Crime and Commerce:

A Study of Urban Vibrancy and Criminal Activity in Chicago

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B.A. Thesis

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15 May 2020

ABSTRACT

New urbanist theories of neighborhood safety suggest that urban vibrancy, or the amount of pedestrian activity in an area, may be an important deterrent of crime. This study attempts to examine the relationship between vibrancy and crime rates through the use of business and crime data for the City of Chicago between the years 2014 and 2018. Using business licenses as a proxy for urban vibrancy, I develop time and place fixed effects models to examine the relationship between business licenses and crime throughout the city's census tracts. The findings generally indicate that more business licenses are negatively associated with higher crime rates, a conclusion which falls in line with the new urbanist hypothesis. However, business heterogeneity and the dynamic nature of urban vibrancy limit the degree to which theoretical conclusions can be drawn from the empirical analysis. Further research is needed to find new ways of measuring vibrancy and expand our understanding of the neighborhood and environmental dynamics of urban crime.

INTRODUCTION

Though some studies of urban crime have often focused on profiling offenders and victims, rather than examining the ecological characteristics of crime events, ecological approaches to the study of crime have become increasingly relevant. Environmental criminology places particular emphasis on both the social and spatial conditions of possibility for criminal activity. The amount of pedestrian activity in an area may be an important deterrent of crime, as criminals tend to avoid being seen by potential bystanders who may report their actions to the authorities. Building on this notion, new urbanist theories of safety theorize that urban vibrancy, a measure of the degree of human activity in a given area, may contribute to the creation of safer urban places (Cahill 2004; Taylor and Gottfredson 1986).

The research at hand attempts to examine the relationship between vibrancy and crime rates through the use of business and crime data for the City of Chicago between the years 2014 and 2018. I employ fixed effects regression models to statistically measure the strength and direction of the relationship between crime and the number of business licenses awarded in each of Chicago's census tracts. The key benefit of FE models is that they account for time-invariant, place specific factors that may influence total crime that would not be considered in a standard

cross-sectional model. To control for extraneous factors and further isolate the impact of the total number of business licenses on urban crime rates, I incorporate demographic and socioeconomic data from the U.S. Census Bureau as structural covariates into the analysis.

The findings generally indicate that more business licenses are negatively associated with higher crime rates, a conclusion which falls in line with the new urbanist hypothesis. Furthermore, these results support the theory that urban vibrancy deters criminal activity, thereby rendering vibrant urban areas less criminogenic than their more desolate counterparts. However, there is some uncertainty about the viability of using business licenses as a proxy for urban vibrancy. Business heterogeneity results in varying degrees of vibrancy at different points in time, which may affect the areas in which crimes take place. In line with the philosophy of environmental criminology, this paper emphasizes the importance of place in studies of urban crime. Further research is needed to find new ways of measuring vibrancy and expand our understanding of the neighborhood and environmental dynamics of urban crime.

THEORETICAL FRAMEWORK

Focusing on Offenders

Until the last few decades, criminological research has focused primarily on understanding the characteristics, behavior, and development of individuals who commit crimes. A number of individualistic theories of crime have been developed and tested, emphasizing the role of individuals' psycho-social development in the process of committing crimes. Laub and Sampson (2006) adopt a developmental approach to the study of crime, outlining the differences in males' propensity to engage in criminal activity at various stages throughout their lifetimes. Other studies have explored the impact of excessively stressful environments on children's cognitive and anger management skills, arguing that difficult upbringing conditions can lead to

greater dispositions for crime later in life (Sharkey et al. 2012). Economically-oriented studies of criminal activity suggest that both income inequality and poverty are substantially associated with violent crime in both urban and rural areas of the United States (Hsieh and Pugh 1993). Other research indicates that personal experiences of racial discrimination also play an important role in increasing the likelihood of committing an offense (Burt, Simons, and Gibbons 2012). Undoubtedly, demographic and social-psychological factors play an important role in determining individual dispositions to commit criminal offenses. Despite the substantive breadth of these theories, individualistic explanations fail to account for other factors that may impact crime in urban environments.

