A STRUCTURAL EXAMINATION OF RURAL CRIME IN THE MIDWEST, 1980–2000: WHAT HAS CHANGED OVER TIME AND WHY?

By

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To my family for always being there

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LIST OF ABBREVIATIONS

β	Beta
n	Number in a sub sample
N	Total number in a sample
OMB	Office of Management and Budget
p	Probability
PIZA	Population-Interaction Zones for Agriculture
SD	Standard deviation
SE	Standard error
t	Computed value of *t* test
UCR	Uniform Crime Report
z	A standard score; difference between one value in a distribution and the mean of a distribution divided by the SD
ZINB	Zero-inflated negative binomial
ZIP	Zero-inflated Poisson

Abstract of Dissertation Presented to the Graduate School
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Recent research has documented an increase in rural crime, particularly violent crime, over the past two decades. While the relationship between community structure and crime has received a large amount of attention in criminology, most of this research has focused only on urban areas. This study builds on previous works by not only examining the relationship between structural factors and arrests in rural areas, but also by taking into account structural changes that have had a profound effect on rural life over the past few decades (i.e., the industrialization of farming). Using cross-sectional time series regression and pooled time series regression, I estimate the effects of changes in social disorganization and the industrialization of farming on criminal arrests in rural, Midwest counties from 1980 to 2000. Overall, the findings suggest that the industrialization of farming, particularly changes in the number of farms in a county, has had a significant impact on arrests.

CHAPTER 1
INTRODUCTION

Importance of Rural Crime

Rural crime has largely been ignored by criminologists even though 25% of the U.S. population lives in rural areas with populations less than 2,500 (Weisheit & Donnermeyer, 2000). According to the 2000 Census, 56 million people reside in rural areas[1] (Brown & Swanson, 2003). This exceeds the total population of all but 22 of the world's 200 nation states (Brown & Swanson, 2003). But rural crime can no longer be ignored. Out of the 100 highest ranking counties on rates of homicide, 71 are rural (Kposowa, Breault, & Harrison, 1995).

While research on rural crime is growing, most of the research has focused largely on drug use (Diala, Muntaner, & Walrath, 2004; Donnermeyer, Barclay, & Jobes, 2002; Weisheit & Fuller, 2004), domestic violence (Davis, Taylor, & Furniss, 2001; Krishnan, Hilbert, & VanLeeuwen, 2001; Websdale, 1998; Websdale & Johnson, 1998), and community policing (Jobes, 2003, 2002; Liederbach & Frank, 2003; O'Shea, 1999;Weisheit, Wells, & Falcone, 1994). Despite this increased attention, these studies still only make up a small portion of the overall criminological research.

The current study shifts the focus to rural crime. It examines the relationship of rural crime with social disorganization and changes in land use and farm structure (the industrialization of farming). The goal is to estimate the influence of shifts in structural predictors on the increases (or declines) in violent and property crime across rural locales. While structural theories of crime have been prominent in the criminology literature, these have primarily focused on urban[2] areas,

[1] According to the Census, rural is territory, population and housing units not classified as urban.

[2] The Census defines urban as all territory, population and housing units in urbanized areas and in places of more than 2,500 persons outside of urbanized areas. An urbanized area (UA) is an area consisting of a central place(s) and adjacent territory with a general population density of at least 1,000 people per square mile of land area that together has a minimum residential population of at least 50,000.

and it is uncertain whether such theories adequately explain rural crime. Such macro-level theories need to be examined in rural areas to ensure that they are general theories of crime and not urban specific theories (Weisheit & Donnermeyer, 2000).

Recently in criminology there has been an increasing interest in contextual studies. Place is one example of a context, and rural areas may be a different context from urban areas. Cebulak (2004) claims "the context of rural crime, its causes and its characteristics, are so different than for urban crime, we need a separate set of theories to account for rural crime and justice" (p. 72). Some types of crime, such as theft of farm animals or equipment and wildlife crimes, are limited to only rural areas (Cebulak, 2004; Weisheit & Wells, 1999). Furthermore, there are unique features of rural communities that may influence rural crime such as: physical distance and isolation, more informal social control, low mobility and density, higher density of acquaintanceship, mistrust of government, reluctance to seek outside assistance, and factory farms and processing plants (Weisheit & Donnermeyer, 2000; Weisheit & Wells, 1999). For more on the effect of processing plants on rural communities and crime see Broadway (1990).

Rural Crime Today

The image of rural areas being free of crime has persisted despite evidence to the contrary throughout history. There was the lawless West at the end of the 19th Century. There were lynch mobs and the Ku Klux Klan in the South. There were the moonshiners during the Prohibition (Donnermeyer, 1994).

Contrary to common misconceptions, rural crime/deviance is an increasingly important and relevant issue. Nonmetropolitan[3] crime rates have been increasing since 1984 (Rephann, 1999). The Uniform Crime Report (UCR) crime rate in 1991 for rural areas exceeded the 1966

[3] According to the Census, nonmetropolitan refers to the area and population not located in any metropolitan area (MA).

rate for urban areas when the "war on crime" was declared by Congress (Donnermeyer, 1994). Furthermore, while violent crime rates in large cities have declined since the early 1990's, rural violent crime rates have been increasing (Weisheit & Donnermeyer, 2000). Between 1991 and 1997 urban violent crime rates decreased by 531.8 per 100,000, while rural violent rates increased by 37.9 per 100,000 (Weisheit & Donnermeyer, 2000).

Suicide rates are also higher in rural areas (Butterfield, 2005). In the most rural counties, the incidence of suicide with a gun is greater than the incidence of murder with guns in major cities (Butterfield, 2005). From 1989 to 1999, the risk of dying from a gunshot was the same in rural and urban areas. The difference was who pulled the trigger (Butterfield, 2005).

The types of rural crime and deviance are also unique. Driving under the influence (DUI's) are more common in rural areas, and rural youth are more likely to use cigarettes or smokeless tobacco (Weisheit & Donnermeyer, 2000). In addition over the past 20 years, rural youth alcohol use has matched or exceeded that of urban youth. Similarly, nonmetropolitan 12th graders in 1995 had higher use rates for crack cocaine, stimulants, barbiturates, and tranquilizers than did their metropolitan counterparts (Weisheit & Donnermeyer, 2000). Drug manufacturing, particularly for methamphetamine, is of increasing concern in rural areas. Missouri had more methamphetamine lab seizures than any other state in 1997, with most of the seizures occurring in rural areas (Weisheit & Donnermeyer, 2000). Such findings were repeated in research that showed there were 300 times more methamphetamine lab seizures in Iowa in 1999 than in New York and New Jersey combined (Eagan, 2002).

Why the Midwest?

The current study is limited to the Midwest[4] region for two primary reasons. First, from 1985-1991, violent and property crime in rural areas in the Midwest increased more so than in urban areas (Donnermeyer, 1994). During this time, aggravated assault increased nearly 50%, and the homicide rate in rural Indiana in 1991 was slightly higher than the homicide rate for urban Indiana (Donnermeyer, 1994). In 1991, total crime index rates for rural areas in the Midwest ranged from a low of 954.5 per 100,000 in North Dakota to a high of 3012.5 per 100,000 in Michigan.

Second, the study was also limited to the Midwest due to the interest in looking at the relationship between industrialization of farming and crime. The farm crisis of the 1980's affected certain types of farms more than others (Brasier, 2005). A significant number of these farms were concentrated in the Midwest and Plains (Leistritz & Eckstrom, 1988). Furthermore, the Midwest states analyzed here have all three scales of farming as identified by Wimberley (1987) – smaller family farming, larger family farming, and industrial farming (Crowley & Roscigno, 2004).

Research Questions

The purpose of this study is to explore in more depth the relationship between social disorganization, industrialization of farming, and offending in rural areas. By focusing on these dynamics at the structural level, a number of key research questions are addressed in this work, including the following:

1. Has rural crime (as measured by arrests) changed in the Midwest over the past two decades?

[4] See Appendix A for a list of the Midwest states

2. What is the impact of social disorganization on arrests in rural counties in the Midwest?

3. What is the impact of the industrialization of farming on arrests in rural counties in the Midwest?

Summary

This study seeks to fill a gap in the existing criminological literature both by focusing on rural crime (which is understudied) and by conducting a structural analysis that incorporates important changes in rural life (industrialization of farming). It is one of only a few empirical studies of rural crime at the structural level. It is one of only a few rural crime analyses that are longitudinal and informed by social disorganization theory. This dissertation will consist of six chapters. Chapters 2 and 3 provide the theoretical background and literature review, as well as, the basis for the hypotheses. Chapter 4 describes the data and statistical procedures utilized. Chapter 5 provides the results from the multivariate analyses. Finally, Chapter 6 provides concluding remarks and directions for future research, as well as suggests application and policy implications.

CHAPTER 2
SOCIAL DISORGANIZATION THEORY

Social Disorganization in Urban Areas

In the past 20 years there has been a renewed interest in social disorganization theory. Social disorganization theory has its roots in Chicago as it rapidly urbanized. Park and Burgess (1925) emphasized the importance of looking at natural areas and their characteristics. Areas are considered to be functioning and changing organisms. Burgess (1925) suggested that cities expand and grow outward in concentric circles from the core of the city - zone one. Zone two is the transition zone. It is generally the oldest and poorest zone. The third zone consists of workers' homes. The fourth zone is the residential zone and consists of single family housing, and finally the fifth zone is the commuter zone or suburbs. Mobility is constantly occurring in all of these zones as new people move to the city and current residents try to move outward into a different zone. The zones are displayed in Figure 2-1.

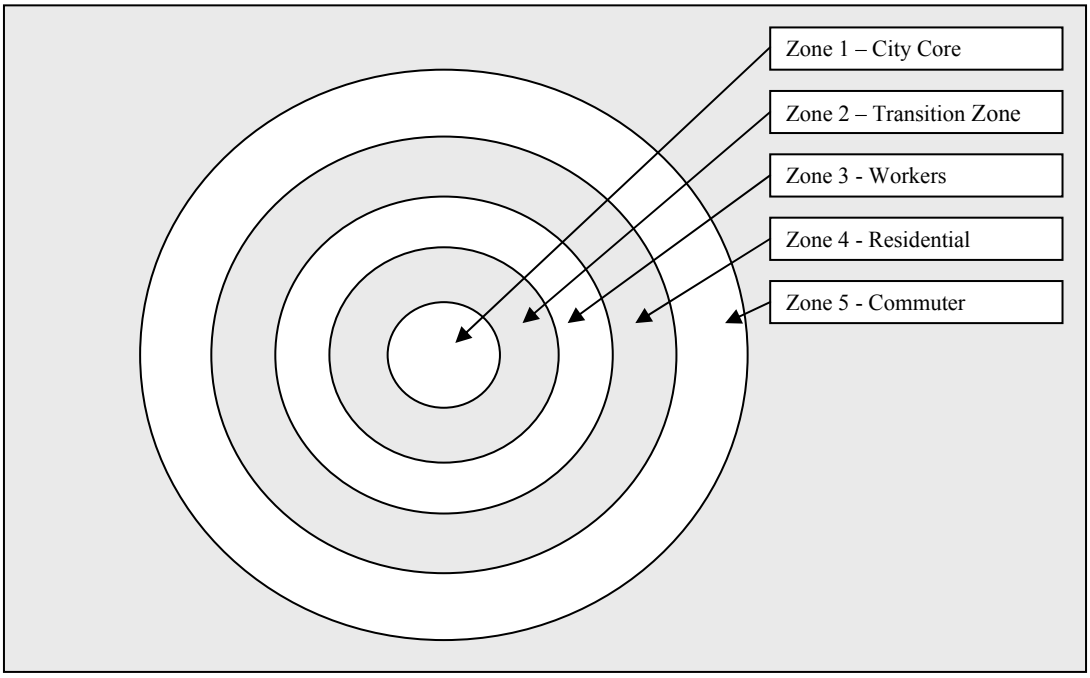

Figure 2-1. Burgess's zones for city growth

In *Juvenile Delinquency and Urban Areas,* Shaw and McKay (1942) examined juvenile delinquency in Chicago. Their main argument was that 1) poor economic status, 2) population heterogeneity, and 3) residential mobility lead to social disorganization. Social disorganization in turn leads to breakdowns in conventional attachments and informal and formal control and therefore results in more crime. More recently, it has been suggested that family disruption (Sampson, 1987; Sampson & Groves, 1989) and population size and density (Mayhew & Levinger, 1976) also contribute to social disorganization. The key theoretical concepts of social disorganization theory are displayed in Figure 2-2. Several studies have examined social disorganization theory and have found support for the theory in urban areas (Kposowa, Breault, & Harrison, 1995; Lee, Maume, & Ousey, 2003; Petee & Kowalski, 1993; Sampson, 1991; Sampson & Groves, 1989). These studies are discussed below.[1]

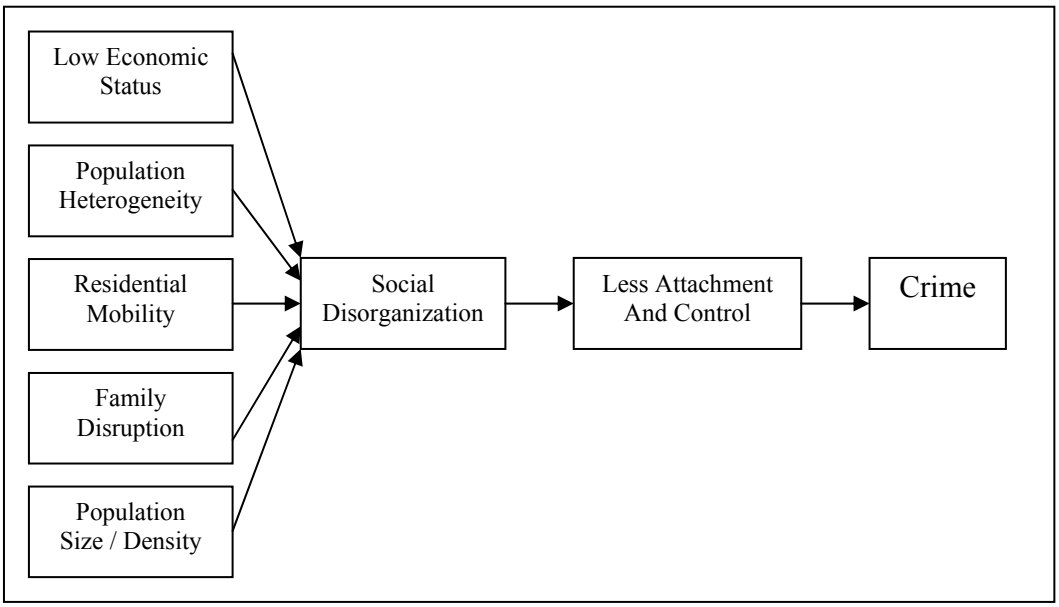

Figure 2-2. Basic theoretical model of social disorganization theory

[1] See Appendix B for a summary of urban social disorganization studies cited here.

Urban Empirical Findings

Sampson and colleagues have conducted several studies on social disorganization theory. Sampson (1987) examined the relationship between family disruption and crime. Using 1980 homicide and robbery rates for 171 cities, he found family disruption, and housing density to be related to juvenile robbery, and family disruption, population size, and housing density were related to adult robbery. Family disruption was also found to be related to adult homicide. Furthermore, family disruption and population size were also related to black juvenile homicide, and region and city size were associated with black adult homicide.

Sampson and Groves (1989) expanded the research on social disorganization theory. Unlike previous studies, they measured the levels of social organization within communities besides using the standard structural indicators of social disorganization. Based on data from the 1982 British Crime Survey (N =10,905 individuals, N = 238 localities), they found family disruption, urbanization, and ethnic heterogeneity to be associated with attachment to peers, specifically with more disorderly peer groups. Urbanization was negatively associated with friendship networks, and socioeconomic status was positively related to organizational participation. Further analysis revealed that the structural measures of social disorganization were mediated by the community organization measures. In other words, community disorganization (as measured by sparse local friendship networks, unsupervised teenage peer groups, and low organization participation) accounts for much of the effect of socioeconomic status, residential mobility, family disruption, and ethnic/population heterogeneity on crime. In an extension of the previous study, Sampson (1991) analyzed data from the 1984 British Crime Survey (N = 11,030 individuals, N = 526 polling districts) and found that residential stability has a direct effect on community-based social ties, or attachments, which in turn increases the level of community cohesion.

In yet another study, Sampson, Raudenbush, and Earls (1997) tested whether concentrated disadvantage (low economic status) and residential instability/mobility decrease collective efficacy and whether collective efficacy in turn explains the relationship between neighborhood disadvantage and crime. Collective efficacy is "defined as social cohesion among neighbors combined with their willingness to intervene on behalf of the common good" (p. 918). They interviewed 8,782 residents of 343 neighborhood clusters in Chicago. The results indicated that the effects of concentrated disadvantage and residential instability on violence were mediated in a large part by collective efficacy.

Consistent with social disorganization theory, Kposowa, Breault, and Harrison (1995) examined crime in counties with a population larger than 100,000 ($N = 408$) and found poverty (low economic status) to be a significant predictor of violent crime. Church membership (attachment) and divorce (family disruption) were significant predictors of property crime. When examining crime in all counties ($N = 3,076$), the strongest predictor of property crime was urbanity, but percent black and percent Hispanic (population heterogeneity), population change, and unemployment (low economic status) were also significant. Predictors of violent crime in the total county sample were percent black and percent Hispanic (population heterogeneity), church membership (attachment), and population density. When examining homicide in the large counties ($N = 408$), they found percent black (population heterogeneity), Gini coefficient[2], divorce rate (family disruption), and population change to be the strongest predictors. Contrary to social disorganization theory though, they found poverty (low economic status) to be significantly related to less homicide.

[2] The Gini coefficient is used by the federal government to document income inequality in the United States. The measure represents the proportion of the population with different income categories. The index ranges from 0 to 1 where 0 reflects complete equality and 1 represents complete inequality (Coulter, 1989).

Lee, Maume, and Ousey (2003) also examined the relationship between socioeconomic disadvantage and poverty on the homicide rate average from 1990-1992 in 778 metropolitan counties. Unlike Kposowa and colleagues (1995), Lee and colleagues (2003) did find poverty concentration to be significant and positively related to homicide. Disadvantage was also found to be significant and positively related to homicide.

Land, McCall, and Cohen (1990) also examined the structural correlates of homicide rates across time – 1960, 1970, and 1980 – and across space – cities, SMSA's,[3] and states. While not specifically testing social disorganization theory, they did find support for the indicators of social disorganization. Resource deprivation (low economic status) was associated with higher homicide rates across all the time periods and locations. In addition, population structure – an index of population size and density – and percent divorced (family disruption) were also related to homicide across most of the models.

Summary

Overall, there is much support for social disorganization theory. There are, however, inconsistencies in terms of which social disorganization indicators are significant and for which types of offenses. Furthermore, some studies have findings opposite of what social disorganization theory would suggest. For instance when looking at the predictors of homicide in metropolitan counties, Kposowa and colleagues (1995) found poverty (low economic status) to be significant but in the negative direction; however, Lee and colleagues (2003) found poverty concentration (low economic status) to have a significant positive effect on homicide in metropolitan counties.

[3] This acronym has changed over time. It was SMA beginning in 1949, changed to SMSA in 1959, and then changed to MSA in 1983. MSA refers to a metropolitan statistical area. It is a geographic entity defined by the federal Office of Management and Budget for use by federal statistical agencies, based on the concept of a core area with a large population nucleus, plus adjacent communities having a high degree of economic and social integration with that core.

Social Disorganization in Rural Areas

Most research on social disorganization has focused on urban areas; however, social disorganization theory can also be applied to rural areas. The structural conditions usually associated with social disorganization are not unique to urban areas. In fact, nonmetropolitan poverty rates have exceeded metropolitan poverty rates every year since poverty was first officially measured in the 1960s (Rural poverty at a glance, 2004). Throughout the 1980s, the rural poverty rate exceeded the urban rate by over five percent (Brown & Swanson, 2003). In fact, 500 rural counties have consistently had poverty rates in excess of 20% over the past four decades (Brown & Swanson, 2003). In addition, the 2003 unemployment rate was 5.8% in nonmetropolitan areas and 6.0% in metropolitan areas (Rural America at a glance, 2004). Albrecht and colleagues (2000) examined how poverty levels in rural America have been affected by industrial transformation. Using 1990 census data on 2,390 nonmetropolitan counties, they argue that Wilson's (1987) model for the inner city underclass can be used to understand increased levels of rural poverty and the growth of the rural underclass (for more on rural ghettos see Davidson, 1996).

Population mobility is also an issue in rural areas. While 74% of the 2,303 nonmetropolitan 1993 counties gained in population from 1990 to 2000, there were still widespread losses in the Great Plains[4] and Western Corn Belt[5] regions, and large segments of the Heartland continue to lose people and institutions (Brown & Swanson, Ch 1, 2003) Over 1,000 nonmetropolitan counties have lost population since 2000, primarily counties in the Great Plains, but there are also fast growing nonmetropolitan recreational counties in the South and

[4] The Great Plains is a geographically and environmentally defined region covering parts of ten states: Montana, North Dakota, South Dakota, Nebraska, Wyoming, Kansas, Colorado, Oklahoma, Texas, and New Mexico.

