime was significantly greater after Hurricane Katrina. The effects of bridging and bonding social capital mostly did not change significantly after the storm. Taken together, this suggests support for the argument that altruism is likely to increase in the wake of a disaster (Barton 1969; Fritz 1961/1996; Prelog 2016; Quarantelli and Dynes 1977; Solnit 2009). These findings also highlight the importance of measuring collective resources directly. While most theories about crime after a disaster emphasize relationships among neighbors, most previous research used civic organizations as a proxy measure (Doucet and Lee 2015; Prelog 2016; Zahran et al. 2009).

We did not find consistent support for the vulnerability or routine activities theories. The effect of concentrated disadvantage on crime did not change significantly after Hurricane Katrina on most types of crime, and several of the significant changes went against the direction predicted by the theories. The main effect and spatial lag effect rose for robbery, and the spatial lag effect of burglary rose after Katrina, but neither the main or spatial lag effects were significantly different for the other crime types after Katrina. Thus, we find more support for the altruism and social disorganization theories than the vulnerability and routine activities theories. These results underline the importance of analyzing disaggregated crime types instead of aggregated categories before and after a disaster (Mears and Bhati 2006; Prelog 2016; Spencer 2017; Varano et al. 2010; Weil et al. 2019; Zahran et al. 2009).

While the current study contributed to the broader research on neighborhood correlates of crime and the more specific research on post-disaster crime levels, it is important to note several limitations. First, several data points are pooled cross-sections. We controlled for the mean date of the interview per tract to mitigate this and found no statistically significant effect, and any changes in coefficients were trivial. Related to the first point, a second limitation is that our collective resource indicators represent only one effective period. To our knowledge, such longitudinal data do not exist for New Orleans, and our survey provides very rare measures of collective resources in the aftermath of an environmental disaster. To ameliorate this limitation, respondents were aggregated into their pre- and post-storm residential locations to correspond with pre- and post-storm crime events. Finally, we were unable to assess concerns about whether New Orleans Police Department and other authorities suppressed reports of violent crime during our study period (Asher 2015; Burns and Thomas 2015). Thus, the results represent plausible baseline models that could be re-examined by future research should longitudinal measures of collective resources and crime after a disaster become available.

Despite an increasing number of high-profile disaster events, efforts to collect large-scale data that allow for the measurement of social cohesion at fine-grained neighborhood levels discussed by the most frequently cited theoretical frameworks remain limited. Our study is a rare exception, allowing for the investigation of the causes of crime before and after a disaster in ways that are seldom possible. Our results highlight the need for such data since we find that different forms of collective resources were differentially associated with the major crime types. More data on collective resources before and after major disasters could help

policymakers determine where community cohesion might be best leveraged to lower crime rates following a disaster. Further, our results show that neighborhood research more broadly and disaster-oriented studies of neighborhood crime more must analyze variation in disaggregated forms of crime.

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Table 1. Means and Standard Deviations for Analysis Variables

	(1) 2001-2003		(2) 2008-2010		(3) 2013-2015	
	Mean	SD	Mean	SD	Mean	SD
Assault	31.206	28.943	*17.982*	17.037	**87.382**	105.029
Homicide	3.552	4.512	**2.352**	2.530	**2.491**	2.919
Robbery	44.091	69.491	**18.145**	33.957	**19.539**	33.721
Burglary	85.648	46.904	**69.630**	46.426	**48.291**	35.776
Theft	237.370	400.219	**113.097**	183.396	**113.103**	238.736
Auto Theft	133.255	147.168	**46.352**	63.275	**39.564**	31.634
Social Trust	2.509	0.265	2.507	0.263	2.507	0.263
Bonding Social Networks	-0.036	0.386	-0.024	0.397	-0.024	0.397
Bridging Social Networks	-0.025	0.342	-0.008	0.349	-0.008	0.349
Civic Engagement	-0.005	0.416	0.024	0.413	0.024	0.413
Concentrated Disadvantage	-0.002	0.883	0.010	0.730	0.007	0.777

N = 165 Census Tracts

Bolded show significant differences compared to the first period. Italicized show marginally significant differences compared to the first period.