The Environmental Approach

Recent studies have emphasized the importance of place and the built environment to the study of crime and criminal behavior (Eck and Eck 2012; Eck and Weisburd 2015). This analytical approach is especially relevant to studies of urban crime rates, as a city's various neighborhoods and public spaces create differing contexts in which crimes may occur. An increased focus on these contexts has led to the development of the relatively modern field of environmental criminology. This perspective of crime studies is rooted in the notion that an area's environmental elements significantly impact both crime rates and the types of crimes that are committed (Jeffery 1971). The rise of Jeffery's 'crime prevention through environmental design' or CPTED is largely founded on the principles of social disorganization theory. Building on the ecological framework of urban development espoused by Park and Burgess (1925), social disorganization theory emphasizes the impact of neighborhood ecological factors on urban crime rates (Shaw and McKay 1942).

Importantly, the environmental approach to criminology understands crimes as *events* in which offender profiles are but one of many important factors. As Brantingham and Brantingham explain, environmental criminology is concerned with "jointly considering potential offenders and their proximate and distal surroundings" (1998: 31). Thus, given the high degree of functional and formal variation that exists among urban spaces, this perspective implies that some areas of the city lend themselves better to criminal activity, that is, are more criminogenic, than others.

This notion has been corroborated by research which demonstrates that crime is not randomly distributed across urban space, but rather strongly related to the identifiable spatial patterns of ecological factors within cities (Chakravorty and Pelfrey 2000; Eck, Gersh, and Taylor 2000). Early environmental studies of crime (Schmid 1960) aimed to identify the social, economic, and demographic determinants of high crime urban areas and their dimensions. By combining police and census data, Schmid offers preliminary insight into the demographic and socioeconomic character of urban environments with above average crime rates. The development of routine activity theory takes environmental considerations one step further, emphasizing the importance of the opportunity for crime afforded by a particular place at a particular time. Pioneering this approach, Cohen and Felson demonstrate that "the dispersion of activities away from households and families increases the opportunity for crime and thus generates higher crime rates" (1979:588). The impact of community cohesion and collective efficacy on the degree to which an area may be considered criminogenic has also been studied. Previous research on public spaces and social disorder in urban neighborhoods has emphasized the role of collective efficacy in the maintenance of low crime rates in certain city areas (Sampson and Groves 1989; Sampson and Raudenbush 1999).

Urban Space and Safety

Combining the ecological approach of the Chicago School and sociological theories of collectivity, other explanations of the relationship between safety and urban space have been developed throughout the 20th century. In her seminal work, *The Death and Life of Great American Cities*, Jane Jacobs critiques the urban renewal policies of the 1950s and argues for more organic, community-oriented plans and designs. Jacobs is largely credited for coining the notion of "eyes on the street," which describes the degree of natural surveillance that an area is capable of exerting through the presence of civilians (Jacobs 1961). Expanding on this concept, Jacobs argues that safer urban areas are generated by greater degrees of urban vibrancy, a measure of the amount of human activity on a given street block. Jacobs goes on to outline a number of characteristics that promote to vibrancy including population density, mixed land use, and commercial activity.

Explicit consideration for the spatial dimensions of crime events have become increasingly prominent in criminological research and urban studies. The increased availability of high resolution urban data has allowed criminologists, sociologists, and urban researchers to empirically test established hypotheses of the relationship between urban space and crime. Research on land use in Seattle has demonstrated that the social orientation of public land, i.e. the degree to which it is intended to supplement business versus residential activity, differentially impacts community crime rates depending on the social structural characteristics of the neighborhood (Wilcox et al. 2004). Other studies have attempted to explain the clustering of crime in specific areas of the city, associating crime hotspots to both demographic and environmental factors (Weisburd, Groff, and Yang 2012). Further research on where crime takes place builds upon theories of collective efficacy and social disorganization to demonstrate that

the specific advantages provided to offenders by various urban locations explains why some types of crime occur more frequently on some blocks than on others (St. Jean 2007).