[5] The Corn Belt is an agricultural region of the central United States primarily in Iowa and Illinois but also including parts of Indiana, Minnesota, South Dakota, Nebraska, Kansas, Missouri, and Ohio.

West and the growth of the Hispanic population has contributed to nonmetropolitan county population growth in the West, South, and Midwest (Rural America at a glance, 2004). Population turnaround in rural counties has been linked to a variety of social problems including problems in education, community solidarity, heath care, social welfare, and crime (Price & Clay, 1980).

Other features of social disorganization are also present in rural areas. Seventeen percent of nonmetropolitan residents are minorities, and 15% of nonmetropolitan families are headed by a single female (Jolliffe, 2003). Snyder and McLaughlin (2004) found that poverty in nonmetropolitan areas closely resembles that in central cities. The risk of poverty for female-headed families and subfamilies with children is significantly higher for those living in nonmetropolitan areas compared with those living in central cities and suburban areas.

Rural Empirical Findings

A few empirical studies of social disorganization in rural areas have provided some support for social disorganization theory[6] (Barnett & Mencken, 2002; Kposowa, Breault, & Harrison, 1995; Lee, Maume, & Ousey, 2003; Osgood & Chambers, 2000; Petee & Kowalski, 1993). Petee and Kowalski (1993) tested social disorganization theory on violent crime rates in 630 rural counties from 1979-1980. They found residential mobility to have the greatest impact on violent crime followed by single-parent households (family disruption), and then racial heterogeneity (population heterogeneity). Barnett and Mencken (2002) applied social disorganization theory to violent and property crime rates circa 1990 in 2,254 nonmetropolitan counties. They found resource disadvantage (low economic status) to have a significant positive

[6] See Appendix C for a summary of rural social disorganization studies cited here.

effect on violent crime, and population change was significant and positively related to property crime.

While Kposowa, Breault, and Harrison (1995) did not specifically test social disorganization theory, they did incorporate standard measures of social disorganization when examining the structural correlates of crime in rural counties (N = 1,681). They found population change to be significant and positively related to both violent and property crime. Church membership (attachment), divorce rate (family disruption), and percent Native American (population heterogeneity) were also found to be significant predictors of violent crime, and percent Hispanic (population heterogeneity) was found to be a significant predictor of property crime. Contrary to social disorganization theory though, poverty (low economic status) was not found to be a significant predictor of violent or property crime. They did, however, find poverty (low economic status), divorce rate (family disruption), and population change all to be significant when only examining homicide in the small counties.

Lee, Maume, and Ousey (2003) found poverty (low economic status) not significant when examining the average homicide rate from 1990-1992 in 1,746 nonmetropolitan counties. They did find a significant and positive relationship between disadvantage and homicide though.

Osgood and Chambers (2000) also found no meaningful relationships between indicators of economic status, poverty, or unemployment on the juvenile violent crime arrest rate in 264 rural counties. Consistent with social disorganization theory they did find residential instability (mobility), female headed households (family disruption), and ethnic heterogeneity (population heterogeneity) to be associated with juvenile arrests.

Jobes, Barclay, Weinand, and Donnermeyer (2004) also found none of their economic measures to be significant when examining crime rates in 123 rural LGA's[7] in Australia. In support of social disorganization theory, though, they did find residential instability (mobility) and family instability (disruption) to be associated with higher rates of crime. Higher proportions of indigenous people (population heterogeneity) were also associated with higher rates of assault and with "break and enter" crimes.

Arthur (1991) examined the socioeconomic predictors of violent and property crime in 13 rural Georgia counties from 1975-1985. He found that indicators of low economic status (the percent of the population below poverty, the percent of families receiving aid, unemployment) and percent black (population heterogeneity) predict both violent and property crime. Contrary to most findings at the urban level, however, he found the variables to be better predictors of rural property crime than of rural violent crime.

Summary

Based on the review of the literature, there are numerous inconsistencies in the findings when examining social disorganization in urban areas. Likewise, it appears these inconsistencies in the findings persist when applying social disorganization theory to rural areas, especially when examining economic disadvantage indicators. Barnett and Mencken (2002) found resource disadvantage to have a significant positive impact on violent crime. Kposowa and colleagues (1995), however, did not find poverty to be a significant predictor of violent crime arrests in rural areas, but they did find poverty to be predictive of homicide rates. When Lee and colleagues (2003) examined rural homicide rates, they found poverty to be nonsignificant. Osgood and

[7] LGA' is a local government area. It is a term used in Australia to refer to areas controlled by each individual local government.

Chambers (2000) also found no meaningful relationships between the indicators of economic status, poverty, or unemployment on juvenile arrests.

Conclusion

Consistent with social disorganization theory, I propose that the measures of social disorganization will have a positive effect on rural arrests for crime. As indicated in this chapter, numerous studies have found some support for social disorganization indicators in predicting crime in both urban cities and in nonmetropolitan counties.

H1: Increases in social disorganization will be related in increases in arrests in rural areas.

CHAPTER 3
THE INDUSTRIALIZATION OF FARMING

The industrialization of farming refers to the transformation whereby farms have become larger in scale and have declined in number (Drabenstott & Smith, 1996; Lobao, 2000; Stofferahn, 2006). Due to technology changes in the 1950s and 1960s, the number of farms decreased from 5.8 million in 1945 to only 2.3 million in 1974 (Albrecht, 1997; National Agricultural Statistics Service, 2002). Industrialization accelerated again during the farm crisis of the 1980's. By 1992, the number of farms across the country had declined to 1.9 million (Brasier, 2005).

Industrial restructuring in urban areas has been argued as a mechanism for the concentrated disadvantage and violence found in urban areas (Massey et al., 1993, 1994; Wilson, 1987, 1996). Likewise, similar relationships may be found between industrialized farming and rural crime. While several scholars (Ousey, 2000; Parker, 2004; Shilhadeh & Ousey, 1998) have examined the relationship between industrial restructuring and crime in urban areas, little research has examined this relationship in rural areas.[1]

The Farm Crisis and Industrialization in the Midwest

The farm crisis of the 1980s was the result of a multitude of factors including: a worldwide recession that reduced demand for farm exports, low farmland values, lower incomes, and large amounts of debt (Brown & Swanson, Ch 11, 2003). Farmers and communities in the Midwest were hit particularly hard. By 1989, 39% of Midwest farmers faced serious financial

[1] Lee and Ousey (2001) examined the relationship between small manufacturing, economic deprivation, and crime rates in nonmetropolian counties. They found that in counties where there were more small manufacturing firms, crime rates were lower.

problems (Lansley et al, 1995). Between 1982 and 1992, the feed and grain region[2] lost 17.3% of its farms (Brasier, 2005). Over the last two decades farms in the Heartland states[3] have declined by one-fourth while increasing in average size by one-fourth to about 750 acres (Barkema & Drabenstott, 1996).

Iowa was the hardest hit of the Midwest States. Net farm income in Iowa went from $17,680 in 1981 to $7,366 in 1982 to $-1,891 in 1983 (Davidson, 1996, p. 17). Between 1982 and 1987, 27% of Iowa hog farmers went out of business. The economic shock of the farm crisis trickled down to the communities that depended on the farmers: retail sales declined by 25% in the 1980s; bankruptcies among Iowa businesses rose 46% in 1985 alone; and poverty more than doubled in Iowa from 1979-1985 (Davidson, 1996). Perhaps Jacobsen said it best: "It's not really a farm crisis at all. It's a rural community crisis, and if you understand it in that way, it's even scarier." (quoted in Davidson, 1996, p. 53).

While the term "ghetto" has historically been associated with urban areas and minorities, the farm crisis and industrialization led to the rise of the rural ghetto in the Midwest. "The word ghetto speaks of the rising poverty rates, the chronic unemployment, and the recent spread of low-wage, dead-end jobs. It speaks of the relentless deterioration of health-care systems, schools, road, buildings, and of the emergence of homelessness, hunger, and poverty…" (Davidson, 1996, p. 158).

[2] The feed and grain region is a Land Resource Region defined by the Natural Resources Conservation Service and includes 514 counties in Minnesota, South Dakota, Nebraska, Kansas, Oklahoma, Iowa, Illinois, Wisconsin, Missouri, Indiana, Michigan, and Ohio (Brasier, 2005).

[3] Heartland states include Colorado, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, and Wyoming (Barkema & Drabenstott, 1996; Lobao, 2000). More than two-thirds of the country's farming-dependent counties are located in these states (Lobao, 2000)

The Goldschmidt Hypothesis

Goldschmidt (1947) suggested that changes in farm structure, particularly a decline in the number of farms and an increase in farm size, has an adverse effect on communities. Likewise, it has been suggested that large, corporate farming[4] has a negative effect on communities (Goldschmidt, 1978; MacCannell, 1988).

In his classic study of two agricultural towns in California in 1944 – Arvin and Dinuba – Goldschmidt (1978) found lower socio-economic conditions in the community dominated by large-scale industrial farms. On the other hand, the family-farming community had higher levels of community participation, economic well-being, and business activity. Goldschmidt concluded that "quality of social conditions is [negatively] associated with scale of operations; that farm size is in fact an important causal factor in the creation of such differences, and that it is reasonable to believe that farm size is the most important cause of these differences" (Goldschmidt, 1946, p. 114). Hayes and Olmstead (1984) criticize, however, that the two towns of Arvin and Dinuba were not as closely matched research sites as intended.

Essentially the Goldschmidt hypothesis (1978) claims that levels of social, economic and political well being are lower in localities with more large scale, non-family farming. "In its most rudimentary form, the hypothesis posits that the emergence of large-scale farming is related to the decline of family farming and associated measurable consequences for community decay" (Durrenberger & Thu, 1996, p. 410).

Empirical Findings on Industrialization and Community Decay

Industrialized farming has been linked to a number of consequences for communities including: greater income inequality, greater poverty, higher unemployment, declines in local

[4] It should be noted though that some family farms may decide to incorporate because of family farmers' interests in estate planning, limited liability, and income tax advantages (Lobao, 2000).

population, increases in crime rates, less civic participation, less democratic decision making, etc (for example see Heady & Sonka, 1974; Marousek, 1979; Skees & Swanson, 1988). While several studies have found support for the Goldschmidt hypothesis (see for instance Buttel & Larson, 1979; Crowley & Roscigno, 2004; Durrenberger & Thu, 1996; Goldschmidt, 1978; Lyson, Torres, & Welsh, 2001; Peters, 2002), some have only found mixed support (Gilles & Dalecki, 1988; Harris & Gilbert, 1982; Lobao-Reif, 1987), and others have found no support for the hypothesis (Barnes & Blevins, 1992; Heaton & Brown, 1982). Some of these more recent studies are discussed in more detail below.[5]

One of the most comprehensive and recent studies on the effects of industrialization on community well-being was that by Lobao (1990). She examined the relationships between farm scale and farm organization on community outcomes in 3,037 counties in 1970 and 1980. Industrialized farming was related to higher income inequality at both time frames. It was also related to lower family income and higher poverty. These are all variables that social disorganization theory posits relate to crime.

Another comprehensive study is that by Crowley (1999). She studied the effects of farm concentration on community well-being in 1,053 counties in the North Central region[6]. She found that in counties where farm sector concentration[7] is higher, so too are poverty and income inequality, and education is lower. Similar results were found in Crowley and Roscigno's (2004) study.

[5] Refer to Appendix D for a complete list of studies on industrialized farming and community decay.

[6] The North Central region includes the states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Ohio, North Dakota, South Dakota, and Wisconsin (Crowley, 1999).

[7] Farm sector concentration means that a few large farms hold a disproportionate share of farm property in a county (Crowley, 1999).

Peters (2002) also found support for the notion that the industrialization of farming has negative consequences. In his study of 278 nonmetropolitan counties in Iowa, Kansas, and Missouri in 2000, he found that greater employment in meat processing and greater employment in industrial agriculture results in worse socio-economic conditions for children[8].

Similarly, Durrenberger and Thu (1996) also found negative consequences. They examined the industrialization of hog farming in all 99 Iowa counties. Their results indicated that the industrialization of hog farming is indeed related to a decline in well-being. In this case, industrialization was linked to an increase in food stamp usage.

Gilles and Dalecki (1988) examined industrialization in nonmetropolitan counties in the Corn Belt and Great Plains regions[9]. Using 1950 and 1970 census data and 1949 and 1969 census of agriculture data, they found mixed support for the Goldschmidt hypothesis. Contrary to expectations, they found that increases in the percentage of large (Class 1) farms were associated with high levels of socio-economic well-being rather than low levels. Consistent with the Goldschmidt hypotheses though, an increase in the number of hired farm laborers (corporate farming structure) was related to negative consequences (i.e. lower socio-economic status).

One of the only studies to include crime rate as an indicator of community welfare was conducted by Lyson and colleagues (2001).They analyzed the relationship between scale of agriculture[10], civic engagement (attachment) and community welfare in 433 agriculture dependent counties. The four dependent community welfare variables were: 1) the percent of

[8] His index for children at risk included: the percent of children enrolled in free and reduced lunch programs; the percent of infants born with low birth weight; births to female teenagers; and the high school dropout rate (Peters, 2002).

[9] The Corn Belt and Great Plains are two of the land-resource regions of the United States. Both the Great Plains and the Corn belt are characterized by single-family farms that produce grain and livestock.

[10] Large scale farming was measured by combining three variables: 1) the percentage of agricultural sales in a county accounted for by farms with sales of $500,000 or more, 2) the percentage of farm operators in a county that reside off their farms, and 3) the percentage of tenant farmers in a county.

families in poverty, 2) unemployment rate, 3) percentage of low birth weight babies in a county, and 4) violent crime rate. They found large scale farming was related to well-being; however, the relationship was mediated by level of civic engagement (attachments) and the strength of the middle class. Large scale farming was also related to violent crime. Violent crime rates were significantly higher in the counties dominated by large scale farming and significantly lower in the counties with a strong independent middle class.

Conclusion

Consistent with the Goldschmidt hypothesis, I propose that the industrialization of farming will have a positive effect on arrests for crime in rural communities. As indicated in this chapter, numerous studies have linked industrialized farming to a variety of community consequences including: greater income inequality, greater poverty, higher unemployment (Skees & Swanson, 1998; Welsch & Lyson, 2001), decline in local population (Goldschmidt, 1978; Heady & Sonka, 1974), increases in crime rates, less civic participation (Goldschmidt, 1978), etc.

H2: The industrialization of farming will be related to an increase in arrest levels in rural areas.

CHAPTER 4
DATA AND METHODOLOGY

Sources of the Data

In order to achieve the goals of this study, and to address the complexity of the issue, data were obtained from multiple sources. Uniform Crime Report (UCR) County Level Arrest Data from 1981-1983, 1991-1993, and 2001-2003 were used to measure the dependent variables. Summary Files One[1] and Three[2] from the 1980, 1990 and 2000 US Census, as well as, the Census of Agriculture[3] from 1978, 1987, and 1997 were the sources of data for the independent variables. In addition, the 1983, 1993 and 2003 Beale Codes were employed to identify the rural sample and the 1980, 1990, and 2000 Population-Interaction Zones for Agriculture (PIZA) were used to identify a rural sub-sample. Both the Beale Codes and the PIZA Codes are provided through the Economic Research Service of the U.S. Department of Agriculture.

Unit of Analysis

The current study uses rural counties as the unit of analysis.[4] Most tests of the Goldschmidt hypothesis use county level data.[5] The definitions of rural are complex and often lacking consistency. There is a debate on whether definitions based on population or those based

[1] Summary File 1 presents 100% population and housing figures for the total population and for race categories. This includes age, sex, households, household relationship, housing units, and tenure.

[2] Summary File 3 presents data on the population and housing long form subjects such as income and education. It includes population totals for ancestry groups. It also included selected characteristics for a limited number of racial/ethnic categories.

[3] The Census of Agriculture is the leading source of statistics about the nation's agricultural production and the only source of consistent, comparable data at the county, state, and national levels. The first agriculture census was conducted in 1840.

[4] Gilles (1980) suggested counties as units of analysis because they "are more homogenous than are states with respect to agricultural production systems" (Gilles, 1980, p. 338). Counties represent the smallest administrative units for which secondary data is available but it is important to note that 1) counties may vary considerably in their dependence on agriculture and 2) the impacts of agrarian change in an agriculture community may be masked by industrial development in a nearby town (Gilles & Dalecki, 1988).

[5] See for instance Barnes and Blevins (1992), Crowley and Roscigno (2004), Durrenberger and Thu (1996), Gilles & Dalecki (1988), Lobao-Reif (1987), Lyson et al (2001), and Peters (2002).

on culture should be used. There is no consensus on either, however. As a result general population size estimates are generally used. The US Census simply defines rural as territory, population and housing units not classified as urban. In order to be considered urban by the census the area has to contain at least 2,500 people. Previous studies that have examined crime in rural areas have used counties as the unit of analysis, and have also relied on the rural-urban continuum codes, otherwise known as the Beale codes.

Sample

The sample is limited to non-metropolitan counties in the Midwest. The sample is limited to counties in the Midwest due to the interest in looking at changes in land use, particularly changes in farming practices and the industrialization of farming. The farm crisis of the 1980s affected certain types of farms more than others (Brasier, 2005). A significant number of farms were concentrated in the Midwest and Plains (Leistritz & Eckstrom, 1988). In addition, limiting the region to the Midwest "provides some control for regional variation in historical and contemporary structural and ecological conditions that may influence the precise way in which processes examined here play out at the local level" (Crowley & Roscigno, 2004, p. 140).

Whether a county is classified as non-metropolitan is based on the 1983, 1993, and 2003 Beale Codes provided by the USDA (see Appendix E). There are 1,055 counties in the Midwest. Of those, 860 were non-metropolitan in 1983, 834 in 1993, and 770 in 2003.[6] In order to be included in the current study, the county needed to be classified as non-metropolitan across all three time periods. This reduced the sample size to 757 counties. Due to limited UCR reporting by Illinois across the years, Illinois counties were omitted from the sample. This reduced the sample from 757 rural counties to 692. Another 96 rural counties across the Midwest were

[6] For a breakdown of the number of metropolitan and non-metropolitan counties by state and year see the table in Appendix F.

omitted in order to create a balanced data set[7] resulting in a final sample size of 596 counties at each of the three decade time points (1980, 1990, and 2000). To see which counties are included in the final sample size of 596, please refer to the maps in Appendix G.

Sub-Sample

The Population-Interaction Zones for Agriculture (PIZA Codes) were employed to create a sub-sample to control for the interactions between urban-related population and farm production activities. These codes consist of a four-category classification: (1) rural, little or no urban-related population interaction, (2) low population interaction, (3) medium population interaction, and (4) high population interaction. To create the sub-sample, the final sample ($N = 596$) was limited to only those counties that were classified as (1) rural, little or no urban-related population interaction across all three time periods (1980, 1990, and 2000). This created a sub-sample of 519 counties that was used for some analyses in this study.[8]

Measures

Dependent Variables

The current study has four dependent variables derived from the UCR County Level Arrest Data.[9] The four dependent variables are the UCR total crime index, the Part 1 crime index, the

[7] In a balanced data set each time series is the same length and has the same set of points. In other words, the 596 counties included in the final sample had complete data for all three time points, not just one or two time points.

[8] The 77 counties not included in the sub sample are as follows: (Indiana) Blackford, Cass, Decatur, Fayette, Grant, Henry, Jay, Jefferson, Jennings, Koscuisuko, Larange, Marshall, Montgomery, Noble, Randolph, Ripley, Rush, Steuben, Wabash, and Wayne; (Iowa) Muscatine; (Kansa) Barton, Cowley, Dickinson, Geary, McPherson, Pottatomie, Reno, Riley, and Saline; (Michigan) Shiawassee; (Minnesota) Goodhue, Le Sueur, McLeod, Norman, Pennington, Rice, and Wilikin; (Missouri) Cape Girardeau, Johnson, and St Francois; (Nebraska) Adams, Hall, Saline, and Scotts Bluff; (North Dakota) Richland, Rolette, Traill, and Wand; (Ohio) Ashland, Athens, Champaign, Clinton, Darke, Fayette, Hardin, Highland, Hocking, Holmes, Huron, Logan, Marion, Muskingum, Ross, Sandusky, Scioto, Seneca, Shelby, Tuscarawas, Wayne, and Williams; (South Dakota) Brown, Davison, and Lawrence; (Wisconsin) Dodge, Jefferson, and Walworth.

[9] The limitations of using UCR data are well known: it only represents crimes which come to the attention of law enforcement; agency participation is voluntary; etc. In addition, there were two major changes to the UCR county-

violent crime index, and the property crime index for each year. The dependent variables consist of three year averages[10] in arrests for each county as reported in 1981-1983, 1991-1993, and 2001-2003 UCR arrest data.[11] Using lagged three year averages is consistent with the work of Lyson et al. (2001). Counts of rare events often fluctuate substantially from year to year. Using an average over multiple years helps to provide a more reliable estimate (Lee, Maume, & Ousey, 2003).

UCR total crime index count is a grand total of the number of arrests. It includes non-index crimes such as fraud, gambling, forgery, and prostitution. The part one crime index count includes arrests for: murder, rape, robbery, aggravated assault, burglary, larceny, motor vehicle theft, and arson. The violent crime total is an index of arrests for murder, rape, robbery, and aggravated assault. The property crime total is an index of arrests for burglary, larceny, motor vehicle theft, and arson. In all the models, I offset for the log of the population (Agresti, 1996; Allison, 1999) thereby essentially creating a rate for the dependent variables.