Table 2: Predictors of Assault, Homicide, and Robbery in New Orleans before and after Hurricane Katrina

	Homicide			Assault			Robbery		
	(1) 2001-2003	(2) 2008-2010	(3) 2013-2015	(1) 2001-2003	(2) 2008-2010	(3) 2013-2015	(1) 2001-2003	(2) 2008-2010	(3) 2013-2015
Social Trust	0.503*	**0.212*** **	0.423*	0.457***	**0.244*** **	0.372***	0.796	**0.500***	**0.385*** **
	(0.152)	(0.056)	(0.150)	(0.085)	(0.057)	(0.085)	(0.188)	(0.137)	(0.108)
Bonding Social Networks	1.550	*2.614*** *	2.010*	1.909**	1.437	1.701*	1.255	1.412	1.423
	(0.465)	(0.720)	(0.698)	(0.386)	(0.361)	(0.415)	(0.367)	(0.523)	(0.464)
Bridging Social Networks	0.560	0.288***	0.329**	0.373***	0.389***	0.366***	0.371**	0.228***	0.244***
	(0.208)	(0.102)	(0.136)	(0.086)	(0.107)	(0.091)	(0.117)	(0.087)	(0.081)
Civic Engagement	0.620*	*0.946*	0.902	0.774+	0.764+	0.753+	1.047	0.937	0.867
	(0.129)	(0.188)	(0.216)	(0.101)	(0.123)	(0.111)	(0.174)	(0.189)	(0.160)
Concentrated Disadvantage	1.670***	1.378**	1.803***	1.380***	1.189+	**0.914**	0.808+	0.748*	**0.547*** **
	(0.204)	(0.153)	(0.299)	(0.115)	(0.123)	(0.099)	(0.092)	(0.094)	(0.073)
Spatial Lag of Concentrated Disadvantage	1.241	1.641**	1.251	1.491***	1.632**	1.981***	2.517***	**1.496+**	2.827***
	(0.211)	(0.306)	(0.289)	(0.172)	(0.284)	(0.314)	(0.403)	(0.345)	(0.603)
Time Since Katrina	1.000	1.000	1.000	1.000	1.000	1.000	0.999	0.999**	0.999
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	165	165	165	165	165	165	165	165	165

Exponentiated coefficients; Standard errors in parentheses
+ p<0.10; * p<0.05; ** p<0.01; *** p<0.001

Bolded show significant differences compared to the first period (p<.05).
Italicized show marginally significant differences compared to the first period (p<.10).

Table 3: Predictors of Burglary, Theft and Auto Theft in New Orleans before and after Hurricane Katrina

	Burglary			Theft			Auto Theft		
	(1) 2001-2003	(2) 2008-2010	(3) 2013-2015	(1) 2001-2003	(2) 2008-2010	(3) 2013-2015	(1) 2001-2003	(2) 2008-2010	(3) 2013-2015
Social Trust	0.630**	0.750	0.801	0.714	0.574*	0.484***	0.483***	0.418***	0.590**
	(0.097)	(0.149)	(0.157)	(0.159)	(0.130)	(0.105)	(0.091)	(0.094)	(0.114)
Bonding Social Networks	1.437*	1.326	1.681**	1.686+	*1.248*	1.454	1.714*	1.559	1.314
	(0.235)	(0.275)	(0.329)	(0.484)	(0.358)	(0.363)	(0.381)	(0.428)	(0.280)
Bridging Social Networks	0.575**	0.738	0.563**	0.338***	0.325***	0.296***	0.354***	0.336***	**0.538****
	(0.111)	(0.166)	(0.125)	(0.104)	(0.094)	(0.074)	(0.086)	(0.093)	(0.121)
Civic Engagement	0.955	0.877	1.143	1.286	*1.025*	1.136	1.044	**0.972**	0.983
	(0.099)	(0.113)	(0.145)	(0.211)	(0.167)	(0.170)	(0.142)	(0.156)	(0.128)
Concentrated Disadvantage	0.961	1.147	1.170	0.738**	0.720***	*0.588****	0.694***	0.763**	0.857
	(0.071)	(0.101)	(0.125)	(0.076)	(0.071)	(0.060)	(0.061)	(0.075)	(0.082)
Spatial Lag of Concentrated Disadvantage	1.122	1.348*	**1.730*****	1.660***	*1.051*	1.496*	1.376**	1.208	1.681***
	(0.116)	(0.202)	(0.235)	(0.245)	(0.191)	(0.238)	(0.170)	(0.219)	(0.236)
Time Since Katrina	1.000	1.000	1.000	0.999	0.999+	0.999**	1.000	0.999**	1.000+
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	165	165	165	165	165	165	165	165	165

Exponentiated coefficients; Standard errors in parentheses
+ p<0.10; * p<0.05; ** p<0.01; *** p<0.001

Bolded show significant differences compared to the first period (p<.05).
Italicized show marginally significant differences compared to the first period (p<.10).