Despite the extensive literature regarding the impacts of urban space on neighborhood crime rates, the role of urban vibrancy proposed by Jacobs has received only limited empirical consideration. This is particularly surprising considering the extent to which Jacobs' writing has influenced urban planning and architecture throughout the past half century. The lack of empirical research regarding vibrancy and safety is due, in part, to the difficulty of measuring street-level activity in urban environments. While some work in the field of urban planning has dismissed the accuracy of Jacobs' theory, this is done largely through an investigation of the impact of individual formal urban structures (street networks, public spaces, etc.) on the opportunity for criminal activity (Cozens 2011). The primary issue of this critique is that it does not consider areas in which all conditions are met, thereby presenting only a limited view of the urban processes that impact crime rates. Though some studies have accounted for the impact of the economic transformation of neighborhoods (Papachristos et al. 2011), little work has been done to address how commercial activity and business presence directly relate to urban crime rates.

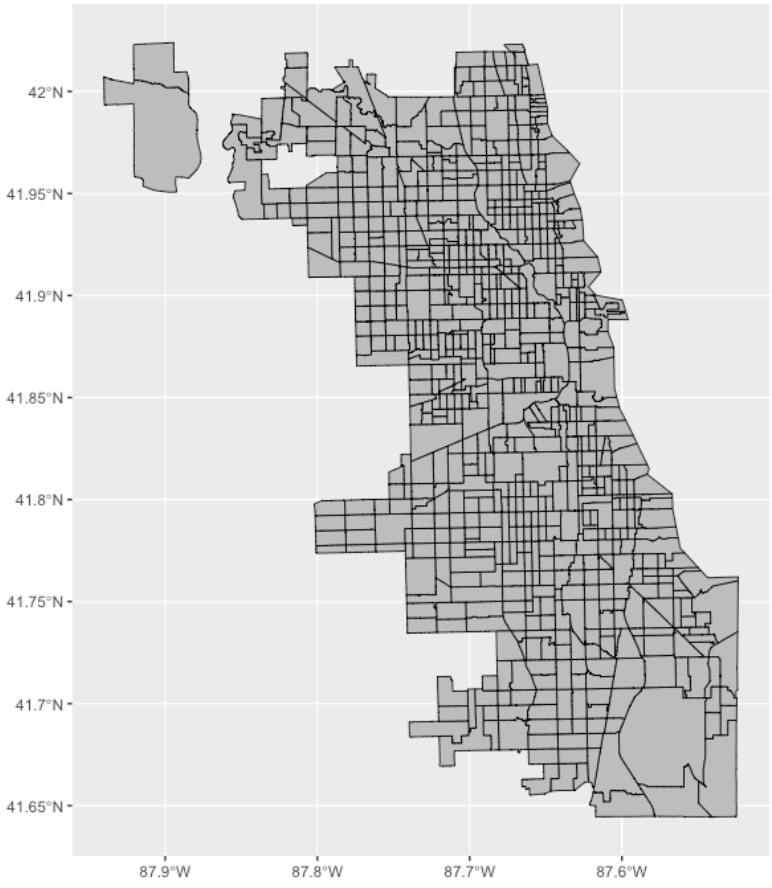
Up to this point, the literature which deals directly with the study of urban vibrancy measured through commercial proxies and crime is comprised of only one study taking place in Philadelphia, which finds that, in some areas, greater degrees of business presence are associated with reductions in certain types of criminal activity at specific times of the day and week (Humphrey et al. 2019). In this study, I empirically examine the impacts of business presence on crime rates within census tracts in the city of Chicago. This moves beyond other environmental studies of urban crime by examining commerce and business prominence as a potential deterrent

of the development of criminogenic urban environments. Additionally, this study expands on the notions of collective efficacy and neighborhood cohesion by exploring how commerce may impact the opportunity for crime provided by a certain area. Finally, the theoretical foundations of this study situate the research within the broader dialogue surrounding the impact of the urban built environment (business presence in particular) on variations in crime rates throughout urban areas and, more generally, informal mechanisms of social control within urban communities.

DATA AND METHODS

Urban vibrancy, as described by Jacobs (1961), is a concept intended to capture the liveliness of an area. In other words, vibrancy is a measure of human activity on the streets of an urban area. As it is used here, vibrancy includes both pedestrian traffic (sidewalks), street traffic,

Figure 1: Chicago Census Tracts



and daily activities of those occupying these spaces (shopping, business activities, etc.). Due to the complex and fluctuating nature of the concept, vibrancy is notoriously difficult to measure quantitatively. The study at hand focuses on the prominence of businesses in an area as an indicator of urban vibrancy. The intent is to build an understanding of the relationship between business prominence and crime rates throughout various areas in Chicago. A similar approach was employed by Humphrey, et al. (2019) in their study of neighborhood safety and urban vibrancy in Philadelphia.