Independent Variables

Social disorganization indicators

Standard measures of social disorganization are used in this study.[12] They include (1) residential mobility, (2) the percent living below poverty (low economic status), (3) the percent

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level files that were implemented starting in 1994, so comparisons before and after 1994 must be interpreted with caution.

[10] Iowa data are a two year average for 1992-1993 time period because Iowa did not report UCR data in 1991 due to switching to NIBRS. In addition, Wisconsin data are a two year average for 2002-2003 because no data were reported in 2001.

[11] Common to use multiple years to create crime averages when doing macro-level research (Lee & Ousey, 2001).

[12] All of the social disorganization indicators were calculated from Summary Files One and Three of the US Census from 1980, 1990, and 2000.

black (population heterogeneity), and (4) the percent Hispanic (population heterogeneity). The measures of social disorganization utilized in this study are defined below.

Residential mobility. The first measure of social disorganization is residential mobility. Consistent with numerous other studies (for example see Lee & Ousey, 2001; Lee, Maume, & Ousey, 2003; Miethe, Hughes, & McDowall 1991; Osgood & Chambers, 2000), residential mobility is calculated by dividing the number of people ages 5 and over that lived in a different house in a given year by the total number of people ages 5 and over. This is then multiplied by 100 to obtain the percent. For example:

$$\left[\frac{(\text{Population} \geq 5 \text{ years of age that lived in a different house in 1995})}{(\text{Population} \geq 5 \text{ years of age})}\right] \times 100$$

Percent living below poverty. For the current study, the percent of the population living below poverty[13] is based on the number of individuals for whom poverty status was determined[14] in a given year with incomes below the poverty line divided by the total population for whom poverty status was determined in a given year. The result is then multiplied by 100 to obtain the percent. For example:

$$\left[\frac{(\text{Population for whom poverty status was determined in 1999 with incomes below poverty level})}{(\text{Total population for whom poverty status was deterermined in 1999})}\right] \times 100$$

Percent black. Several studies have measured racial heterogeneity as the percent of the population that is black (Kposowa, Breault, & Harrison, 1995; Lee & Bartkowski, 2004). This is

[13] The Census Bureau uses a set of money income thresholds that vary by family size and composition to detect who is poor. If the total income for a family or unrelated individual falls below the relevant poverty threshold, then the family (and all members of the family) or unrelated individual is classified as being below the poverty level.

[14] Poverty status was determined for all people except institutionalized people, people in military group quarters, people in college dormitories, and unrelated individuals under 15 years old.

calculated by dividing the black population for a given year by the total population for a given year. This is then multiplied by 100 to obtain the percent. For example:

$$\left[\frac{(2000\ \text{Black Population})}{(2000\ \text{Population}}\right]\times 100$$

Percent Hispanic. While most studies on urban areas include percent black or percent minority as a measure of social disorganization, the current study is more interested in the percent Hispanic. Many Hispanic immigrants have settled in the rural Midwest to work in meatpacking and food processing due to the restructuring of the meat processing industry in the 1980s (Baker & Hotek, 2003). Including the Hispanic population is consistent with the work of Kposowa and colleagues (1995). It is important to look at the Hispanic population because Hispanics account for 25% of the nonmetropolitan population growth between 1990 and 2000. In addition, around 90% of all nonmetropolitan counties experienced Hispanic population growth in the 1990s, and the Hispanic population is growing faster than all other ethnic and racial groups in rural America (Kandel & Newman, 2004). Without the growth of the Hispanic population during the 1990s, many rural counties would have lost population (Kandel & Cromartie, 2004). This measure is computed by dividing the Hispanic population for a given year by the total population for that year. This is then multiplied by 100 to obtain the percent. For example:

$$\left[\frac{(2000\ \text{Hispanic Population})}{(2000\ \text{Population}}\right]\times 100$$

Industrialization of farming indicators (scale)

Goldschmidt (1947) suggested that changes in farm structure, particularly a decline in the number of farms and an increase in size, has an adverse effect on community well-being. Likewise, it has been suggested that large, corporate farming has a negative effect on

communities (Goldschmidt, 1978; MacCannell, 1988). Because of this the following measures of land use have been included in the current study.

Number of farms. Goldschmidt (1947) suggested that a decline in the number of farms has negative effects on well-being. When farms decrease in number and increase in size, employment opportunities are reduced this then affects the viability of communities (Marousek, 1979). This variable is simply measured as the number of farms in a county in a given year as reported in the Census of Agriculture.[15]

Average farm size.[16] Average farm size refers to the average farm size in acres for a given year (1978, 1987 and 1997) in each county as reported in the Census of Agriculture. The average number of acres has been used traditionally to measure farm size (Buttel & Larson, 1979; Flora & Flora, 1988; Green, 1985; Heaton & Brown, 1982; Skees & Swanson, 1988; Van Es et al, 1988). This variable is simply measured as the average size of farm in acres in a given county in a given year as reported by the Census of Agriculture.

[15] The Census of Agriculture defines a farm as any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the census year. The definition has changed 9 times since 1850. This current definition has been in place since the 1974 Census.

[16] According to the Census of Agriculture, "The acreage designated as 'land in farms' consists primarily of agricultural land used for crops, pasture, or grazing. It also includes woodland and wasteland not actually under cultivation or used for pasture or grazing, provided it was part of the farm operator's total operation. Large acreages of woodland or wasteland held for nonagricultural purposes were deleted from individual reports during the processing operations. Land in farms includes acres in the Conservation Reserve and Wetlands Reserve Programs. Land in farms is an operating unit concept and includes land owned and operated as well as land rented from others. Land used rent free was to be reported as land rented from others. All grazing land, except land used under government permits on a per-head basis, was included as land in farms provided it was part of a farm or ranch. Land under the exclusive use of a grazing association was to be reported by the grazing association and included in land in farms. All land in American Indian reservations used for growing crops or grazing livestock was to be included as land in farms. Land in reservations not reported by individual American Indians or non-Native Americans was to be reported in the name of the cooperative group that used the land. In many instances, an entire American Indian Reservation was reported as one farm." (Census of Agriculture, 1997, definition of "Land in Farms").

Industrialization of farming indicators (structure)

Scale alone does not capture the organizational features of industrialized farming since family farms may now be large scale due to advances in technology. Most large farms are operated by owners who are sole proprietors (Reimund et al, 1987). Therefore, organizational measures of industrial farming structure are also needed (Lobao, 2000). They are as follows:

Percent hired labor. Hired labor is considered a measure of corporate farming structure. Barnes and Blevins (1992) and Brasier (2005) measured this by using the percent of farms with hired labor.[17] Similarly, the current study also measures this by using the percent of farms with hired labor.[18] This is calculated by dividing the number of farms that use hired labor in a given year by the total number of farms for that year. This is then multiplied by 100 to obtain a percent. For example:

$$\left[\frac{(\text{Number of Farms in 1997 with Hired Labor})}{(\text{Total Number of Farms in 1997})}\right]\times 100$$

Percent corporate farms.[19] Another measure of industrial structure is the percent of farms that are corporate farms. This includes both family held and non-family held corporations. This is calculated by dividing the total number of farms identified as corporations in a given year (as listed in the Census of Agriculture) by the total number of farms for that year. This is then multiplied by 100 to obtain a percent. For example:

[17] Others have used the number of hired farm workers (Gilles & Dalecki, 1988; Lobao-Reif, 1987; Wimbereley, 1987).

[18] According to the Census of Agriculture, hired farm and ranch labor includes regular workers, part-time workers, and members of the operator's family if the received payments for labor.

[19] All farms in the Census of Agriculture are classified by four type of organization: 1) individual or family (sole proprietorship), excluding partnership and corporation, 2) partnership, including family partnership, 3) corporation, includes family corporations, and 4) other, cooperative, estate or trust, institutional, etc.

$$\left[\frac{(\text{Total Number of Farms Classified as Corporations in 1997})}{(\text{Total Number of Farms in 1997})}\right]\times 100$$

Controls

The current study controls for the elderly population and for the state. In addition, a control for time is also included in the time-series models.[20]

Percent elderly. In several Midwest counties, the percent of the population over the age of 65 represents a significant portion of the total population. Rural areas are aging rapidly as young adults leave. For example, in 1987 Iowa ranked 4th in the country in terms of the percent of the population over the age of 65 (Davidson, 1996). In 1998, the elderly constituted 15% of the rural population nationwide resulting in declining populations and tax bases while increasing demand for medical and social services (Rogers, 2000).

For the current study, the percent elderly is based on the number of individuals 65 and over in a given year divided by the total population in a given year. This result is then multiplied by 100 to obtain the percent. For example:

$$\left[\frac{(\text{Population} \geq 65 \text{ years of age})}{(\text{Total Population})}\right]\times 100$$

State. A dummy variable was created for the Midwest states included in the sample. This is done "to capture scale effects caused by state-level farm and economic policies" (Brasier, 2005, p. 549). States have different policies regarding anti-corporate farming laws. Dummy variables were created for 10 states (k-1 states), with Kansas being the omitted state (Lewis-Beck, 1990).

[20] The current study does not control for government subsidies because the Census of Agriculture did not start collecting that information until 1987.

Time. Consistent with previous research modeling change (Cohen & Cohen, 1983; Gilles & Dalecki, 1988), time is included as a control variable. This is because observed change may be the result of unreliable measures (Gilles & Dalecki, 1988). Dummy variables were created for 1990 and 2000 (k-1 time periods), with 1980 being the reference period (Lewis-Beck, 1990).

Descriptives

The means and standard deviations for the variables are presented in Table 4-1 for the three different time points (1980, 1990, and 2000). When examining the dependent variables, we notice that both UCR total arrests and violent crime arrests increased from 1980 to 1990 to 2000. UCR total arrests had a mean of 499.5850 (*SD* = 632.874) in 1980, 678.3659 (*SD* = 948.565) in 1990, and 875.2448 (*SD* = 1166.573) in 2000. Violent crime arrests had a mean of 9.2405 (*SD* = 13.223) in 1980, 14.9221 (*SD* = 23.874) in 1990 and 19.2811 (*SD* = 28.031) in 2000.

In regards to the social disorganization indicators, the percent black and the percent Hispanic both increased from 1980 to 1990 to 2000; however, residential mobility and the percent living below poverty fluctuated across the three time periods. In addition, there is also a decline in the number of farms across the three time periods. At the same time, there is an increase in the average size of farms and the percent of farms that are corporations across the three time points.

Table 4-2 reports the paired sample *t*-test values to show whether the variable means are significantly different between 1980 and 2000. All of the variables have significantly different means except for one. Beginning with the key dependent variables in the study, the mean arrests significantly increased for total UCR crimes and for violent crimes. However, mean arrests for property crime significantly declined between 1980 and 2000, and there was no significant change in the means of Part 1 arrests.

When examining the indicators of social disorganization, the means for percent black and the percent Hispanic significantly increased from 1980 to 2000; whereas the means for residential mobility and poverty significantly decreased. Furthermore, the mean number of farms significantly decreased from 1980 to 2000; while the average size of farms and the percent of farms that are corporations significantly increased.

Multicollinearity

The bivariate correlation matrices for both the sample and the sub-sample are presented in Appendix H for 1980, 1990, 2000, and for all three time points combined. Generally if a correlation is .5 or greater multicollinearity is a problem, but there is no definitive rule for this. When examining the correlation matrices for the full sample there are some correlations that are in fact greater than .5. For example, residential mobility and the percent of the population that is elderly have correlation values of -.503 in 1980, -.549 in 1990, and -.697 in 2000

To verify that multicollinearity is not a problem, variance inflation factor values were calculated for the variables included in the models. Variance inflation factors indicated how much the variance of a coefficient is increased due to collinearity (Ott & Longnecker, 2001, p. 652). The variance inflation factor is designated by

$$VIF = 1 / (1 - R^2)$$

where R^2 refers to how much of the variation in one independent variable is explained by the others (Ott & Longnecker, 20001, p. 709). It is generally accepted that a variance inflation factor greater than four indicated multicollinearity (Fisher & Mason, 1981, p. 109); however, some suggest that a value of 10 or greater indicates multicollinearity (Pindyck & Rubinfeld, 1998; Ott & Longnecker, 2001, p. 652). Table 4-3 displays the variance inflation factor values for the independent variables included in the models. None of the variables have a variance inflation

factor greater than four. This is also true when looking at the variance inflation factors for the sub-sample (Appendix I).

Analytical Plan

Cross-Sectional Analyses

Cross-sectional regression models will be utilized to capture the impacts of social disorganization and industrialization of farming on crime in the rural Midwest at three different time points – 1980, 1990, and 2000. Poisson based regression will be used to examine the structural correlates of offending in the Midwest counties.[21] Low arrest counts may be common in the data since the study is looking at counts in rural counties. Poisson based techniques take into account the problem of the relatively low arrest counts (Osgood, 2000).

Negative binomial regression models will be used because they allow for overdispersion (Gardner et al, 1995; Osgood, 2000). Count data often have overdispersion, with the variance exceeding the mean (Agresti, 2002). Poisson forces the variance to equal the mean whereas the negative binomial distribution has

$$\mathrm{E(Y)} = \mu \quad \mathrm{Var(Y)} = \mu + (\mu^2 / k)$$

where $1/k$ is called the dispersion parameter. Comparing the sample mean and variance of the dependent count variable provides a simple indication of overdispersion (Cameron & Trivedi, 1998).

The negative binomial model, however, usually under predicts the amount of zero counts in the dependent variable. Due to the large number of zero counts, zero-inflated negative binomial regression models will also be employed. Zero-inflated models account for overdispersion due to excess zero counts (Cameron & Trivedi, 1998; Min & Agresti, 2002).

[21] While most prior studies on aggregate crime rates have used OLS regression models, this is problematic when low crime counts are common in the data (Lee & Ousey, 2001; Osgood, 2000).

Since the zero-inflated Poisson model (ZIP) assumes that the mean equals the variance, zero-inflated negative binomial models (ZINB) are more likely to be appropriate (Min & Agresti, 2002). While uncommon in criminology (for an example see Robinson, 2003), zero-inflated negative binomial regression (ZINB) is common in public health research (for an example see Chin & Quddus, 2003). In all the models, I offset for the log of the population (Agresti, 1996; Allison, 1999) thereby essentially creating a rate for the dependent variables.

Pooled Cross-Sectional Time Series Analyses

Multivariate models are also utilized to capture the impacts of changes in social disorganization and industrialization of agriculture on changes in crime in the rural Midwest across time (from 1980 to 2000). The current study employs pooled cross-sectional time series regression as the primary technique for modeling change in this research. A variety of methods for modeling change exist in the social sciences (Allison, 1990; Firebaughh & Beck, 1994; Kessler & Greenberg, 1981). Pooled cross-sectional time series allows the researcher "to capture variation across different units in space, as well as variation that emerges over time" (Sayrs, 1989, p. 7). Pooling the data is useful when the length of the time series is abbreviated and can boost sample size (Sayrs, 1989).

There are several ways for analyzing time series panel data. Researchers commonly use fixed effects and/or random effects methods to analyze panel data. The current study will employ a fixed effects model. Since this study seeks to evaluate the effects of change in a covariate on the change in arrests within a given county, the fixed effects estimator is appropriate because it expresses variables only in terms of change within a unit (Parker, 2004; STATA, 2003). The fixed effect model also controls for all included and omitted time invariant variables (Allison, 1994; Johnson, 1995).

In addition, the Hausman specification test (1978) was used to verify that the fixed effect model is the appropriate technique for the current study. This tests whether or not the coefficients estimated by the more efficient random effects model are the same as those estimated by the fixed effects model (Greene, 2000; Hausman, Hall, & Griliches, 1984; Hsaio, 1986; Maddala, 1983). If the results of the Hausman chi-square test are insignificant, then it is acceptable to use the random effects specification in the model. If the test yields a significant p value, then fixed effects is the more appropriate model. As indicated in the next chapter, all of four of the pooled time-series models use the fixed effects specification. The Hausman chi-square test was significant in all four cases.

Table 4-1. Descriptive statistics (means with standard deviations in parentheses)

	Time 1 - 1980	Time 2 - 1990	Time 3 - 2000	All 3 Times
UCR total arrests	499.5850 (632.874)	678.3659 (948.565)	875.2448 (1166.573)	684.0874 (953.320)
Part 1 total arrests	98.8258 (127.906)	114.0922 (168.191)	103.8541 (142.642)	105.5793 (147.215)
Violent crime arrests	9.2405 (13.223)	14.9221 (23.874)	19.2811 (28.031)	14.4724 (22.934)
Property crime arrests	89.5584 (117.883)	99.1689 (149.131)	84.5649 (119.893)	91.0948 (129.807)
Number of farms	875.89 (476.603)	779.44 (414.169)	682.67 (366.072)	779.50 (428.579)
Average size of farms (acres)	571.77 (740.794)	597.9 (664.958)	659.58 (698.682)	609.69 (702.802)
% Corporations	2.0048 (2.075)	3.1541 (2.686)	4.7993 (3.727)	3.3172 (3.126)
% Hired labor	39.8500 (9.009)	40.1373 (9.704)	35.6219 (9.718)	38.5386 (9.699)
% Black	.6335 (1.933)	.7424 (2.043)	.8878 (2.025)	.7544 (2.002)
% Hispanic	.9033 (1.679)	1.1818 (2.413)	2.4661 (4.571)	1.5160 (3.207)
Residential mobility	40.6336 (7.142)	37.4766 (6.992)	38.0765 (6.220)	38.7321 (6.931)
% Poverty	13.7299 (4.616)	14.3969 (4.771)	11.3530 (4.055)	13.1609 (4.675)
% Elderly	15.9182 (3.691)	18.0515 (4.017)	17.8071 (3.965)	17.2567 (4.007)
N	596	593[a]	593[b]	1782[c]

Notes: (a) 3 cases missing, (b) 3 cases missing, (c) 6 cases missing

Table 4-2. T-test scores for change from 1980 to 2000 ($N = 591$)

	Mean 1980	Mean 2000	Mean Diff	*t*
UCR total arrests	501.9532	874.9980	-373.0448	-13.043***
Part 1 arrests	99.3799	103.9430	-4.5632	-1.602
Violent arrests	9.2414	19.2484	-10.0071	-10.896***
Property arrests	90.1120	84.658	5.4261	2.174**
Number of farms	883.13	684.90	198.23	33.185***
Average size of farms	575.00	661.09	-86.10	-9.956***
% Corporations	2.0218	4.8156	-2.7938	-27.338***
% Hired labor	39.9966	35.6672	4.3294	12.349***
% Black	.6376	.8880	-.2504	-8.512***
% Hispanic	.9065	2.4684	-1.5619	-11.265***
Residential mobility	40.6210	38.0892	2.5317	14.207***
% Poverty	13.7293	11.3222	2.4072	16.553***
% Elderly	15.9198	17.8216	-1.9018	-19.677***

* $p < .10$ ** $p < .05$ *** $p < .01$

Table 4-3. Variance inflation factor values for independent variables included in all models

	Time 1 - 1980	Time 2 - 1990	Time 3 - 2000	All 3 Times
Number of farms	1.619	1.677	1.598	1.653
Average size of farms	2.338	1.901	2.119	1.969
% Corporations	2.506	2.122	2.181	2.380
% Hired labor	1.460	1.542	1.681	1.555
% Black	1.327	1.368	1.342	1.339
% Hispanic	1.637	1.636	1.541	1.540
Residential mobility	1.814	2.066	2.225	2.020
% Poverty	1.608	1.461	1.451	1.527
% Elderly	2.416	2.430	2.476	2.424
Indiana	1.876	1.771	1.732	1.725
Iowa	2.325	2.353	2.281	2.217
Michigan	2.183	2.106	2.001	2.008
Minnesota	2.199	2.103	1.970	1.998
Missouri	1.949	1.986	2.024	1.952
Nebraska	2.044	1.988	2.018	1.958
North Dakota	2.101	1.991	1.836	1.866
Ohio	1.921	1.921	1.938	1.876
South Dakota	1.928	1.698	1.615	1.676
Wisconsin	1.940	1.903	1.925	1.856
1990 dummy				1.525
2000 dummy				2.127

CHAPTER 5
RESULTS

This chapter presents the results from the regression models for the cross-sectional analyses and for the pooled time-series analyses. In all the models, I offset for the log of the population thereby essentially creating a rate for the dependent variable.

Cross-Sectional Analyses

Tables 5-1 through 5-3 present the negative binomial and zero-inflated negative binomial regression coefficients, Z scores, and standard errors for the 1980, 1990, and 2000 arrest models. The social disorganization variables are grouped at the top of the tables, followed by the industrialization of farming indicators, and then the controls. Those models that used ZINB instead of negative binomial regression are indicated in the table notes. As discussed in Chapter 4, zero-inflated models account for overdispersion due to excess zero counts (Cameron & Trivedi, 1998; Min & Agresti, 2002). The ZINB model is more appropriate if the Vuong test is significant. For example, when looking at the 1980 cross sectional results (Table 5.1), the violent crime model uses the ZINB regression and had a Vuong test value of 6.32 ($p < .01$).