The present analysis of crime rates as they relate to business or commercial prominence (a proxy for urban vibrancy) throughout the city of Chicago employs three primary datasets. The first dataset, titled "Crimes – 2001 to Present," contains records of all crimes reported to the Chicago Police Department. The second dataset, appropriately titled "Business Licenses," includes records of all business licenses issued and renewed by the City of Chicago's Department of Business Affairs and Consumer Protection. The expectation is that areas, i.e. census tracts, with more business licenses have more customers and employees frequenting these locations thereby resulting in more pedestrian traffic and a greater degree of vibrancy. Finally, demographic information is obtained from the U.S. Census Bureau's American Community Survey 5-Year Estimates.

Three primary spatial units of analysis are most effective for evaluating the relationship between crime and commercial presence in urban areas. In order of increasing granularity (i.e. specificity afforded by the relative size of the grouping) they are: census tracts, block groups, and city blocks. According to the University of Chicago Library's documentation on spatially referenced census data, the city of Chicago is made up of ca. 866 census tracts and roughly 10,000 blocks. I was unable to find an exact or approximate number for the total number of

block groups in the city. The majority of the analysis presented here uses census tracts as the cross-sectional unit. Figure 1 depicts the boundaries of the census tracts within Chicago's city limits, with longitude and latitude coordinates as an underlying grid.

Datasets

As mentioned, population demographic data comes from the American Community Survey's 5-Year Estimate tables for the years 2014 to 2018. This five-year period was selected because the overall number of crimes reported and business licenses granted remained relatively stable during this time frame. See appendix A for more details. The ACS datasets contain information on a multitude of demographic variables, including total population, population density, race, gender, ethnicity, employment status, and education level. While all ACS Estimate tables include data at the census tract level, only the table for the year 2010 contains information at the block group and individual block level. This is due to the higher specificity of estimates afforded by the decennial census. Similarly, economic information for each spatial unit also comes from the U.S. Census Bureau's American Community Surveys. Three tables are of particular interest: Median household income, poverty status, and ratio of income to poverty level. Other measures of the socioeconomic status are also included (such as Gini Index and housing occupancy) are also integrated into the final dataset, though these are not used extensively in this analysis.

The first table employed, titled "Median Household Income," provides information about the median household income adjusted for inflation for each census tract. Variations of this table provide stratified versions of this measure based on household type, family structure, and other characteristics, though these are not used in the study at hand. The second table, "Poverty Status of Families by Family Type," provides information on the number of families with reported

incomes below the determined poverty level. This metric is further broken down by the family type and the presence of children under the age of 18. However, only the total number (and corresponding percentage) of families living below the poverty line is used here. Finally, the ACS "Ratio of Income to Poverty Level" table provides information about the proportion of the population within each of 7 income categories expressed as ratios of the poverty level. These categories consist of the following ranges: [0, 0.5), [0.5, 1), [1, 1.25), [1.25, 1.5), [1.5, 1.85), [1.85, 2), [2, ∞). A summarized version of this table aggregates these ranges into four categories, [0, 1], [1, 1.99] [0, 2], and [2, ∞), respectively labeled *Doing Poorly*, *Struggling*, *Poor or Struggling*, and *Doing Ok*.

Land use data and business license data is provided by the Chicago Data Portal. The land use dataset provides information about the city's current zoning districts. It is formatted as a shapefile with areas and land use classifications for 12,287 lots in the city of Chicago. The business license data contains information about all active and historical business licenses for enterprises operating within the city. Importantly, the dataset contains geographic information for each license which allows us to determine the extent to which commercial zones are actively being used by businesses.

Finally, crime data is provided by Chicago Data Portal. The dataset used for this analysis contains information for all crimes reported to the Chicago Police Department dating back to 2001. The variables of interest include the block-level location of the crime in geographic coordinates, a primary and secondary description, the date and time of occurrence, whether or not an arrest took place, and a location description (which was used to determine whether the crime occurred in public). The dataset was filtered to include only crime reports taking place between 2010 and 2014.