When examining the social disorganization indicators, the percent black is significant and positively related to: all four arrest models in 1980; Part 1 arrests and violent crime arrests in 1990; and Part 1, violent, and property arrests in 2000. In other words, in 1980 for example, a one unit increase in the percent black resulted in a 2.54% increase in UCR total arrests, a 4.68% increase in Part 1 arrests, a 6.83% increase in violent arrests, and a 4.21% increase in property arrests.[1] Percent Hispanic is also positive and significant in several models: Part 1 arrests and violent arrest in 1980; violent arrests in 1990; and all four models in 2000. As expected,

[1] Exponentiating the parameter estimates, subtracting one, and multiplying this result by one hundred returns the percentage increase in the arrest rate for a unit increase in a given independent variable (Lee et al, 2003).

residential mobility is also positively significant in all but two of the models (violent arrests 1980 and violent arrests 1990).

While the percent living below poverty is significantly related to arrests in several of the models, it is in the opposite direction as expected (i.e., greater amounts of poverty resulted in less crime, instead of in more crime as social disorganization theory would predict). For example when examining property crime arrests in 1980, a one unit increase in poverty results in a 3.80 percent decrease in property arrests. While this finding is contrary to social disorganization theory, it is not surprising if one looks at prior research.

There is mixed support for the notion that the industrialization of agriculture results in more crime in a county. As expected, a decline in the number of farms results in an increase in criminal arrests in two of the models (violent arrests 1980 and violent arrests 2000). Likewise the percentage of farms that are corporate farms is positively related to arrests (i.e. more corporate farms, more crime), in three of the models (violent arrests 1990, part 1 arrest 2000, and property arrests 2000). For instance, in 1990, a one unit increase in the percentage of corporate farms corresponds with a 3.64 percent increase in violent crime arrests.

The percent of farms that use hired labor is significant in several of the models, but it is in the opposite direction as expected. As the percent of farms with hired labor increases, arrests significantly decrease. This may be because this measure is more a proxy of economics or employment in a county than it is a proxy of corporate farming structure, especially since the measure of hired labor includes both part-time workers and family members.

Pooled Time-Series Analyses

Table 5-4 presents the overall means, as well as the overall, between, and within sample standard deviations for the indicators included in the time-series models. For example, there was

an overall mean of 776.939 farms from 1980 to 2000. The overall mean size of those farms was 609.688 acres.

Table 5-5 presents the findings from the pooled time-series multivariate models. These results are discussed below. Results from the sub-sample are available in Appendix I, and are similar to those presented here on the full sample. As discussed in chapter four, all models employ a fixed-effects specification since this study seeks to evaluate the effects of change in a covariate on the change in the dependent variable within a given county. In addition, results from the Hausman Test (also provided in Table 5-5) indicate that the fixed-effects model is the more appropriate technique than the random-effects model.

There is no support for the first hypothesis that increases in social disorganization indicators from 1980 to 2000 are related to increases in arrests over the past two decades. Contrary to expectations, as the black population increased over time within a county, it was significantly related to a decline in crime in two of the models (total UCR arrests and violent crime arrests within a county). Likewise, the increase in the Hispanic population from 1980 to 2000 within a county was also significantly related to a decline in one model (total UCR arrests) and was insignificant in the other models. Also contrary to social disorganization theory, residential mobility is inversely related to Part 1 arrests and property arrests (i.e., as residential mobility increased within a county over time, arrests declined), and the percent below poverty is insignificant across all four arrest models.

There is some support for the second hypothesis that increases in the industrialization of farming from 1980 to 2000 will be related to an increase in arrests over the past two decades. As expected, based on the Goldschmidt hypothesis, a decline in the number of farms over the past two decades within a county is significantly related to an increase over time in total UCR arrests,

Part 1 arrests, violent crime arrests, and property crime arrests within a county. In addition, increases in the average farm size over the past two decades are related to increases in total UCR arrests; however, average farm size is insignificant in the other three models. Changes in the indicators of industrial structure (percent of corporate farms and the percent of farms with hired labor) within a county from 1980 to 2000 though have no significant effect on changes in arrests over time across any of the four models.

Summary

Overall, I find mixed support for the hypotheses presented in Chapters 2 and 3. There is support for social disorganization theory when examining cross-sectional data. However, when examining the pooled time-series data, all of the social disorganization indicators that are significant are in the opposite direction of what the theory posits. In terms of the industrialization of farming, the decline in the number of farms is significantly related to increases in arrests in both the cross-sectional and pooled time series analyses.

Table 5-1. 1980 cross-sectional negative binomial and ZINB regression results (and z-scores)

	UCR Total	Part 1	Violent[a]	Property
% Black				
β	.0250933*	.0457475***	.0660362***	.0412246***
Z	(1.74)	(3.43)	(4.88)	(3.02)
SE	.014425	.0133293	.0135437	.0136546
% Hispanic				
β	.0107253	.0298051*	.0566827***	.0214435
Z	(0.59)	(1.70)	(2.99)	(1.19)
SE	.0181989	.0175532	.0189863	.0179563
Residential mobility				
β	.0287212***	.0317195***	.0080715	.0333057***
Z	(6.20)	(7.21)	(1.56)	(7.38)
SE	.0046309	.0043996	.0051706	.0045134
% Below poverty				
β	-.0189387***	-.0340157***	-.0010628	-.0387894***
Z	(-2.99)	(-5.57)	(-0.14)	(-6.19)
SE	.0063357	.0061049	.0075486	.0062692
Number of farms				
β	-.0000694	-.0000779	-.0003423***	-.0000551
Z	(-1.11)	(-1.32)	(-5.16)	(-0.91)
SE	.0000625	.0000588	.0000664	.0000603
Average farm size				
β	.0000633	.0000283	.0001255	.0000233
Z	(1.23)	(0.55)	(1.51)	(0.44)
SE	.0000514	.0000515	.0000832	.0000526
% Corporate farms				
β	-.0138931	-.0193353	-.0163732	-.0184973
Z	(-0.75)	(-1.14)	(-0.77)	(-1.07)
SE	.0186021	.0170279	.0212093	.0173618
% Hired labor				
β	-.00417	-.0028328	-.0113462***	-.0010906
Z	(-1.34)	(-0.95)	(-3.35)	(-0.35)
SE	.0031077	.0029901	.0033829	.0031001
% Elderly				
β	-.0324052***	-.0139942	-.0282118**	-.0124708
Z	(-3.28)	(-1.45)	(-2.42)	(-1.25)
SE	.0098752	.009662	.0116421	.0100098
Indiana				
β	-.0447772	-.1210811	-.7255734***	-.04694
Z	(-.038)	(-0.87)	(-4.61)	(-0.33)
SE	.1467518	.1384799	.1573106	.141822
Iowa				
β	.1001402	.1707421*	-.3428275***	.232111**
Z	(0.94)	(1.68)	(-2.85)	(2.23)
SE	.1066709	.1014366	.1201236	.1038772

Note: (a) ZINB regression model, 42 zero observations
* $p < .10$ ** $p < .05$ *** $p < .01$

Table 5-1. Continued

	UCR Total	Part 1	Violent[a]	Property
Michigan				
β	.2098717*	.2199783*	-.2220428*	.2646281**
Z	(1.74)	(1.89)	(-1.66)	(2.21)
SE	.120291	.11644	.1336461	.1195077
Minnesota				
β	.0198837	.2701722**	-.4883436***	.3568799***
Z	(0.17)	(2.47)	(-3.76)	(3.18)
SE	.1138318)	.1095618	.1299759	.1122905
Missouri				
β	-.0502783	.0681471	-.1103503	.1091818
Z	(-0.43)	(0.62)	(-0.90)	(0.97)
SE	.116745	.1095643	.1227679	.1123728
Nebraska				
β	.132694	-.0117065	-.5377586***	.0670898
Z	(1.27)	(-0.12)	(-4.14)	(0.65)
SE	.1044673	.1002855	.1298453	.1027791
North Dakota				
β	.4591505***	-.0500258	-.8469451***	.0521982
Z	(3.632)	(-0.40)	(-4.72)	(0.41)
SE	.1267906	.123539	.1794992	.126729
Ohio				
β	-.1230941	-.1353041	-.6459574***	-.0600823
Z	(-0.89)	(-1.04)	(-4.41)	(-0.45)
SE	.1379608	.130319	.1463151	.1333017
South Dakota				
β	.5606135***	.2548966*	-.1452041	.2868504**
Z	(3.94)	(1.92)	(-0.92)	(2.11)
SE	.1421578	.1325453	.1581768	.1359079
Wisconsin				
β	.5798815***	.6261943***	-.0013974	.6884086***
Z	(4.78)	(5.45)	(-0.01)	(5.85)
SE	.1213114	.1149615	.1319821	.1176409
Constant	-4.19807***	-6.118062***	-6.659407***	-6.392144***
Log Likelihood	-3832.4292	-2803.6708	-1505.243	-2745.3832
N	596	596	596	596
Maximum Likelihood R2	0.307	0.353	0.771	0.348
Vuong Test			6.32***	

Note: (a) ZINB regression model, 42 zero observations

* $p < .10$ ** $p < .05$ *** $p < .01$

Table 5-2. 1990 cross-sectional negative binomial and ZINB regression results (and z-scores)

	UCR Total	Part 1[a]	Violent[b]	Property[c]
% Black				
β	.0160837	.0296571*	.0540349***	.0221252
Z	(0.97)	(1.79)	(3.34)	(1.29)
SE	.0165502	.0165594	.0162886	.0171746
% Hispanic				
β	.0119532	.0160838	.0271923*	.0133176
Z	(0.88)	(1.10)	(1.68)	(0.91)
SE	.0135176	.0145569	.0161515	.0147016
Residential mobility				
β	.0321487***	.0426218***	.0101884	.0459214***
Z	(5.84)	(7.03)	(1.50)	(7.27)
SE	.0055017	.006066	.0068036	.0063149
% Below poverty				
β	.0005098	-.0147774**	-.0019339	-.0167824**
Z	(0.08)	(-2.09)	(-0.25)	(-2.27)
SE	.006365	.0070736	.0076473	.0074045
Number of farms				
β	.0000637	.0000326	-.0001183	.0000314
Z	(0.80)	(0.38)	(-1.35)	(0.36)
SE	.0000798	.0000854	.0000874	.0000883
Average farm size				
β	-.0001238**	-.0000854	.0000467	-.0001005
Z	(-2.18)	(-1.18)	(0.53)	(-1.31)
SE	.0000567	.0000725	.0000885	.0000769
% Corporate farms				
β	.0175035	.0133845	.0357684**	.0109586
Z	(1.30)	(0.90)	(2.18)	(0.71)
SE	.0134393	.0148367	.0164239	.0154099
% Hired labor				
β	-.0062207*	-.0054329	-.0079184**	-.0048024
Z	(-1.90)	(-1.54)	(-2.11)	(-1.31)
SE	.0032772	.0035197	.0037615	.0036643
% Elderly				
β	-.0397267***	-.0319535***	-.0332394***	-.0301594***
Z	(-3.94)	(-2.87)	(-2.65)	(-2.60)
SE	.0100956	.0111395	.0125487	.0116052
Indiana				
β	-.5763356***	-.7456477***	-.9016025***	-.7209942***
Z	(-3.77)	(-4.60)	(-5.25)	(-4.30)
SE	.1530174	.1620066	.1717994	.1676722
Iowa				
β	-.2122415*	-.5159315***	-.718623***	-.4618421***
Z	(-1.86)	(-4.21)	(-5.37)	(-3.61)
SE	.1139715	.1226892	.1337438	.1280505

Notes: (a) ZINB regression model, 11 zero observations; (b) ZINB regression model, 45 zero observations, (c) ZINB regression model, 16 zero observations

* $p < .10$ ** $p < .05$ *** $p < .01$

Table 5-2. Continued

	UCR Total	Part 1[a]	Violent[b]	Property[c]
Michigan				
β	-.0387671	-.1561611	-.4141667***	-.1216386
Z	(-0.30)	(-1.14)	(-2.90)	(-0.85)
SE	.1287002	.1375001	.142736	.1429338
Minnesota				
β	.1425462	.2142951*	-.103461	.2592412**
Z	(1.21)	(1.70)	(-0.78)	(1.98)
SE	.1176641	.1259467	.1332107	.1307571
Missouri				
β	-.5292951***	-.5146341***	-.6062202***	-.4942074***
Z	(-4.26)	(-3.91)	(-4.38)	(-3.62)
SE	.1241697	.1317162	.1384507	.1365464
Nebraska				
β	.0131272	-.2004512*	-.8256106***	-.1024361
Z	(0.12)	(-1.71)	(-6.09)	(-0.84)
SE	.1084458	.1170202	.1356763	.1215456
North Dakota				
β	-.3623152***	-.2512866*	-1.474432***	-.0665682
Z	(-2.78)	(-1.71)	(-6.75)	(-0.44)
SE	.1303431	.146607	.2185654	.1525086
Ohio				
β	-.545606***	-.8251643***	-1.431436***	-.6808622***
Z	(-3.70)	(-5.25)	(-8.62)	(-4.15)
SE	.1472986	.1572415	.1660642	.1642018
South Dakota				
β	.3805642***	-.0407468	-.5477135***	.0544558
Z	(2.68)	(-0.27)	(-3.28)	(0.35)
SE	.1430652	.1488112	.1672262	.1552585
Wisconsin				
β	.6256112***	.4610953***	-.2568768*	.5644702***
Z	(4.84)	(3.35)	(-1.77)	(3.95)
SE	.1292432	.1377935	.1450342	.1430194
Constant	-3.859042***	-5.914251***	-6.345573***	-6.255604***
Log Likelihood	-3939.8617	-2847.904	-1724.54	-2756.862
N	593	593	593	593
Maximum Likelihood R2	0.376	0.813	0.784	0.810
Vuong Test		2.84***	4.94***	3.62***

Notes: (a) ZINB regression model, 11 zero observations; (b) ZINB regression model, 45 zero observations, (c) ZINB regression model, 16 zero observations

* $p < .10$ ** $p < .05$ *** $p < .01$

Table 5-3. 2000 cross-sectional negative binomial and ZINB regression results (and z-scores)

	UCR Total	Part 1[a]	Violent[b]	Property[c]
% Black				
β	.0183299	.0372741***	.0498169***	.0352867**
Z	(1.42)	(2.63)	(3.99)	(2.33)
SE	.0128977	.0141532	.0124749	.0151287
% Hispanic				
β	.0062945	.0132311**	.0169453***	.0129998*
Z	(1.07)	(1.99)	(2.56)	(1.87)
SE	.0058897	.0066414	.0066116	.0069509
Residential mobility				
β	.037127***	.0418651***	.0180735***	.0441429***
Z	(7.13)	(6.97)	(3.00)	(6.87)
SE	.0052099	.0060102	.0060173	.0064288
% Below poverty				
β	-.0024032	-.0089238	.0107717	-.014825*
Z	(-0.38)	(-1.19)	(1.44)	(-1.85)
SE	.0063605	.0075102	.007468	.0080016
Number of farms				
β	-.0000589	-.0000447	-.0001425*	-8.93e-06
Z	(-0.80)	(-0.55)	(-1.87)	(-0.10)
SE	.000074	.0000817	.0000763	.0000874
Average farm size				
β	-.0000348	-9.73 e -06	.000065	-9.17e-06
Z	(-0.73)	(-0.16)	(0.84)	(-0.14)
SE	.0000475	.000061	.0000778	.000066
% Corporate farms				
β	.0093193	.0163152*	.0143156	.0173596*
Z	(1.10)	(1.68)	(1.45)	(1.68)
SE	.0084702	.0097062	.0098431	.0103511
% Hired labor				
β	-.0092552***	-.0106454***	-.0161049***	-.0096868***
Z	(-3.25)	(-3.31)	(-5.06)	(-2.81)
SE	.0028467	.0032202	.0031827	.0034509
% Elderly				
β	-.0162742**	-.0124079	-.0151966	-.010138
Z	(-1.93)	(-1.25)	(-1.46)	(-0.95)
SE	.008449	.0099279	.0103982	.0106574
Indiana				
β	.1145506	.4137682***	.0752734	.5075558***
Z	(0.91)	(2.94)	(0.55)	(3.40)
SE	.1263315	.1405581	.1378586	.1492795
Iowa				
β	.0300274	.3300102***	.3713339***	.32844***
Z	(0.32)	(3.00)	(3.30)	(2.80)
SE	.0950975	.1098655	.1124568	.1174247

Notes: (a) ZINB regression model, 10 zero observations; (b) ZINB regression model, 28 zero observations, (c), ZINB regression model, 14 zero observations

* $p < .10$ ** $p < .05$ *** $p < .01$

Table 5-3. Continued

	UCR Total	Part 1[a]	Violent[b]	Property[c]
Michigan				
β	.304954***	.2175444*	.1673453	.2339188*
Z	(2.87)	(1.81)	(1.40)	(1.82)
SE	.1062637	.1198635	.1195726	.1282095
Minnesota				
β	.3167465***	.6323428***	.2459167**	.7417164***
Z	(3.25)	(5.68)	(2.17)	(6.23)
SE	.097591	.1112658	.1134081	.1190155
Missouri				
β	.0839006	.5390233***	.5949907***	.5298716***
Z	(0.79)	(4.52)	(5.15)	(4.17)
SE	.1064908	.1191321	.1154466	.1270982
Nebraska				
β	.2217144**	.18977*	-.184996	.3114538***
Z	(2.36)	(1.74)	(-1.52)	(2.66)
SE	.0941129	.1088991	.1214146	.1168814
North Dakota				
β	.4254756***	.4792039***	-.6717096***	.6851137***
Z	(3.97)	(3.77)	(-3.92)	(5.05)
SE	.1071415	.1272027	.1714066	.135647
Ohio				
β	.0292239	.2162578	-.5696397***	.386704***
Z	(0.24)	(1.56)	(-4.16)	(2.63)
SE	.1242349	.1383167	.1369203	.1470037
South Dakota				
β	.3712066***	.2294772*	-.1756508	.361983***
Z	(3.29)	(1.79)	(-1.23)	(2.62)
SE	.1129348	.1284451	.142996	.1381194
Wisconsin				
β	.938421***	1.00269***	.8226698***	1.03885***
Z	(8.46)	(8.05)	(6.66)	(7.85)
SE	.1109036	.1245745	.123463	.1323966
Constant	-4.416545***	-6.959965***	-7.393848***	-7.363348***
Log Likelihood	-4019.9741	-2747.193	-1777.335	-2635.211
N	593	593	593	593
Maximum Likelihood R2	0.350	0.844	0.845	0.833
Vuong Test		2.68***	3.97***	3.27***

Notes: (a) ZINB regression model, 10 zero observations; (b) ZINB regression model, 28 zero observations, (c), ZINB regression model, 14 zero observations

* $p < .10$ ** $p < .05$ *** $p < .01$

Table 5-4. Means and overall, between and within sample standard deviations for indicators included in the time-series models (N = 1788, n = 596, T = 3)

	Overall mean	Overall *SD*	Between *SD*	Within *SD*
UCR total	683.1834	952.263	883.0524	357.6257
Part 1	105.3833	147.0369	138.9387	48.3476
Violent	14.48145	22.95122	19.00135	12.88841
Property	90.88963	129.6461	122.7206	42.00746
Number of farms	776.939	430.1281	418.194	101.5857
Average size of farms	609.688	702.8018	694.0328	108.9772
% Corporations	3.309681	3.126718	2.688989	1.598059
% Hired labor	38.4711	9.813698	8.382787	5.110402
% Black	0.7582758	2.006605	1.971166	.3812051
% Hispanic	1.513976	3.202232	2.772108	1.605711
Residential mobility	38.71674	6.933031	6.395852	2.68436
% Poverty	13.18587	4.747422	4.156911	2.297269
% Elderly	17.25987	4.016864	3.7633331	1.410101

Table 5-5. Pooled cross-sectional time series negative binomial regression results (and z-scores), 1980-2000 (N = 1788, n = 596, T = 3)

	UCR Total	Part 1	Violent	Property
% Black				
β	-.0384619**	-.0275986	-.0446019**	-.021807
Z	(-2.47)	(-1.50)	(-2.02)	(-1.15)
SE	.0155577	.0184092	.0220354	.0189964
% Hispanic				
β	-.0109168**	-.0077867	-.007803	-.0074412
Z	(-2.22)	(-1.46)	(-1.06)	(-1.33)
SE	.0049071)	.0053385	.007334	.0055897
Residential mobility				
β	-.0047676	-.010506**	-.0090004	-.0107304**
Z	(-1.17)	(-2.28)	(-1.41)	(-2.23)
SE	.0040694	.0046076	.0064059	.0048059
% Below poverty				
β	-.0038192	-.0001653	-.0092298	.0024384
Z	(-0.80)	(-0.03)	(-1.16)	(0.41)
SE	.00474843	.0056515	.0079519	.0059016
Number of farms				
β	-.0004975***	-.0006321***	-.0008568***	-.0005653***
Z	(-5.56)	(-6.11)	(-6.57)	(-5.36)
SE	.0000894	.0001034	.0001305	.0001054
Average farm size				
β	.0001968***	.0001467	.0001468	.0001335
Z	(2.86)	(1.41)	(0.90)	(1.28)
SE	.0000689	.0001041	.0001624	.0001046
% Corporate farms				
β	-.0093096	.0018302	-.0036575	.0030338
Z	(-1.25)	(0.20)	(-0.29)	(0.32)
SE	.0074573	.0090768	.0124186	.0095969
% Hired labor				
β	-.0005691	-.0011087	.0008163	-.00124
Z	(-0.31)	(-0.52)	(0.28)	(-0.56)
SE	.0018155	.0021145	.0029352	.0022145
% Elderly				
β	-.0077299	-.015158	.0192787	-.0193308*
Z	(-0.86)	(-1.44)	(1.32)	(-1.77)
SE	.008961	.0105212	.014599	.010904
1990 dummy				
β	.2753487***	.0648994*	.2882677***	.0281988
Z	(8.28)	(1.74)	(5.55)	(0.74)
SE	.0332741	.0372084	.0519842	.0382662
2000 dummy				
β	.4110019***	-.2354687***	.3155274***	-.3192851***
Z	(10.25)	(-4.99)	(4.93)	(-6.53)
SE	.0401147	.0471642	.0639827	.0488635
Indiana				
β	-1.619943***	-1.877463***	-1.48973***	-1.820965***
Z	(-7.23)	(-7.69)	(-5.10)	(-7.41)
SE	.2240569	.2441663	.291956	.245731

* $p < .10$ ** $p < .05$ *** $p < .01$

Table 5-5. Continued

		UCR Total	Part 1	Violent	Property
Iowa					
	β	-.6964233***	-1.30432***	-.7701236***	-1.314879***
	Z	(-4.06)	(-6.57)	(-3.19)	(-6.57)
	SE	.171429	.1985452	.2414295	.2002462
Michigan					
	β	.0002102	-.1848774	.5454879	-.2547243
	Z	(0.00)	(-0.83)	(1.63)	(-1.14)
	SE	.196434	.2219363	.3347629	.2226815
Minnesota					
	β	-.5435243***	-.458451**	.1057826	-.4552677**
	Z	(-3.02)	(-2.17)	(0.37)	(-2.12)
	SE	.18024	.2111221	.2836133	.2150322
Missouri					
	β	-.7893498***	-.9032593***	-.5498497**	-.7903809***
	Z	(-4.27)	(-4.32)	(-2.20)	(-3.72)
	SE	.1848205	.2088467	.2497546	.2122836
Nebraska					
	β	.2703297	.1883918	.4137071	.1895065
	Z	(1.55)	(0.89)	(1.18)	(0.89)
	SE	.1746884	.2106554	.3498637	.2129819
North Dakota					
	β	-1.016781***	-.1732043	-.0936378	-.0138508
	Z	(-5.31)	(-0.67)	(-0.20)	(-0.05)
	SE	.1915442	.2567837	.4699943	.2620215
Ohio					
	β	-.9948173***	-1.365956***	-1.158445***	-1.350391***
	Z	(-4.54)	(-5.55)	(-3.89)	(-5.40)
	SE	.2191897	.2463197	.2975563	.2500489
South Dakota					
	β	-.227901	-.1040513	.374723	-.0662275
	Z	(-1.11)	(-0.43)	(0.97)	(-0.27)
	SE	.2060755	.2398184	.385849	.245903
Wisconsin					
	β	.0169701	.1277944	-.7724992***	.152574
	Z	(0.09)	(0.58)	(-2.94)	(0.68)
	SE	.1969752	.2212581	.2625513)	.2231384
Constant		-6.867052***	-6.294809***	-7.438934***	-6.367896***
Log Likelihood		-7130.389	-4998.8519	-3010.8737	-4835.8573
N Observations/Groups		1781 / 595 [a]	1778 / 594 [b]	1763 / 589 [c]	1778 / 594 [d]
Hausman Test		325.94***	373.69***	205.22***	333.38***

Notes: (a) 1 group (1 observation) was dropped because of only one observation per group; (b)1 group (1 observation) was dropped because of only one observation per groups and 1 group (3 observations) were dropped due to all zero outcomes; (c) 1 group (1 observation was dropped because of only one observation per group and 6 groups (18 observations) were dropped due to all zero outcomes; (d) 1 group (1 observation) was dropped because of only one observation per group and 1 group (3 observations) were dropped due to all zero outcomes.

* $p < .10$ ** $p < .05$ *** $p < .01$

CHAPTER 6
DISCUSSION AND CONCLUSION

The purpose of this research was to explore the dynamics of social disorganization, the industrialization of farming, and criminal arrests across rural counties in the Midwest. This included examining changes in structural conditions and in arrests across rural Midwest counties from 1980 to 2000. Cross-sectional time series analyses were presented in order to evaluate the utility of social disorganization theory and the Goldschmidt hypothesis at explaining arrest rates at three individual points of time (1980, 1990, and 2000). In addition, pooled-time series analyses were also presented in order to evaluate the effectiveness of social disorganization theory and the Goldschmidt Hypothesis at explaining changes in arrests within rural counties over time (1980-2000).

Discussion

In regards to the first research question, there have been changes in crime (as measured by arrests) in the rural Midwest over the past two decades. Most notably, violent crime arrests in the rural Midwest have significantly increased over the past two decades. This is consistent with the claims of other scholars (Donnermeyer, 1994; Rephann, 1999; Weisheit & Donnermeyer, 2000). This continued increase in rural violent crime indicates the necessity to continue studying crime in non-metropolitan areas.

The second research question posed was: What is the impact of social disorganization on arrests in rural counties in the Midwest? The results presented in chapter five find mixed support for social disorganization theory when trying to explain crime at one point in time (1980, 1990, and 2000). The percent black, the percent Hispanic, and residential mobility operated as expected. However, the percent of the population below poverty was related to a decline in crime in several of the models.

There are several possible explanations for these findings in regards to poverty. "The informal economy of the poor may be dominated more by licit activities such as hunting, fishing, selling home-grown vegetables, and repairing farm machinery, than by illicit activities" (Lee et al., 2003, p. 126). It may also be that the poor in rural areas are better suited to deal with economic crises because they have access to more kinship and friendship networks than their urban counterparts.

When looking at the pooled time-series results, increases in the indicators of social disorganization from 1980 to 1990 within a given county do not explain increases in rural crime over time. This may highlight a problem with social disorganization theory's ability to explain trends over time. Other scholars have also found less support for social disorganization theory when examining changes over time (for example, see Miethe, Hughes, & McDowall, 1991). The current findings may also be due to the inability of the theory to explain crime outside of the large, urban context. Several researchers have questioned the applicability of urban theories at explaining rural crime and have suggested the need for the development of criminological theories that explore the rural context (Cebulak, 2004; Weisheit & Wells, 1996).

The third research question was: What is the impact of the industrialization of farming on arrests in rural counties in the Midwest? More particularly, the Goldschmidt hypothesis asserts that a decline in the number of farms and increases in farm size adversely affect rural communities. Overall, there is some indication that the industrialization of farming does influence crime rates both cross-sectionally, and over time. This is especially true when looking at the number of farms within a county. From 1980 to 2000, a decline in the number of farms was significantly related to an increase in criminal arrests within a county. Numerous studies (as mentioned in chapter three) have showed that the decline of family farming has resulted in a

variety of consequences for rural communities. But since it is unlikely that we will see a resurgence in family farming anytime in the near future, perhaps the better question is to explore what factors help mediate the negative consequences of the industrialization of agriculture.

One possible mediator may be attachments. Lyson et al. (2001) found that civic engagement (i.e. the percentage of the population belonging to a church and the percentage of the population voting) mediated the effects of large-scale farm operations. Criminologists have also found that a civic engagement is related to a decline in some types of crime in rural areas (Lee & Bartkowski, 2004a, 2004b) and several other researchers have highlighted the importance of religious institutions to rural civic life (Bartkowski & Regis, 2003; Ellison & Sherkat, 1995; Paerisi et al, 2002). Civic engagement may also enhance the social networks and trust within a community.

Limitations and Future Research

Like all studies, this one is not without limitations. There are numerous limitations with using UCR data. Most notably, the data only present crimes which come to the attention of law enforcement. Under-reporting may be especially true in rural areas where people have less trust in the government, are more reluctant to seek outside assistance, and generally handle problems informally (Cebulak, 2004; Wells & Weisheit, 1996). Also, there was a change in the way UCR county-level files were implemented beginning in 1994, so analysis comparing previous and subsequent years must be interpreted with caution.

In addition, the current study only examined the total counts for crime, as well as the total counts for violent and property offenses. There has been a recent trend in criminology to disaggregate both by specific offense and by gender. One concern with disaggregating by specific offense in rural areas though is that doing so results in a larger number of either very low counts or even zero counts. While zero-inflated statistical models do help, they are not “magic”

(Osgood, 2000; Pridemore, 2005). These models depend on trustworthy data and, the validity of rural crime data at the county level is questionable (Pridmore, 2005).

Finally, the current study was limited to only the Midwest from 1980 to 2000. It would be worth expanding the sample to include other regions as well as earlier data. Changes in land use and the industrialization of farming have been occurring throughout the past century. While the industrialization of farming accelerated during the farm crisis of the 1980s, it also accelerated in the 1950s and 1960s due to advances in technology.

Conclusion

The findings from this study indicate that rural crime can no longer be ignored. Violent crime in rural areas is on the rise. We need to move beyond the myth "that rural areas do not matter, there is no crime there, and consequently they do not deserve much consideration" (Cebulak, 2004, p. 80). Furthermore, in the time series analyses, increases in the percent black and the percent Hispanic were related to decreases in arrests. This finding is contrary to most criminological research and further highlights the importance of why we need to continue exploring crime within the rural context. Until we can understand rural crime, "the usefulness of national crime control policies will be limited" (Weisheit & Wells, 1996, p. 395).

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APPENDIX A
MIDWEST STATES

INDIANA

IOWA

KANSAS

MICHIGAN

MINNESOTA

MISSOURI

NEBRASKA

NORTH DAKOTA

OHIO

SOUTH DAKOTA

WISCONSIN

Note: Illinois was omitted from the final sample due to limited UCR reporting

APPENDIX B
SUMMARY OF STUDIES CITED EXAMINING STRUCUTRAL CORRELATES OF CRIME IN URBAN AREAS

Table B-1. Summary of articles cited examining structural correlates of crime in urban areas

Study	Methods	Measures
Sampson (1987)	171 cities	Family Disruption, region, population size, housing density
Sampson & Groves (1989)	238 localities & 10,905 individuals (Britain)	Family disruption, urbanization, ethnic heterogeneity, socioeconomic status
Sampson (1991)	Britain – 526 districts; 11,030 individuals	Residential stability
Sampson et al (1997)	Chicago – 8782 individuals; 343 neighborhoods	Concentrated disadvantage, residential instability, collective efficacy
Kposowa et al (1995)	408 counties with populations > 100,000	Poverty, church membership, divorce rate, urbanity, % black, % Hispanic, population change, unemployment, population density, gini coefficient
Lee et al (2003)	778 metro counties	Poverty concentration, disadvantage
Land et al (1990)	Cities, SMSA's, & states	Resource deprivation, population size, population density, % divorced

APPENDIX C
SUMMARY OF STUDIES CITED EXAMINING STRUCTURAL CORRELATES OF CRIME IN RURAL AREAS

Table C-1. Summary of articles cited examining structural correlates of crime in rural areas

Study	Methods	Measures	Findings
Petee & Kowalski (1993)	630 rural counties	Residential mobility, single-parent households, racial heterogeneity, poverty (% households with annual income less than $7500), population density	Residential mobility has the greatest impact on violent crime, followed by single parent households, and racial heterogeneity
Barnett & Mencken (2002)	2,254 nonmetro counties in continental US	Index of Resource disadvantage, population change, % nonwhite,	Resource disadvantage and population change positively related to violent crime. Population change positively related to property crime.
Kposowa et al (1995)	1681 rural counties	Poverty, economic inequality, divorce rate, population change, % unemployed, % black	Poverty, % black, divorce rate, and population change related to homicide. Divorce and population change related to violent crime. Population change related to property crime.
Lee et al (2003)	1746 nonmetro counties	Disadvantage index, poverty concentration, % divorced, population density,	Disadvantage related to homicide. But poverty was not significantly related.
Osgood & Chambers (2000)	264 rural counties	Economic status, poverty, unemployment, residential instability, female headed households, ethnic heterogeneity, population size	No relationship between economic status, poverty, or unemployment on juvenile violent crime rate. Residential instability, female headed households and ethnic heterogeneity were significant.
Jobes et al (2004)	123 rural LGA's in Australia	Residential instability, family instability, proportion indigenous	None of the economic indicators significant. Residential instability and family instability were significant.
Arthur (1991)	13 rural counties in Georgia	Percent below poverty, percent families receiving aid, unemployment, percent black	Variables predict both property and violent crime. Predict property crime better than violent.

APPENDIX D
SUMMARY OF STUDIES EXAMINING INDUSTRIALIZED FARMING AND COMMUNITY WELL-BEING

Table D-1. Summary of studies examining the industrialization of farming and community well-being by year of publication

Study	Methodology	Region	Measures of Industrialized Farming	Community Well-Being Indicators	Results
Goldschmidt (1968, 1978a)(1944 original)	Comparative case study, 2 communities	California	Scale/organization	General socioeconomic indicators (class structure, services, population, politics, retail trade)	Detrimental effects
Heady & Sonka (1974)	150 producing areas	Continental U.S.	Scale	Socioeconomic indicators (income, employment generation)	Some detrimental effects; large farms lower food costs but generate less total community income
Flora et al. (1977)	105 counties	Kansas	Scale/organization	General socioeconomic indicators (class structure, services)	Some detrimental effects; industrialized farming is related to greater income inequality but other relationships not clearly supported
Fujimoto (1977)	130 towns	California	Scale	Social fabric (community services)	Detrimental
Goldschmidt (1978b)	States	All but Alaska	Scale	Social fabric (agrarian class structure)	Detrimental effects

Table D-1. Continued

Study	Methodology	Region	Measures of Industrialized Farming	Community Well-Being Indicators	Results
Wheelock (1979)	61 counties	Alabama	Scale	General socioeconomic indicators – class structure, population size	Some detrimental effects; rapid increases in farm scale related to decline of population, income, and white collar labor force; other relationships mixed
Marousek (1979)	Regional economic impact, one community	Idaho	Scale	Socioeconomic indicators (income, employment generation)	Some detrimental effects; large farms result in greater regional income but produce less employment than small farms
Buttel & Larson (1979)	State-level data	Entire U.S.	Scale/organization	Environment (energy use)	Detrimental effects
Heaton & Brown (1982)	Counties	Continental U.S	Scale/organization	Environment (energy use)	No detrimental effects
Swanson (1980)	27 counties	Nebraska	Scale	General socioeconomic indicators (population size)	Detrimental effects

TableD-1. Continued

Study	Methodology	Region	Measures of Industrialized Farming	Community Well-Being Indicators	Results
Harris & Gilbert (1982)	State level data	Continental U.S.	Scale/organization	General socioeconomic indicators (class structure)	Some detrimental effects; large farms result in more lower class farm personnel but have positive total effects on rural income
Swanson (1982)	520 communities	Pennsylvania	Scale / # of farms	Social fabric (population)	No detrimental effects
Green (1985)	109 counties	Missouri	Scale / organization	General socioeconomic indicators (services, population size)	No detrimental effects
Skees & Swanson (1988)	706 counties	Southern US (excluding Florida & Texas)	Scale / organization	General socioeconomic indicators (services)	Some detrimental effects: moderate sized farms produce greater employment; large and very small farms related to higher unemployment; some detrimental impacts of large farms over time

Table D-1. Continued

Study	Methodology	Region	Measures of Industrialized Farming	Community Well-Being Indicators	Results
MacCannell (1988)	98 counties	Arizona, California, Florida, Texas	Scale / organization / capital intensity	General socioeconomic indicators (population size, retail trade, local government taxation, and expenditures	Detrimental effects
Flora & Flora (1988)	234 counties	Great Plains and West	Scale	General socioeconomic indicators (retail trade, population size)	Some detrimental effects; medium sized farms relative to large farms enhance community well being
Buttel et al (1988)	105 counties	Northeast	Organization	General socioeconomic indicators (population, retail trade)	No detrimental effects
van Es et al (1988)	331 counties	Corn Belt	Scale / organization	General socioeconomic indicators (population size)	No detrimental effects

Table D-1. Continued

Study	Methodology	Region	Measures of Industrialized Farming	Community Well-Being Indicators	Results
Gilles & Dalecki (1988)	346 counties	Corn Belt & Central Plains	Scale / organization	General socioeconomic indicators	Some detrimental effects; counties with greater numbers of hired laborers tend to have lower well being; other relationships for scale not supported
Lobao (1990)	3037 counties	Continental U.S.	Scale / organization	Socioeconomic indicators (income, poverty, income inequality, teenage fertility, infant mortality)	Some detrimental effects: moderate sized related to better socioeconomic conditions; industrialized farming related to greater income inequality and births to teenagers, and over time to greater poverty and lower family income, but not to other indicators

Table D-1. Continued

Study	Methodology	Region	Measures of Industrialized Farming	Community Well-Being Indicators	Results
Lobao & Schulman (1991)	2349 rural counties	US and 4 regions	Scale / organization	Socioeconomic indicators (poverty)	No detrimental effects; moderate size farms related to lower poverty, industrialized farms have little relationship to poverty if any
Barnes & Blevins (1993)	2,000 rural counties	U.S.	Scale / organization	Socioeconomic indicators (poverty, median income)	No detrimental effects
Durrenberger & Thu (1996)	99 counties	Iowa	Scale: farm size in acres, total county hog inventory, farms with hogs, farms with more than 1000 hogs, net agriculture sales	Socioeconomic indicators (people living in poverty, people receiving food stamps)	Detrimental: the more large scale operations, the fewer small and moderate farms and the more people who use food stamps
Irwin et al (1999)	3024 counties	Continental US	Organization	Social fabric (residential stability)	No detrimental effects
Crowley (1999)	1053 counties	12 North Central states	Organization	Socioeconomic indicators (poverty rate, income inequality)	Detrimental effects

Table D-1. Continued

Study	Methodology	Region	Measures of Industrialized Farming	Community Well-Being Indicators	Results
Welsh & Lyson (2001)	433 agriculture dependent counties	Iowa, Kansas, Minnesota, Missouri, ND, OK, SD, vs. states without anti-corporate farm laws	Scale / organization	Socioeconomic (% families in poverty, unemployment rate, farms realizing cash gains)	Detrimental effects on agriculture dependent counties in states without anti-corporate farming laws or in states with weaker laws
Lyson et al (2001)	433 agriculture dependent counties		Scale / organization	Social fabric (civically engaged middle class, participation and involvement in civic affairs, community welfare)	Detrimental effects are mediated by presence of civically engaged middle class
Peters (2002)	Agriculture dependent counties	Iowa, Kansas, & Missouri	Organization	Socioeconomic/Children at Risk (% children enrolled in free or reduced meals, low birth weight infants, births to female teenagers, high school dropout rate)	Detrimental Effects
Wilson et al (2002)	Census blocks in rural counties with CAFO's	Mississippi	CAFOS (swine)	Social fabric (whether swine cafos were located in high poverty/high black census blocks	Detrimental: swine CAFOs more likely to be located in census blocks with poor African Americans

Table D-1. Continued

Study	Methodology	Region	Measures of Industrialized Farming	Community Well-Being Indicators	Results
Crowley & Roscigno (2004)	Counties	North Central States – IA, IL, IN, KS, MI, MN, MO, NE, OH, ND, SD	Scale / organization	Socioeconomic (% living below poverty, inequality of income distribution among families)	Detrimental

Adapted from Lobao (2000) & Stofferahn (2006)

APPENDIX E
RURAL URBAN CONTIUUM CODES (BEALE CODES)

Table E-1. 2003 Beale Codes

Metro Counties	
1	Counties in metro areas of 1 million population or more
2	Counties in metro areas of 250,000 to 1 million population
3	Counties in metro areas of fewer than 250,000 population
Nonmetro Counties	
4	Urban population of 20,000 or more, adjacent to a metro area
5	Urban population of 20,000 or more, not adjacent to a metro area
6	Urban population of 2,500 to 19,999, adjacent to a metro area
7	Urban population of 2,500 to 19,999, not adjacent to a metro area
8	Completely rural or less than 2,500 urban population, adjacent to a metro area
9	Completely rural or less than 2,500 urban population, not adjacent to a metro area

Table E-2. 1983 and 1993 Beale Codes

Metro Counties	
0	Central counties of metro areas of 1million population or more
1	Fringe counties of metro areas of 1 million population or more
2	Counties in metro areas of 250,000 to 1 million population
3	Counties in metro areas of fewer than 250,000 population
Nonmetro Counties	
4	Urban population of 20,000 or more, adjacent to a metro area
5	Urban population of 20,000 or more, not adjacent to a metro area
6	Urban population of 2,500 to 19,999, adjacent to a metro area
7	Urban population of 2,500 to 19,999, not adjacent to a metro area
8	Completely rural or less than 2,500 urban population, adjacent to a metro area
9	Completely rural or less than 2,500 urban population, not adjacent to a metro area

(Economic Resource Service, 2004)