Metrics

As mentioned, urban vibrancy is a measure of the activity of citizens, both commercial and residential, in a given urban area. Originally, the intent was to develop a vibrancy index for each census tract using data on the number of business licenses granted, population density, and zoning data, as well as other factors, such as the number of public schools, transportation hubs, and public institutions in the area. Unfortunately, gathering and integrating these datasets proved virtually impossible due to the mismatch between data structures and the lack of geo-spatial information for a large portion of the records. As a result, I resorted to using the number of business licenses awarded in a given year as a direct proxy for urban vibrancy, making it the primary independent variable of this study. This decision was based on the idea that business operations generally require human activity, therefore also necessitating the presence of individuals in or near the location in which the business operates. On that basis, the number of business licenses issued in an area is a viable indicator of its relative degree of vibrancy. Additionally, average business density was calculated by dividing the total number of licenses awarded by the area of the census tract in square miles.

Initially, I attempted to group business licenses by primary type, but I was unable to get accurate counts of each type as nearly two thirds of all licenses awarded fall under the categories of *Limited Business License* and *Retail Food Establishment*. There was not enough detail and variation within the license type column of these records to adequately group them. A similar issue occurred when attempting to group by primary business activity, except in this case, there was too much specificity which resulted in 4,704 unique groups. As a result, I resorted to using the total number of business licenses awarded in each area. Further research employing this

methodology should account for heterogeneity among businesses and the varying impacts that different types of businesses may have on the vibrancy of an area.

Since the focus of this study is crime aggregates and crime rates, as opposed to individual crimes, the raw crime dataset required extensive cleaning and reformatting. Most importantly, crimes were grouped into three primary categories: violent crimes, property crimes, and crimes occurring in public areas. The violent and property crime groups were determined based on the Primary Type column of the original crime dataset. Crimes which were categorized as assault, battery, criminal sexual assault, homicide, kidnapping, and robbery were assigned to the violent crimes group. Crimes categorized as arson, burglary, criminal damage, criminal trespassing, theft, and motor vehicle theft were assigned to the property crime group. A similar method was used to group together public crimes using the Location Description column of the original crime dataset. All crimes occurring on streets, sidewalks, alleys, CTA stops, parking lots and garages, and vacant lots were assigned to the "public" group.

Having established the dimensions by which crime counts would be aggregated, I used standard grouping and summarizing functions to provide counts of each type of crime (violent, property, public) for each observation. The result is a panel dataset which includes two index columns (GEOID and year) and counts for each variable mentioned previously, as well as a column for the total number of crimes for each observation.

The working business license dataset was created using the same method, with aggregates separated into newly issued licenses and license renewals. However, only total licenses issued (which includes both new issues and renewals) was used in the final analysis. This working dataset was merged with the working crime dataset using both census tract and year as the index. Next, demographic and socioeconomic data from the American Community

Survey was imported and merged into the final panel dataset using the same indexing method. Finally, rates for each category of crime reported (violent, property, and public) were calculated using the following formula:

$$[\text{Type}].\,\text{Rate} = \frac{\#\text{ of [Type] Crimes}}{\text{Total Population}} \times 1{,}000$$

With the full panel dataset properly formatted and variables of interest selected, I proceeded to create subsets of the data filtered by year. This allowed for easier plotting and preliminary analysis. Table 1 provides summary statistics for the primary variables of interest. These control variables were selected on the basis of previous literature which examine homicide and other crime at both the micro- and macro-level. The considerations of Baller et al. (2001) and Moody and Marvel (2010) were of particular importance in my selection of control variables.

Table 1: Summary Statistics for Variables of Interest

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
totalpop	3,942	3,443.833	1,817.467	248	2,021.2	4,512.8	19,889
logpop	3,942	8.007	0.539	5.513	7.611	8.415	9.898
crimes	3,942	332.425	290.474	21	155	414.8	4,882
violent	3,942	101.342	89.465	3	39	133	807
property	3,942	151.769	146.270	5	78	184	3,069
public	3,942	117.299	108.776	1	49	149	1,214
biz	3,942	40.376	88.064	1	12	45	2,512
bizdens	3,942	211.868	378.194	0.479	53.068	229.637	5,485.418
whitepct	3,942	45.720	33.166	0	5.9	77.0	98
blackpct	3,942	36.368	40.135	0	2.6	88.6	100
hisplatpct	3,942	26.086	29.206	0	3.6	42.6	100
logmhi	3,942	10.728	0.532	8.330	10.356	11.106	12.094
povertypct	3,942	18.764	14.377	0.000	6.756	27.727	100.000
unemprate	3,942	13.247	9.787	0.000	5.804	18.574	100.000
femalehh	3,942	215.310	163.811	0	93	292	988
medage	3,942	34.707	6.207	15.900	30.500	38.400	66.800