APPENDIX F
MIDWEST METRO AND NONMETRO COUNTIES

1055 Counties in the Midwest

Table F-1. Number of metro and nonmetro counties by state and year

State	Designation	1983	1993	2003
Illinois	Metro Code	26	28	36
(102 counties)	0	1	8	n/a
	1	12	6	17
	2	7	8	10
	3	6	6	9
	NonMetro Code	76	74	66
	4	8	6	9
	5	7	5	6
	6	24	26	22
	7	24	24	20
	8	2	3	2
	9	11	10	7
Indiana	Metro Code	30	37	46
(92 counties)	0	1	4	n/a
	1	10	8	21
	2	9	13	8
	3	10	12	17
	NonMetro Code	62	55	46
	4	3	3	8
	5	3	2	1
	6	36	29	27
	7	10	10	5
	8	9	10	5
	9	1	1	0
Iowa	Metro Code	11	10	20
(99 counties)	0	0	0	n/a
	1	0	0	0
	2	5	5	9
	3	6	5	11
	NonMetro Code	88	89	79
	4	3	3	3
	5	6	6	5
	6	23	24	25
	7	39	36	25
	8	6	8	10
	9	11	12	11

Table F-1. Continued

State	Designation	1983	1993	2003
Kansas	Metro Code	8	9	17
(105 counties)	0	1	2	n/a
	1	3	2	6
	2	2	3	4
	3	2	2	7
	NonMetro Code	97	96	88
	4	1	3	3
	5	8	7	8
	6	11	11	11
	7	31	29	23
	8	5	5	4
	9	41	41	39
Michigan	Metro Code	22	25	26
(83 counties)	0	1	5	n/a
	1	7	4	6
	2	9	14	12
	3	5	2	8
	NonMetro Code	61	58	57
	4	2	2	5
	5	2	1	7
	6	12	11	8
	7	24	25	22
	8	4	3	3
	9	17	16	12
Minnesota	Metro Code	16	18	21
(87 counties)	0	2	5	n/a
	1	8	6	11
	2	1	0	2
	3	5	7	8
	Non Metro Code	71	69	66
	4	3	3	5
	5	1	1	4
	6	17	18	16
	7	32	27	20
	8	4	4	9
	9	14	16	12

Table F-1. Continued

State	Designation	1983	1993	2003
Missouri	Metro Code	17	22	34
(115 counties)	0	3	6	n/a
	1	8	8	17
	2	0	3	6
	3	6	5	11
	NonMetro Code	98	93	81
	4	1	1	3
	5	5	3	5
	6	24	24	22
	7	26	25	17
	8	7	9	10
	9	35	31	24
Nebraska	Metro Code	5	6	9
(93 counties)	0	0	0	n/a
	1	0	0	0
	2	3	4	4
	3	2	2	2
	NonMetro Code	88	87	84
	4	1	1	1
	5	5	6	6
	6	7	7	7
	7	26	21	21
	8	3	4	4
	9	46	48	48
North Dakota	Metro Code	4	4	4
(53 counties)	0	0	0	n/a
	1	0	0	0
	2	0	0	0
	3	4	4	4
	NonMetro Code	49	49	49
	4	0	0	0
	5	1	1	1
	6	1	2	4
	7	11	8	5
	8	5	9	10
	9	31	29	29

State	Designation	1983	1993	2003
Ohio	Metro Code	36	39	40
(88 counties)	0	3	8	n/a
	1	13	9	18
	2	14	15	15
	3	6	7	7
	NonMetro Code	52	49	48
	4	15	13	20
	5	2	1	0
	6	22	25	20
	7	10	7	6
	8	1	2	1
	9	2	1	1
South Dakota	Metro Code	1	3	7
(66 counties)	0	0	0	n/a
	1	0	0	0
	2	0	0	0
	3	1	3	3
	NonMetro Code	65	63	59
	4	0	0	0
	5	2	1	1
	6	2	3	3
	7	17	14	14
	8	4	5	5
	9	40	40	40
Wisconsin	Metro Code	19	20	25
(72 counties)	0	1	3	n/a
	1	4	4	7
	2	5	4	7
	3	9	9	11
	NonMetro Code	53	52	47
	4	5	7	7
	5	2	0	0
	6	18	19	19
	7	12	10	4
	8	6	6	11
	9	10	10	6

Note: Illinois was omitted from final analysis due to limited reporting of UCR data.

APPENDIX G
MAPS OF FINAL SAMPLE (N = 596)

Figure G-1. Indiana

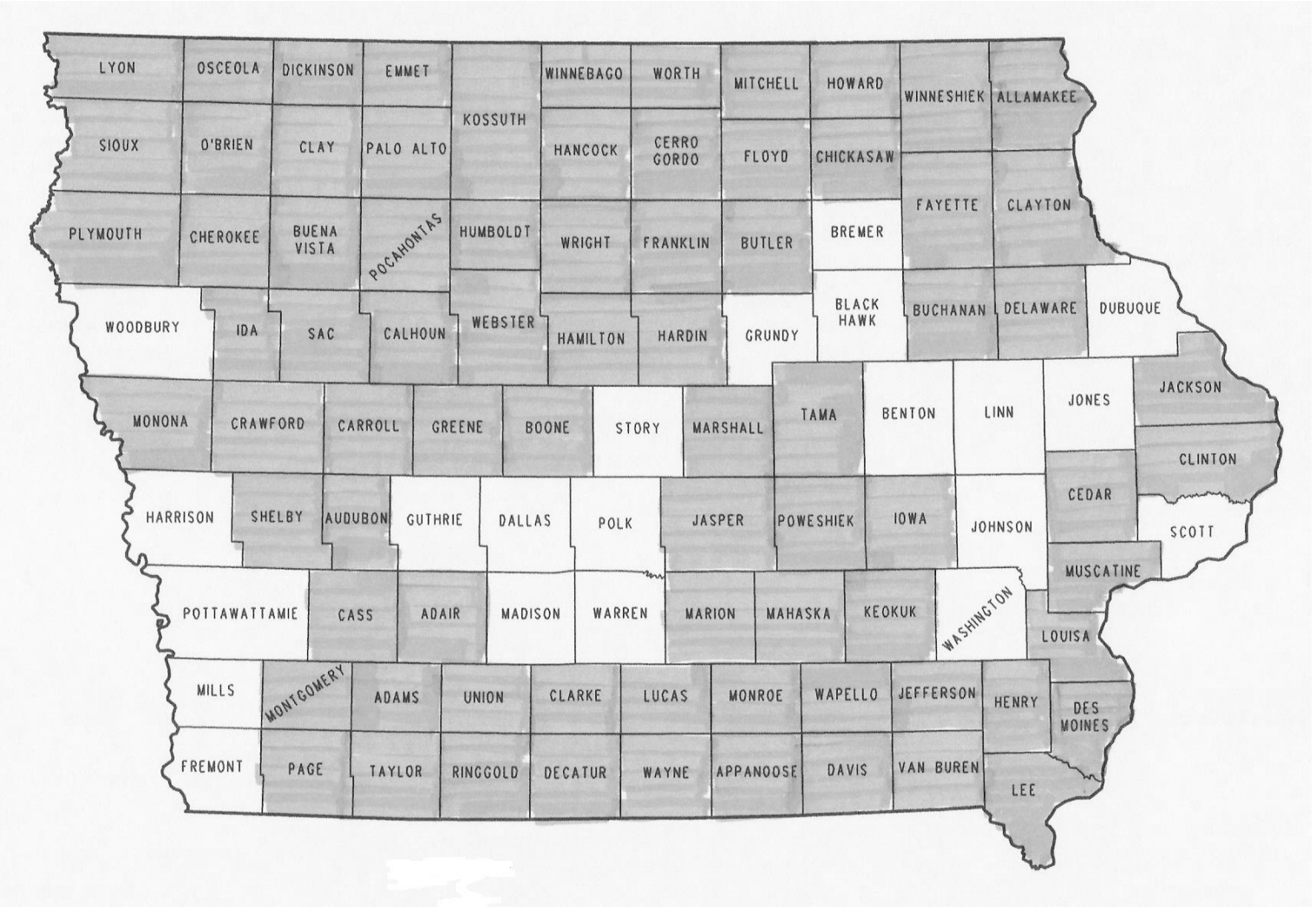

Figure G-2. Iowa

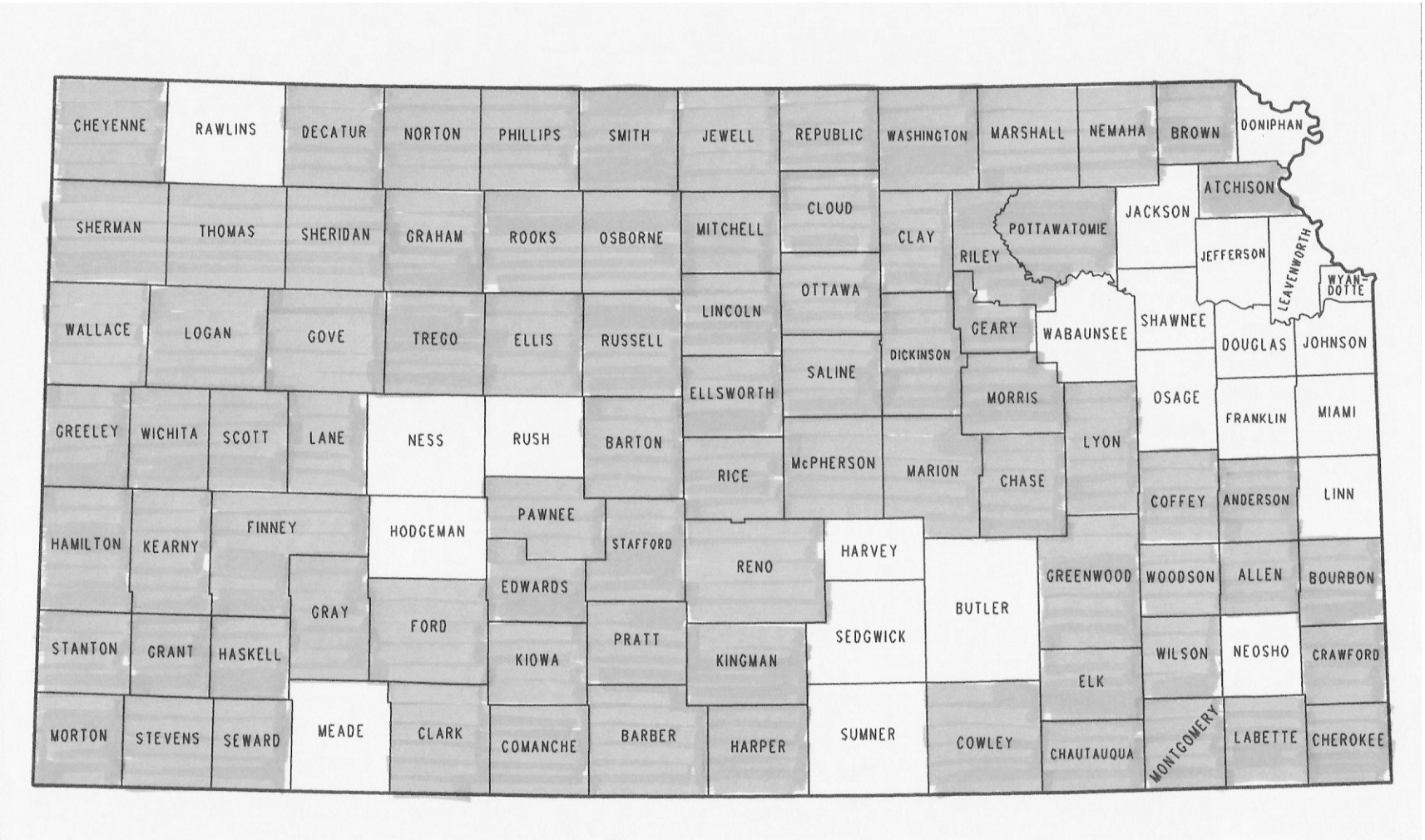

Figure G-3. Kansas

Figure G-4. Michigan

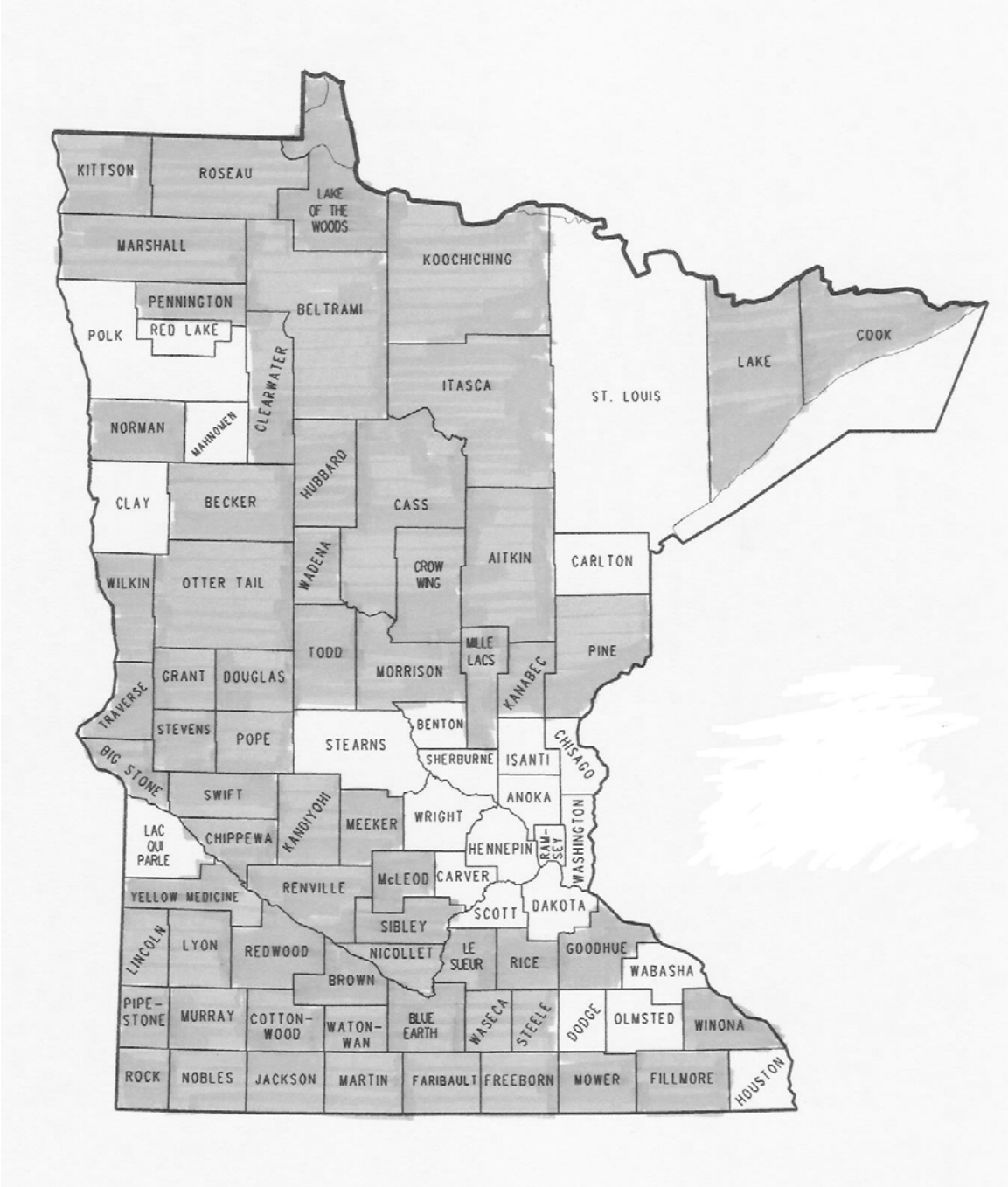

Figure G-5. Minnesota

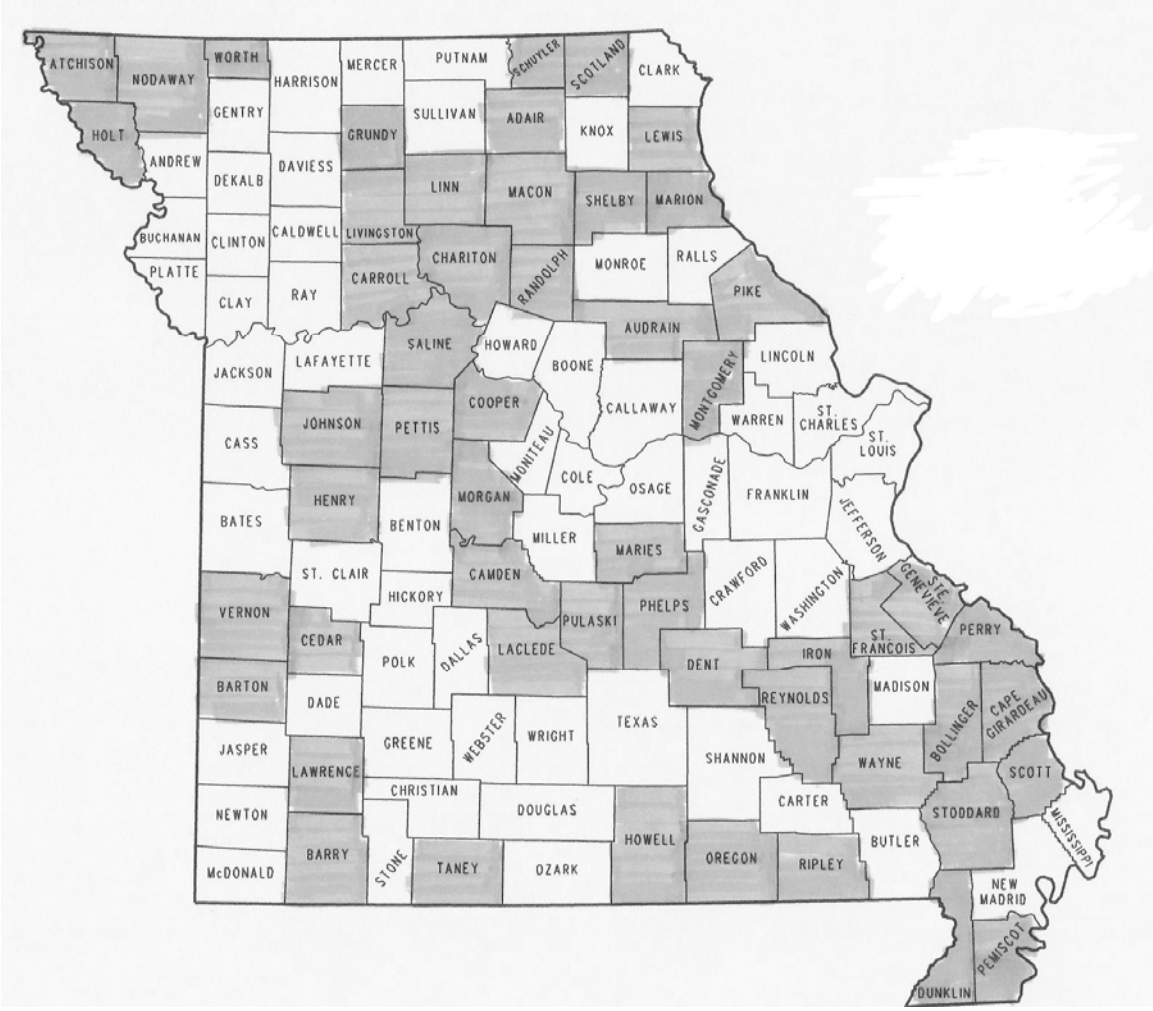

Figure G-6. Missouri

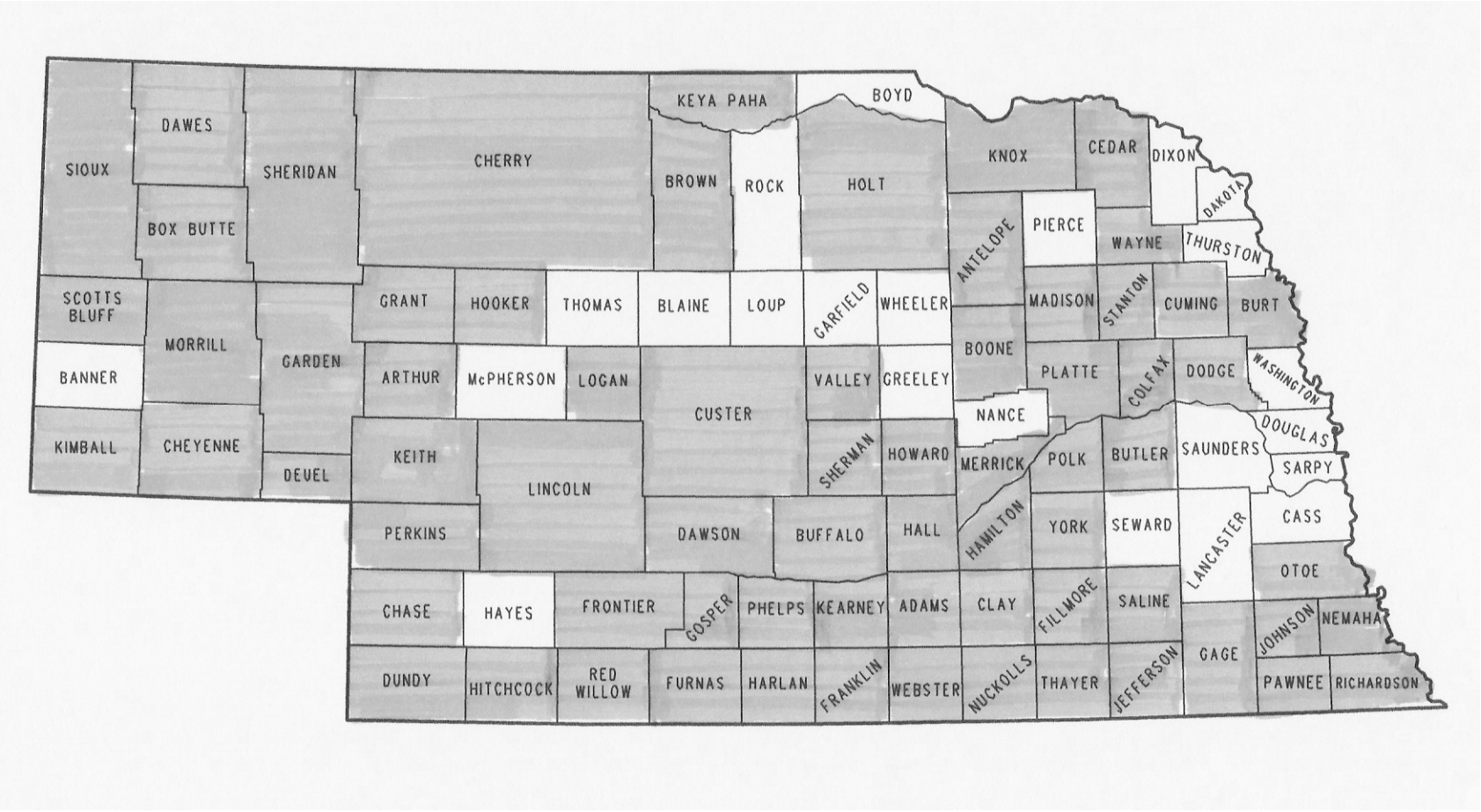

Figure G-7. Nebraska

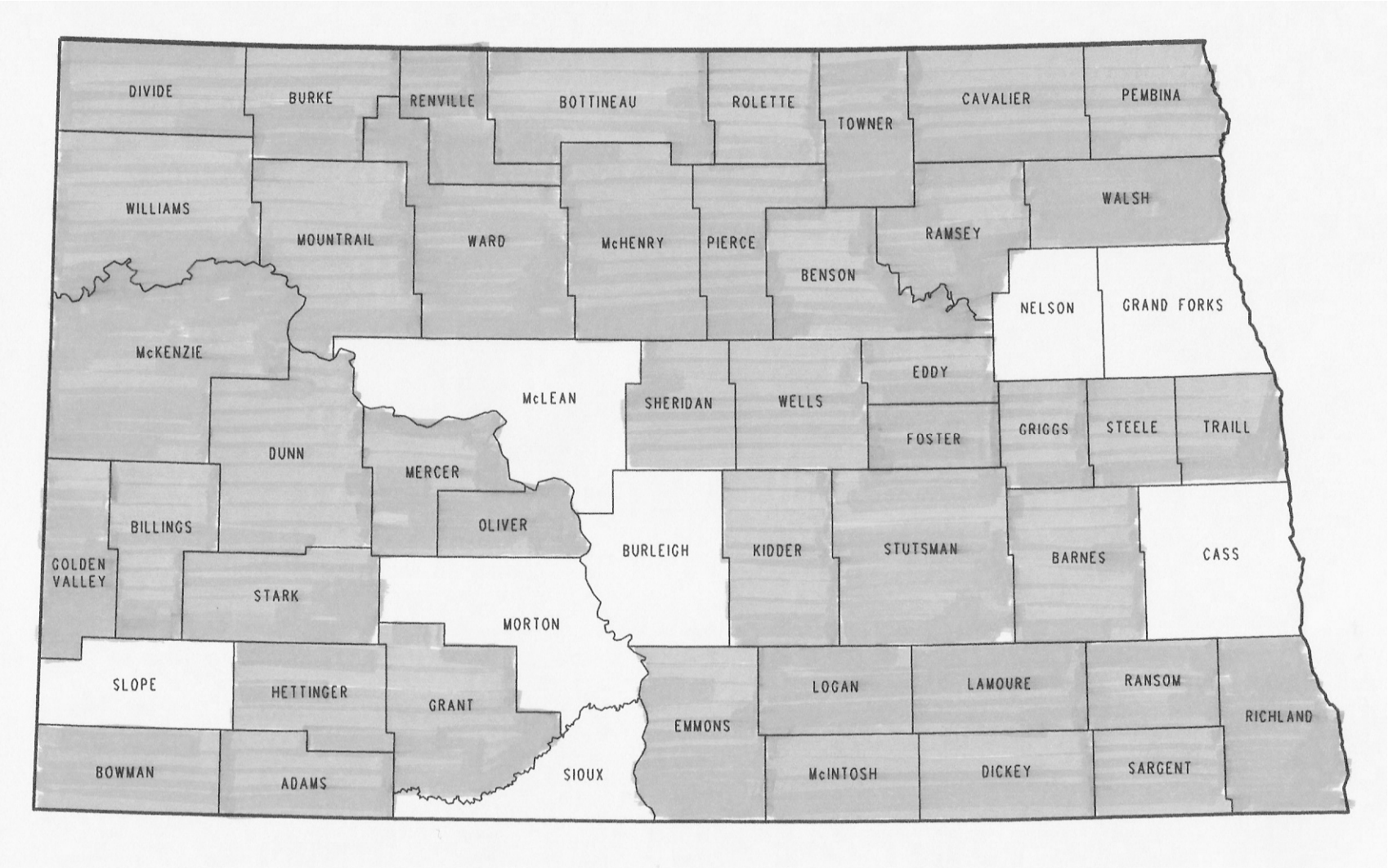

Figure G-8. North Dakota

Figure G-9. Ohio

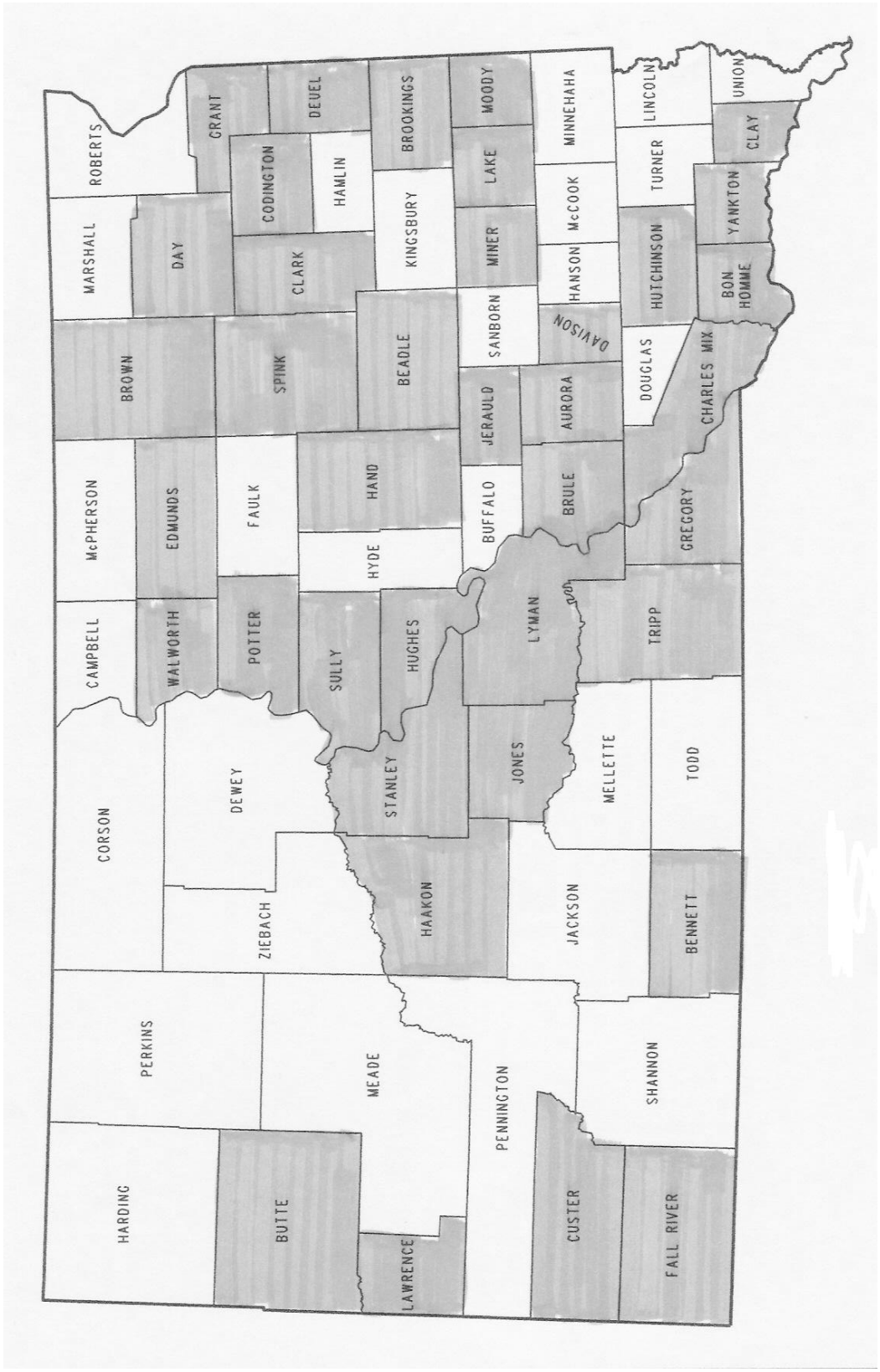

Figure G-10. South Dakota

Figure G-11. Wisconsin

APPENDIX H
CORRELATION TABLES

Table H-1. Correlation matrix of variables – total sample, all years

	UCR	Part 1	Violent	Property	# Farms	Size	% Corp	% Hired	% Black	% Hisp
UCR Total	1.000									
Part 1 Total	.908	1.000								
Violent Crime	.741	.792	1.000							
Property Crime	.899	.994	.721	1.000						
# Farms	.253	.277	.144	.289	1.000					
Av. Farm Size	-.226	-.235	-.203	-.231	-.343	1.000				
% Corporations	.040	-.009	.050	-.019	-.208	.364	1.000			
% Hired Labor	-.133	-.095	-.160	-.080	.097	.266	.264	1.000		
% Black	.217	.271	.388	.238	-.034	-.098	-.039	-.081	1.000	
% Hispanic	.147	.137	.177	.124	-.105	.129	.349	.091	.087	1.000
Residential Mob.	.364	.412	.368	.403	.012	-.091	-.002	-.156	.345	.219
% Poverty	-.207	-.186	-.114	-.191	-.163	.143	-.265	-.035	.143	-.115
% Elderly	-.401	-.424	-.332	-.422	-.192	.099	.077	.070	-.213	-.238
Indiana	.057	.064	.052	.064	.033	-.110	.041	-.109	.014	-.029
Iowa	-.088	-.070	-.030	-.074	.233	-.161	.109	.150	-.084	-.054
Kansas	-.085	-.052	.022	-.063	-.168	.177	.092	.038	.100	.321
Michigan	.075	.050	.089	.041	-.262	-.171	-.141	-.134	.028	-.043
Minnesota	-.011	.028	-.008	.034	.170	-.125	-.132	.080	-.093	-.037
Missouri	-.011	.016	.103	.000	.088	-.131	-.125	-.238	.285	-.065
Nebraska	-.113	-.119	-.143	-.110	-.095	.276	.390	.144	-.112	.057
North Dakota	-.116	-.134	-.157	-.125	-.086	.242	-.220	.080	-.090	-.088
Ohio	.131	.102	.034	.110	.094	-.141	-.133	-.213	.116	-.019
South Dakota	-.076	-.097	-.096	-.093	-.138	.259	-.007	.037	-.080	-.075
Wisconsin	.322	.275	.157	.284	.128	-.155	.016	.056	-.067	-.064
1980 Dummy	-.137	-.033	-.162	-.008	.159	-.038	-.298	.096	-.043	-.135
1990 Dummy	-.004	.041	.014	.044	.000	-.012	-.037	.116	-.004	-.074
2000 Dummy	.142	-.008	.148	-.036	-.160	.050	.335	-.212	.047	.209

Table H-1. Continued

	ResMob	Poverty	Elderly	Indiana	Iowa	Kansas	Michigan	Minnesota	Missouri	Nebraska
UCR Total										
Part 1 Total										
Violent Crime										
Property Crime										
# Farms										
Av. Farm Size										
% Corporations										
% Hired Labor										
% Black										
% Hispanic										
Residential Mob	1.000									
% Poverty	-.032	1.000								
% Elderly	-.570	.086	1.000							
Indiana	.038	-.153	-.212	1.000						
Iowa	-.070	-.165	.091	-.090	1.000					
Kansas	.099	-.064	.139	-.093	-.157	1.000				
Michigan	.101	.012	-.116	-.072	-.121	-.126	1.000			
Minnesota	-.099	-.045	.003	-.079	-.134	-.138	-.107	1.000		
Missouri	.213	.256	.021	-.072	-.122	-.126	-.098	-.107	1.000	
Nebraska	-.070	-.024	.140	-.084	-.142	-.147	-.114	-.126	-.114	1.000
North Dakota	-.231	.157	.099	-.066	-.111	-.115	-.089	-.098	-.090	-.105
Ohio	.040	-.034	-.264	-.058	-.097	-.101	-.078	-.086	-.078	-.091
South Dakota	-.003	.223	.000	-.060	-.102	-.105	-.082	-.090	-.082	-.096
Wisconsin	-.011	-.116	-.058	-.067	-.114	-.118	-.091	-.100	-.091	-.107
1980 Dummy	.195	.086	-.237	-.001	-.001	-.001	.005	.000	-.001	-.001
1990 Dummy	-.128	.187	.140	.000	.000	.000	-.002	.002	.000	.000
2000 Dummy	-.067	-.273	.097	.000	.000	.000	-.002	-.002	.000	.000

Table H-1. Continued

	ND	Ohio	SD	Wisconsin	1980	1990	2000
UCR Total							
Part 1 Total							
Violent Crime							
Property Crime							
# Farms							
Av. Farm Size							
% Corporations							
% Hired Labor							
% Black							
% Hispanic							
Residential Mobility							
% Poverty							
% Elderly							
Indiana							
Iowa							
Kansas							
Michigan							
Minnesota							
Missouri							
Nebraska							
North Dakota	1.000						
Ohio	-.072	1.000					
South Dakota	-.075	-.065	1.000				
Wisconsin	-.084	-.073	-.076	1.000			
1980 Dummy	-.001	-.001	-.001	.001	1.000		
1990 Dummy	.000	.000	.000	-.003	-.501	1.000	
2000 Dummy	.000	.000	.000	.002	-.501	-.499	1.000

Table H-2. Correlation matrix of 1980 variables – total sample

	UCR	Part 1	Violent	Property	# Farms	Size	% Corp	% Hired	% Black	% Hisp
UCR Total	1.000									
Part 1 Total	.939	1.000								
Violent Crime	.729	.779	1.000							
Property Crime	.937	.998	.733	1.000						
# Farms	.288	.289	.124	.300	1.000					
Av. Farm Size	-.193	-.220	-.176	-.219	-.345	1.000				
% Corporations	-.031	-.031	-.048	-.028	-.188	.546	1.000			
% Hired Labor	-.039	-.031	-.094	-.023	.100	.283	.302	1.000		
% Black	.267	.297	.529	.263	-.024	-.089	-.058	-.028	1.000	
% Hispanic	.134	.136	.224	.122	-.118	.158	.304	.144	.119	1.000
Residential Mob	.423	.419	.448	.404	-.051	-.013	.073	-.094	.305	.299
% Poverty	-.339	-.347	-.202	-.354	-.211	.185	-.114	-.025	.093	-.170
% Elderly	-.456	-.440	-.394	-.434	-.104	-.003	-.014	-.035	-.170	-.301
Indiana	.077	.064	.032	.066	.045	-.113	.048	-.096	.015	-.043
Iowa	-.038	-.016	-.064	-.010	.256	-.150	.011	.165	-.082	-.090
Kansas	-.080	-.060	.089	-.074	-.180	.152	.124	.051	.102	.378
Michigan	.058	.066	.116	.059	-.271	-.151	-.173	-.136	.004	-.035
Minnesota	-.056	.006	-.076	.015	.194	-.119	-.140	.101	-.098	-.092
Missouri	-.030	-.014	.084	-.024	.071	-.121	-.105	-.241	.283	-.054
Nebraska	-.116	-.133	-.152	-.127	-.114	.280	.434	.013	-.102	.058
North Dakota	-.060	-.127	-.155	-.120	-.080	.198	-.238	.101	-.082	-.096
Ohio	.174	.150	.153	.146	.093	-.127	-.123	-.161	.124	.031
South Dakota	-.072	-.102	-.072	-.102	-.149	.252	.032	.034	-.076	-.076
Wisconsin	.232	.226	.080	.237	.136	-.136	.036	.087	-.068	-.073

Table H-2. Continued

	ResMob	Poverty	Elderly	Indiana	Iowa	Kansas	Michigan	Minnesota	Missouri	Nebraska
UCR Total										
Part 1 Total										
Violent Crime										
Property Crime										
# Farms										
Av. Farm Size										
% Corporations										
% Hired Labor										
% Black										
% Hispanic										
Residential Mob	1.000									
% Poverty	-.222	1.000								
% Elderly	-.503	.244	1.000							
Indiana	.007	-.164	-.219	1.000						
Iowa	-.041	-.146	.069	-.089	1.000					
Kansas	.090	-.118	.193	-.093	-.156	1.000				
Michigan	.071	-.050	-.145	-.073	-.122	-.127	1.000			
Minnesota	-.079	.033	-.001	-.079	-.133	-.138	-.109	1.000		
Missouri	.154	.204	.124	-.072	-.121	-.126	-.099	-.107	1.000	
Nebraska	-.090	.032	.153	-.084	-.142	-.147	-.115	-.125	-.114	1.000
North Dakota	-.147	.151	-.020	-.066	-.111	-.115	-.090	-.098	-.089	-.104
Ohio	.038	-.111	-.270	-.058	-.097	-.100	-.079	-.086	-.078	-.091
South Dakota	.014	.339	-.032	-.060	-.101	-.105	-.082	-.090	-.082	-.095
Wisconsin	-.011	-.130	-.031	-.067	-.114	-.118	-.092	-.101	-.091	-.107

Table H-2. Continued

	ND	Ohio	SD	Wisconsin						
UCR Total										
Part 1 Total										
Violent Crime										
Property Crime										
# Farms										
Av. Farm Size										
% Corporations										
% Hired Labor										
% Black										
% Hispanic										
Residential Mob										
% Poverty										
% Elderly										
Indiana										
Iowa										
Kansas										
Michigan										
Minnesota										
Missouri										
Nebraska										
North Dakota	1.000									
Ohio	-.071	1.000								
South Dakota	-.075	-.065	1.000							
Wisconsin	-.084	-.073	-.076	1.000						

Table H-3. Correlation matrix of 1990 variables – total sample

	UCR	Part 1	Violent	Property	# Farms	Size	% Corp	% Hired	% Black	% Hisp
UCR Total	1.000									
Part 1 Total	.934	1.000								
Violent Crime	.694	.824	1.000							
Property Crime	.943	.996	.769	1.000						
# Farms	.307	.263	.178	.268	1.000					
Av. Farm Size	-.223	-.203	-.183	-.200	-.331	-1.000				
% Corporations	.015	.005	.003	.006	-.142	.349	1.000			
% Hired Labor	-.076	-.082	-.090	-.078	.142	.159	.326	1.000		
% Black	.195	.249	.370	.222	-.032	-.100	-.035	-.092	1.000	
% Hispanic	.163	.214	.227	.205	-.109	.150	.308	.135	.110	1.000
Residential Mob	.400	.429	.416	.417	-.063	-.088	.068	-.223	.393	.271
% Poverty	-.166	-.160	-.100	-.164	-.230	.107	-.292	-.165	.188	-.123
% Elderly	-.449	-.438	-.381	-.433	-.168	.084	-.006	.098	-.247	-.307
Indiana	.009	.007	.021	.005	.036	-.086	.073	-.101	.013	-.045
Iowa	-.111	-.121	-.075	-.125	.235	-.166	.120	.260	-.085	-.085
Kansas	-.044	.021	.134	.002	-.169	.182	.123	-.016	.106	.385
Michigan	.077	.061	.102	.052	-.281	-.174	-.160	-.149	.025	-.030
Minnesota	.015	.061	.056	.059	.162	-.130	-.163	.113	-.102	-.057
Missouri	-.044	-.032	.008	-.037	.083	-.134	-.127	-.253	.282	-.071
Nebraska	-.105	-.100	-.131	-.092	-.078	.266	.405	.113	-.109	.040
North Dakota	-.139	-.128	-.161	-.118	-.089	.252	-.256	.053	-.087	-.094
Ohio	.096	.035	-.006	.040	.097	-.145	-.137	-.227	.122	-.001
South Dakota	-.061	-.078	-.091	-.073	-.135	.254	-.023	.004	-.079	-.077
Wisconsin	.373	.309	.129	.327	.136	-.155	.030	.080	-.069	-.066