Models

Ordinary least squares (OLS) and fixed effects regression models were applied to explore the relationship between business licenses and the crime rate. The intent is to identify an association between the total number of business licenses awarded in a given tract for each year and the number of crimes reported in that area. A fixed effects model is possible and appropriate due to the panel format of the data. Each record is indexed by census tract and year, and every variable is measured for each of these observations. An OLS model was used to analyze the variation between census tracts for any given year, though the 2018 subset is used primarily as this is the most recently available data. Unlike cross-sectional models, fixed effects models only consider variation within the same tract over time, as opposed to comparing all tracts to one another as is the case with OLS models. The primary benefit of a fixed effects model is that it accounts for place-specific, time-invariant factors that may influence the amount of crime in a census tract. In doing so, this model reduces the likelihood of omitted variable bias thereby providing a more accurate depiction of the relationship between crime and vibrancy, as measured through the total number of business licenses.

The models used in this study incorporate the demographic and socioeconomic variables outlined in the previous section as general controls. The aim is to control for factors that may influence an area's crime rate. Previous studies have demonstrated that poverty, household composition, and employment tend to have significant impacts on crime and urban crime rates. These assertions are controlled for with this model. In this way, the goal is to isolate the impact of the amount of business licenses on the overall crime rate for each tract over the course of the time period observed. This will provide a stronger foundation for making claims about the relationship between urban vibrancy and crime in the city.

RESULTS

Table 2 depicts the results of four regression models with different dependent variables. The first takes total crime as the dependent variable while each subsequent model uses one of the three crime groups outlined previously. All models presented in this table employ fixed effects

Table 2: FE Regression Models for Total Crimes and Crimes by Type

	TOTAL	VIOLENT	PROPERTY	PUBLIC
	1	2	3	4
Total Licenses	−.099*	−.027*	−.088**	−.032**
	(.042)	(.012)	(.031)	(.012)
Total Population (logged)	142.869**	25.581**	84.667*	57.736**
	(50.892)	(9.411)	(34.039)	(17.606)
Percent White	.248	.084	.110	−.058
	(.293)	(.080)	(.190)	(.140)
Percent Black	−.001	−.088	−.470	.484
	(.667)	(.175)	(.386)	(.346)
Percent Hispanic/Latino	−.643	−.081	−.235	−.261
	(.387)	(.108)	(.250)	(.181)
Median Household Income (logged)	20.084	−.569	2.715	17.765**
	(12.659)	(3.347)	(7.613)	(6.620)
% Families Below Poverty Line	.150	.014	.043	.160
	(.330)	(.091)	(.205)	(.157)
Unemployment Rate	1.147*	.173	.550*	.632*
	(.498)	(.135)	(.248)	(.291)
# of Female Headed Households	.061	.009	−.001	.038
	(.038)	(.012)	(.020)	(.023)
Median Age	1.922**	.334	.920*	1.221**
	(.723)	(.208)	(.420)	(.410)
Observations	3,942	3,942	3,942	3,942
R^2	.971	.976	.955	.948
Adjusted R^2	.963	.970	.944	.934
Residual Std. Error (df = 3134)	55.768	15.470	34.749	27.862

Notes: *P < .05 **P < .01 ***P < .001

regression (with fixed effects for place, i.e. census tract, and year), while controlling for population (logged), the three largest race categories (white, black, and Hispanic/Latino), median household income (logged), the percentage of families living below the poverty line, unemployment rate, the number of single female headed households (i.e. households with no husband present), and the median age.

The first model indicates that a one-unit increase in the total number of business licenses corresponds to a decrease of approximately 0.1 in the total number of crimes. A similar result is found for each of the crime aggregate models (violent crime, property crime, and crimes taking place in public areas) albeit with varying magnitudes. The strongest effect of total business licenses is observed for total crimes. Importantly, all coefficients reported for total licenses are statistically significant at a $P < 0.05$ threshold while the coefficients for models 3 and 4 are significant at the $P < 0.01$ threshold.

Unlike total licenses, the total population is strongly associated with both total crime and all of the crime groupings. According to the model, a 1% increase in the total population of a census tracts corresponds to an increase of approximately 143 in the total number of crimes, with increases of 25.6, 84.7, and 57.7 in the number of violent crimes, property crimes, and public crimes, respectively. Interestingly, none of the race coefficients are statistically significant in any of the models. The sign of these coefficients seem to indicate that total crime is more prominent in areas with larger proportions of white residents, though it is possible that this is because residents of these areas are more likely to report crimes to the police than areas with predominately black and Hispanic/Latino residents (Kirk and Papachristos 2011).

Median household income (MHI) has the strongest effect on crime after total population. As shown in the regression table, a 1% increase in MHI corresponds to an increase of roughly

20.1 in the number of total crimes. Surprisingly, the percentage of families living below the poverty rate also is also positively associated with total, violent, property, and public crimes. Looking at the standard errors, however, indicates that these results have large variances and cannot be considered statistically significant. It is possible that a similar cultural mechanism is at play as in the race effects, as more affluent areas may be more likely to report crimes to the police than those with less resources. The unemployment rate is also significantly and positively associated with total, property, and public crime, but insignificantly associated with violent crime.

Finally, the number of single female households appears to have a minor but positive effect on crime, with each additional household headed by a single female increasing the total number of crimes by approximately 0.061. However, these results are insignificant and are only incorporated as a control measurement. Median age, on the other hand, is significantly associated with total, property, and public crime, though insignificantly associated with violent crime. It is important to reiterate that these variables are included only for control purposes and results should be interpreted with caution.

A second analysis was conducted using overall business density measured as licenses per square mile. The coefficients of four fixed effects models regressing business license density on various crime rates is shown in Table 3. The results of both sets of models were rather similar, with business density also being negatively associated with greater numbers of crimes. However, business density was not statistically significant and the coefficients are nearly an order of magnitude smaller.

A final set of regression models was calculated using the crime rate as the primary dependent variable. The results of these models indicate that neither business density or total

Table 3: FE Regression Models with Business Density as IV

	CRIMES	VIOLENT	PROPERTY	PUBLIC
	1	2	3	4
Licenses Per Sq. Mile	−.013	−.002	−.011	−.005
	(.007)	(.003)	(.006)	(.003)
Total Population (logged)	142.921**	25.728**	84.790*	57.704**
	(51.067)	(9.485)	(34.195)	(17.656)
Percent White	.247	.084	.109	−.058
	(.294)	(.081)	(.191)	(.141)
Percent Black	.002	−.088	−.468	.486
	(.665)	(.175)	(.383)	(.346)
Percent Hispanic/Latino	−.640	−.080	−.232	−.259
	(.386)	(.108)	(.250)	(.181)
Median Household Income (logged)	20.261	−.516	2.875	17.821**
	(12.622)	(3.341)	(7.552)	(6.615)
% Families Below Poverty Line	.159	.016	.051	.163
	(.327)	(.090)	(.201)	(.156)
Unemployment Rate	1.153*	.175	.555*	.634*
	(.499)	(.136)	(.249)	(.291)
# of Female Headed Households	.062	.009	−0.000	.039
	(.037)	(.012)	(.020)	(.023)
Median Age	1.943**	.339	.937*	1.228**
	(.728)	(.210)	(.426)	(.411)
Observations	3,942	3,942	3,942	3,942
R^2	.971	.976	.955	.948
Adjusted R^2	.963	.970	.943	.934
Residual Std. Error (df = 3134)	55.844	15.499	34.854	27.876

Notes: *P < .05 **P < .01 ***P < .001

licenses are significantly associated with the number of crimes per 1,000. It is possible that the models using crime rates, as opposed to total counts, are misspecified and should be revisited in future research.

The results presented here indicate the existence of an inverse relationship between total business licenses and the amount of crime taking place in an urban area. These findings corroborate the empirical hypothesis of this paper, namely that areas in which many business licenses are issued experience less crime than areas in which few licenses are provided. A number of theoretical complications arise when attempting to extend this argument into the broader hypothesis of urban vibrancy. The conclusion of this paper discusses the limitations of this research and potential avenues for improvement, as well as exploring some ideas as to why these findings were obtained.

CONCLUSION

The findings of this analysis provide some evidence that violent crime rates are inversely associated with the number of business licenses granted in an urban area. This was primarily the case for total business licenses. License density was also negatively associated with total crime counts but to a lesser degree. It is interesting that when using crime rates as the dependent variable, none of the models resulted in statistically significant coefficients. Additionally, it was surprising that total licenses were negatively associated with property crimes, as businesses provide suitable targets for these types of illegal activities. The expectation that public crimes would be lower in areas with greater degrees of business prominence is supported by these results. Overall, this study provides evidence that areas with greater degrees of urban vibrancy experience less crime. While this is the case for Chicago, it remains unclear how well this hypothesis holds in other cities across the United States and the rest of the world. Three primary aspects should be considered when evaluating the results of this research.

In the first place, it remains unclear whether business licenses are a viable metric for the urban vibrancy of an area. Although the theoretical foundation is fairly straightforward, and

Jacobs does consider the presence of businesses to be an important aspect in promoting the vibrancy of area, the explicit relationship between vibrancy and business remains difficult to measure. This is largely because direct, quantitative measures of vibrancy would require extensive time and resources which go well beyond the scope of this project. Moreover, it is highly probable that different businesses contribute to vibrancy in different ways. A coffee shop, for instance, is likely to have a stronger positive impact on an area's vibrancy than a dental office, simply because it attracts more customers. Unfortunately, while the original business dataset does technically include licenses descriptions, most records are listed as "Limited Business Licenses," which provide no substantive information on what kind of business activity is taking place. This makes it impossible to aggregate businesses by type and considerably limits the degree to which this phenomenon can be taken into analytic consideration.

A second important thing to note is that vibrancy varies by time of day and day of the week. Generally speaking, vibrancy is highest during the day, when shops are open, people are working, and activity is occurring on the streets. However, weekend nights may also be highly vibrant, especially in areas with extensive and diverse nightlife. The fact that each area differs significantly in its pattern or trajectory of vibrancy over time further complicates the possibility of accurately measuring vibrancy. Ethnographic fieldwork may be especially useful for determining the degree of vibrancy of an area during a given time period, though adequate comparison of those findings is likely to prove highly difficult. All this speaks to the difficulty in capturing urban vibrancy as an aspect of urban life, largely due to the concept's complex and multi-faceted nature. Moreover, these considerations work against the simplified use of business licenses as a proxy for vibrancy, as total counts per census tract do not take any of these factors into account.

Finally, there is something to be said about modeling crime both in this specific context and more generally. Crime events are complicated phenomena, often resulting from a variety of factors that influence the time and location of the crime as well as the behavior of victims and offenders. As a result, the demographic, structural, and social factors that determine urban crime rates are extremely difficult to isolate. In Chicago, gang violence plays a major role in the amount of crime that occurs in different parts of the city, adding yet another variable to the already convoluted equation. The profound interconnectedness of criminal activity and the practically infinite dimensions of the urban fabric, which includes both physical and social structures, substantially problematizes any simple model of crime or crime rates.

The present study has attempted to provide some insight into the ecological influencers of crime rates in urban environments. These findings indicate that areas with greater numbers of business licenses are associated with lower levels of crime, supporting the notion that urban vibrancy deters criminal activity. It follows that, as Jacobs explains, a greater number of "eyes on the street," a result of greater degrees of urban vibrancy, are an important aspect of neighborhood safety. While this speaks to the importance of considering the urban built environment in criminological research, more work must be done to determine the degree to which business prominence is correlated to vibrancy. The increasing availability of high-resolution urban data and spatial modeling techniques provide promising opportunities for future studies. Perhaps research including more nuanced aggregation techniques or a more precise measurement of urban vibrancy can corroborate or contradict the findings presented here and continue expanding our understanding of urban crime and vibrancy.

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Appendix A: *Total Crimes and Business Licenses in Chicago by Year*