Table H-3. Continued

	ResMob	Poverty	Elderly	Indiana	Iowa	Kansas	Michigan	Minnesota	Missouri	Nebraska
UCR Total										
Part 1 Total										
Violent Crime										
Property Crime										
# Farms										
Av. Farm Size										
% Corporations										
% Hired Labor										
% Black										
% Hispanic										
Residential Mob	1.000									
% Poverty	.027	1.000								
% Elderly	-.549	.087	1.000							
Indiana	.044	-.177	-.220	1.000						
Iowa	-.103	-.172	.113	-.090	1.000					
Kansas	.099	-.074	.139	-.093	-.157	1.000				
Michigan	.173	.081	-.131	-.072	-.121	-.125	1.000			
Minnesota	-.117	-.053	.008	-.080	-.134	-.139	-.107	1.000		
Missouri	.224	.291	.023	-.072	-.122	-.126	-.097	-.108	1.000	
Nebraska	-.079	-.082	.147	-.084	-.142	-.148	-.113	-.126	-.115	1.000
North Dakota	-.265	.176	.098	-.066	-.112	-.116	-.089	-.099	-.090	-.105
Ohio	.049	.004	-.283	-.058	-.097	-.101	-.078	-.086	-.078	-.092
South Dakota	-.001	.163	-.009	-.060	-.102	-.106	-.081	-.090	-.082	-.096
Wisconsin	-.008	-.106	-.056	-.067	-.113	-.117	-.090	-.100	-.091	-.106

Table H-3. Continued

	ND	Ohio	SD	Wisconsin						
UCR Total										
Part 1 Total										
Violent Crime										
Property Crime										
# Farms										
Av. Farm Size										
% Corporations										
% Hired Labor										
% Black										
% Hispanic										
Residential Mob										
% Poverty										
% Elderly										
Indiana										
Iowa										
Kansas										
Michigan										
Minnesota										
Missouri										
Nebraska										
North Dakota	1.000									
Ohio	-.072	1.000								
South Dakota	-.075	-.066	1.000							
Wisconsin	-.083	-.073	-.076	1.000						

Table H-4. Correlation matrix of 2000 variables – total sample

	UCR	Part 1	Violent	Property	# Farms	Size	% Corp	% Hired	% Black	% Hisp
UCR Total	1.000									
Part 1 Total	.944	1.000								
Violent Crime	.765	.845	1.000							
Property Crime	.944	.992	.771	1.000						
# Farms	.326	.326	.262	.327	1.000					
Av. Farm Size	-.296	-.298	-.288	-.287	-.348	1.000				
% Corporations	-.039	-.023	-.019	-.022	-.162	.312	1.000			
% Hired Labor	-.173	-.180	-.200	-.168	-.056	.404	.449	1.000		
% Black	.208	.277	.364	.244	-.020	-.114	-.088	-.094	1.000	
% Hispanic	.100	.121	.104	.119	-.049	.114	.304	.163	.058	1.000
Residential Mob	.432	.451	.447	.432	.096	-.175	.033	-.212	.386	.276
% Poverty	-.121	-.106	-.016	-.123	-.197	.199	-.211	-.103	.206	.003
% Elderly	-.470	-.463	-.415	-.454	-.238	.199	.041	.199	-.264	-.299
Indiana	.090	.133	.096	.136	.017	-.130	.023	-.136	.014	-.022
Iowa	-.106	-.059	.019	-.075	.220	-.168	.183	.038	-.085	-.036
Kansas	-.129	-.133	-.102	-.135	-.163	.199	.072	.083	.092	.333
Michigan	.093	.023	.079	.009	-.252	-.192	-.139	-.129	.056	-.060
Minnesota	-.007	.011	-.032	.021	.160	-.126	-.135	.032	-.080	-.013
Missouri	.024	.100	.207	.071	.124	-.142	-.166	-.237	.291	-.079
Nebraska	-.130	-.133	-.168	-.119	-.096	.284	.447	.306	-.124	.077
North Dakota	-.140	-.152	-.177	-.140	-.097	.281	-.238	.093	-.101	-.100
Ohio	.150	.141	.016	.164	.101	-.154	-.168	-.261	.102	-.050
South Dakota	-.098	-.116	-.126	-.109	-.139	.275	-.019	.075	-.085	-.089
Wisconsin	.361	.286	.238	.285	.119	-.176	-.002	.008	-.065	-.073

Table H-4. Continued

	ResMob	Poverty	Elderly	Indiana	Iowa	Kansas	Michigan	Minnesota	Missouri	Nebraska
UCR Total										
Part 1 Total										
Violent Crime										
Property Crime										
# Farms										
Av. Farm Size										
% Corporations										
% Hired Labor										
% Black										
% Hispanic										
Residential Mob	1.000									
% Poverty	.104	1.000								
% Elderly	-.607	-.013	1.000							
Indiana	.070	-.135	-.218	1.000						
Iowa	-.069	-.202	.098	-.090	1.000					
Kansas	.116	.001	.101	-.093	-.157	1.000				
Michigan	.057	.002	-.079	-.072	-.121	-.125	1.000			
Minnesota	-.109	-.134	.003	-.079	-.133	-.138	-.106	1.000		
Missouri	.284	.310	-.076	-.072	-.122	-.126	-.097	-.107	1.000	
Nebraska	-.043	-.025	.131	-.084	-.142	-.148	-.113	-.125	-.115	1.000
North Dakota	-.307	.163	.218	-.066	-.112	-.116	-.089	-.098	-.090	-.105
Ohio	.037	.004	-.264	-.058	-.097	-.101	-.078	-.086	-.078	-.092
South Dakota	-.023	.194	.038	-.060	-.102	-.106	-.081	-.089	-.082	-.096
Wisconsin	-.016	-.127	-.090	-.068	-.114	-.118	-.091	-.100	-.092	-.107

Table H-4. Continued

	ND	Ohio	SD	Wisconsin						
UCR Total										
Part 1 Total										
Violent Crime										
Property Crime										
# Farms										
Av. Farm Size										
% Corporations										
% Hired Labor										
% Black										
% Hispanic										
Residential Mob										
% Poverty										
% Elderly										
Indiana										
Iowa										
Kansas										
Michigan										
Minnesota										
Missouri										
Nebraska										
North Dakota	1.000									
Ohio	-.072	1.000								
South Dakota	-.075	-.066	1.000							
Wisconsin	-.084	-.073	-.077	1.000						

Table H-5. Correlation matrix of variables – sub sample, all years

	UCR	Part 1	Violent	Property	# Farms	Size	% Corp	% Hired	% Black	% Hisp
UCR Total	1.000									
Part 1 Total	.894	1.000								
Violent Crime	.733	.780	1.000							
Property Crime	.882	.994	.705	1.000						
# Farms	.252	.271	.148	.281	1.000					
Av. Farm Size	-.236	-.239	-.211	-.233	-.337	1.000				
% Corporations	.015	-.029	.040	-.040	-.198	.374	1.000			
% Hired Labor	-.105	-.060	-.141	-.043	.136	.255	.269	1.000		
% Black	.127	.168	.304	.135	-.042	-.092	-.032	-.049	1.000	
% Hispanic	.121	.110	.148	.098	-.115	.138	.334	.101	.065	1.000
Residential Mob.	.338	.376	.330	.367	-.018	-.072	.015	-.139	.255	.218
% Poverty	-.190	-.160	-.100	-.163	-.116	.123	-.290	-.065	.168	-.115
% Elderly	-.383	-.395	-.305	-.393	-.143	.046	.050	-.002	-.139	-.258
Indiana	-.001	-.007	.001	-.008	-.010	-.065	.032	-.059	-.010	-.028
Iowa	-.056	-.031	.003	-.036	.283	-.186	.103	.142	-.071	-.062
Kansas	-.124	-.094	-.039	-.100	-.179	.174	.105	.031	.048	.332
Michigan	.155	.117	.145	.106	-.269	-.191	-.151	-.156	.061	-.040
Minnesota	.037	.083	.021	.090	.194	-.142	-.137	.058	-.079	-.033
Missouri	.004	.029	.132	.009	.100	-.145	-.131	-.259	.344	-.062
Nebraska	-.127	-.140	-.157	-.130	-.082	.276	.391	.132	-.105	.031
North Dakota	-.128	-.143	-.162	-.133	-.084	.233	-.232	.060	-.090	-.087
Ohio	.029	.015	-.027	.022	.008	-.095	-.092	-.180	.055	.009
South Dakota	-.088	-.106	-.104	-.102	-.128	.257	-.016	.037	-.072	-.072
Wisconsin	.355	.307	.180	.316	.127	-.168	-.002	.041	-.062	-.071
1980 Dummy	-.145	-.030	-.167	-.004	.152	-.036	-.295	.084	-.047	-.131
1990 Dummy	-.002	.046	.008	.051	.001	-.015	-.039	.124	-.010	-.070
2000 Dummy	.148	-.016	.159	-.047	-.153	.051	.335	-.208	.056	.201

Table H-5. Continued

	ResMob	Poverty	Elderly	Indiana	Iowa	Kansas	Michigan	Minnesota	Missouri	Nebraska
UCR Total										
Part 1 Total										
Violent Crime										
Property Crime										
# Farms										
Av. Farm Size										
% Corporations										
% Hired Labor										
% Black										
% Hispanic										
Residential Mob	1.000									
% Poverty	-.032	1.000								
% Elderly	-.545	.053	1.000							
Indiana	-.006	-.079	-.122	1.000						
Iowa	-.042	-.203	.049	-.059	1.000					
Kansas	.067	-.082	.146	-.057	-.171	1.000				
Michigan	.145	-.002	-.167	-.047	-.139	-.136	1.000			
Minnesota	-.076	-.040	-.027	-.049	-.145	-.142	-.116	1.000		
Missouri	.236	.261	.001	-.046	-.137	-.134	-.109	-.114	1.000	
Nebraska	-.063	-.041	.113	-.054	-.160	-.156	-.127	-.133	-.125	1.000
North Dakota	-.260	.138	.098	-.041	-.123	-.120	-.098	-.102	-.096	-.112
Ohio	-.022	-.005	-.172	-.023	-.067	-.066	-.054	-.056	-.053	-.061
South Dakota	-.012	.236	-.025	-.038	-.113	-.110	-.090	-.094	-.088	-.103
Wisconsin	.003	-.122	-.089	-.043	-.127	-.124	-.101	-.106	-.099	-.116
1980 Dummy	.204	.103	-.254	.000	-.001	-.001	.005	.001	-.001	-.001
1990 Dummy	-.134	.191	.151	.000	.001	.001	-.003	.002	.000	.001
2000 Dummy	-.070	-.294	.104	.000	.001	.001	-.003	-.002	.000	.001

Table H-5. Continued

	ND	Ohio	SD	Wisconsin	1980	1990	2000
UCR Total							
Part 1 Total							
Violent Crime							
Property Crime							
# Farms							
Av. Farm Size							
% Corporations							
% Hired Labor							
% Black							
% Hispanic							
Residential Mobility							
% Poverty							
% Elderly							
Indiana							
Iowa							
Kansas							
Michigan							
Minnesota							
Missouri							
Nebraska							
North Dakota	1.000						
Ohio	-.047	1.000					
South Dakota	-.079	-.043	1.000				
Wisconsin	-.089	-.049	-.082	1.000			
1980 Dummy	-.001	.000	-.001	.001	1.000		
1990 Dummy	.000	.000	.000	-.003	-.501	1.000	
2000 Dummy	.000	.000	.000	.002	-.501	-.499	1.000

Table H-6. Correlation matrix of 1980 variables – sub sample

	UCR	Part 1	Violent	Property	# Farms	Size	% Corp	% Hired	% Black	% Hisp
UCR Total	1.000									
Part 1 Total	.936	1.000								
Violent Crime	.727	.790	1.000							
Property Crime	.935	.998	.750	1.000						
# Farms	.314	.280	.121	.290	1.000					
Av. Farm Size	-.201	-.220	-.194	-.217	-.337	1.000				
% Corporations	-.047	-.042	-.063	-.039	-.187	.558	1.000			
% Hired Labor	-.016	.002	-.087	.011	.141	.275	.304	1.000		
% Black	.110	.155	.373	.130	-.027	-.082	-.055	.002	1.000	
% Hispanic	.074	.080	.176	.068	-.143	.177	.308	.153	.064	1.000
Residential Mob	.401	.379	.431	.364	-.084	.007	.091	-.077	.190	.280
% Poverty	-.345	-.333	-.210	-.338	-.154	.160	-.129	-.059	.121	-.174
% Elderly	-.422	-.387	-.351	-.382	-.045	-.065	-.040	-.109	-.067	-.313
Indiana	.001	-.012	-.018	-.010	-.007	-.067	.049	-.035	-.018	-.037
Iowa	.030	.043	-.024	.049	.308	-.174	.000	.158	-.067	-.102
Kansas	-.133	-.100	.033	-.111	-.188	.148	.137	.042	.050	.396
Michigan	.149	.142	.214	.131	-.278	-.169	-.181	-.153	.031	-.030
Minnesota	-.005	.067	-.046	.077	.217	-.134	-.147	.083	-.083	-.082
Missouri	-.021	-.017	.132	-.031	.084	-.133	-.110	-.255	.343	-.050
Nebraska	-.135	-.150	-.178	-.144	-.101	.280	.432	.004	-.093	.031
North Dakota	-.071	-.138	-.171	-.131	-.079	.189	-.241	.083	-.079	-.098
Ohio	.030	.022	.017	.022	.006	-.085	-.086	-.140	.062	.061
South Dakota	-.079	-.105	-.081	-.105	-.138	.247	.025	.030	-.067	-.074
Wisconsin	.278	.260	.118	.268	.134	-.148	.023	.072	-.061	-.079

Table H-6. Continued

	ResMob	Poverty	Elderly	Indiana	Iowa	Kansas	Michigan	Minnesota	Missouri	Nebraska
UCR Total										
Part 1 Total										
Violent Crime										
Property Crime										
# Farms										
Av. Farm Size										
% Corporations										
% Hired Labor										
% Black										
% Hispanic										
Residential Mob	1.000									
% Poverty	-.234	1.000								
% Elderly	-.475	.211	1.000							
Indiana	-.033	-.101	-.111	1.000						
Iowa	-.015	-.190	.025	-.059	1.000					
Kansas	.044	-.141	.207	-.057	-.170	1.000				
Michigan	.111	-.075	-.198	-.047	-.141	-.138	1.000			
Minnesota	-.046	.038	-.041	-.049	-.145	-.142	-.117	1.000		
Missouri	.171	.202	.116	-.046	-.136	-.133	-.110	-.114	1.000	
Nebraska	-.091	.021	.127	-.054	-.159	-.156	-.129	-.133	-.125	1.000
North Dakota	-.169	.137	-.041	-.041	-.122	-.119	-.099	-.102	-.096	-.112
Ohio	-.018	-.078	-.173	-.022	-.067	-.065	-.054	-.056	-.052	-.061
South Dakota	.003	.359	-.061	-.038	-.112	-.110	-.091	-.094	-.088	-.103
Wisconsin	.009	-.141	-.060	-.043	-.127	-.124	-.103	-.106	-.099	-.116

Table H-6. Continued

	ND	Ohio	SD	Wisconsin						
UCR Total										
Part 1 Total										
Violent Crime										
Property Crime										
# Farms										
Av. Farm Size										
% Corporations										
% Hired Labor										
% Black										
% Hispanic										
Residential Mob										
% Poverty										
% Elderly										
Indiana										
Iowa										
Kansas										
Michigan										
Minnesota										
Missouri										
Nebraska										
North Dakota	1.000									
Ohio	-.047	1.000								
South Dakota	-.079	-.043	1.000							
Wisconsin	-.089	-.049	-.082	1.000						

Table H-7. Correlation matrix of 1990 variables – sub sample

	UCR	Part 1	Violent	Property	# Farms	Size	% Corp	% Hired	% Black	% Hisp
UCR Total	1.000									
Part 1 Total	.944	1.00								
Violent Crime	.747	.850	1.000							
Property Crime	.949	.997	.805	1.000						
# Farms	.297	.250	.193	.253	1.000					
Av. Farm Size	-.233	-.209	-.201	-.205	-.330	1.000				
% Corporations	-.013	-.012	.003	-.014	-.135	.363	1.000			
% Hired Labor	-.034	-.045	-.051	-.043	.197	.145	.322	1.000		
% Black	.102	.135	.251	.114	-.042	-.094	-.027	-.048	1.000	
% Hispanic	.142	.189	.210	.181	-.126	.162	.294	.143	.078	1.000
Residential Mob	.373	.376	.360	.369	-.106	-.072	.094	-.185	.297	.269
% Poverty	-.129	-.123	-.078	-.126	-.185	.086	-.317	-.213	.224	-.132
% Elderly	-.445	-.416	-.366	-.413	-.113	.035	-.036	.001	-.164	-.334
Indiana	-.025	-.033	-.007	-.036	-.007	-.052	.040	-.056	-.012	-.038
Iowa	-.087	-.100	-.046	-.106	.286	-.190	.113	.256	-.071	-.097
Kansas	-.092	-.040	.034	-.050	-.181	.182	.142	-.017	.051	.400
Michigan	.153	.120	.163	.111	-.290	-.193	-.171	-.176	.061	-.028
Minnesota	.066	.112	.104	.110	.187	-.146	-.168	.081	-.089	-.050
Missouri	-.040	-.028	.023	-.035	.093	-.146	-.131	-.279	.347	-.069
Nebraska	-.121	-.122	-.149	-.115	-.064	.268	.417	.093	-.102	.013
North Dakota	-.155	-.135	-.171	-.126	-.087	.243	-.267	.040	-.089	-.095
Ohio	.000	-.013	-.055	-.006	.011	-.097	-.088	-.183	.062	.028
South Dakota	-.071	-.090	-.101	-.086	-.124	.252	-.036	.007	-.071	-.075
Wisconsin	.407	.340	.173	.356	.135	-.167	.008	.062	-.064	-.073

Table H-7. Continued

	ResMob	Poverty	Elderly	Indiana	Iowa	Kansas	Michigan	Minnesota	Missouri	Nebraska
UCR Total										
Part 1 Total										
Violent Crime										
Property Crime										
# Farms										
Av. Farm Size										
% Corporations										
% Hired Labor										
% Black										
% Hispanic										
Residential Mob	1.000									
% Poverty	.030	1.000								
% Elderly	-.510	.055	1.000							
Indiana	.008	-.093	-.132	1.000						
Iowa	-.078	-.215	.071	-.059	1.000					
Kansas	.069	-.091	.150	-.058	-.171	1.000				
Michigan	.227	.074	-.187	-.047	-.139	-.136	1.000			
Minnesota	-.096	-.050	-.024	-.049	-.146	-.143	-.116	1.000		
Missouri	.248	.306	.003	-.046	-.137	-.134	-.108	-.114	1.000	
Nebraska	-.068	-.106	.119	-.054	-.160	-.157	-.127	-.134	-.125	1.000
North Dakota	-.302	.152	.097	-.041	-.123	-.120	-.097	-.103	-.096	-.113
Ohio	-.023	.038	-.190	-.023	-.067	-.066	-.053	-.056	-.053	-.062
South Dakota	-.008	.174	-.036	-.038	-.113	-.110	-.089	-.094	-.088	-.103
Wisconsin	.005	-.112	-.088	-.042	-.126	-.123	-.100	-.105	-.099	-.115

Table H-7. Continued

	ND	Ohio	SD	Wisconsin						
UCR Total										
Part 1 Total										
Violent Crime										
Property Crime										
# Farms										
Av. Farm Size										
% Corporations										
% Hired Labor										
% Black										
% Hispanic										
Residential Mob										
% Poverty										
% Elderly										
Indiana										
Iowa										
Kansas										
Michigan										
Minnesota										
Missouri										
Nebraska										
North Dakota	1.000									
Ohio	-.047	1.000								
South Dakota	-.079	-.043	1.000							
Wisconsin	-.089	-.048	-.081	1.000						

Table H-8. Correlation matrix of 2000 variables – sub sample

	UCR	Part 1	Violent	Property	# Farms	Size	% Corp	% Hired	% Black	% Hisp
UCR Total	1.000									
Part 1 Total	.927	1.000								
Violent Crime	.713	.831	1.000							
Property Crime	.932	.989	.740	1.000						
# Farms	.321	.331	.264	.331	1.000					
Av. Farm Size	-.311	-.308	-.290	-.295	-.338	1.000				
% Corporations	-.074	-.047	-.044	-.045	-.146	.316	1.000			
% Hired Labor	-.150	-.154	-.189	-.136	-.023	.392	.455	1.000		
% Black	.145	.225	.339	.182	-.028	-.112	-.086	-.066	1.000	
% Hispanic	.077	.102	.074	.103	-.058	.121	.289	.173	.047	1.000
Residential Mob	.418	.442	.429	.421	.083	-.157	.052	-.208	.330	.286
% Poverty	-.100	-.084	.010	-.105	-.164	.189	-.234	-.134	.238	.011
% Elderly	-.466	-.456	-.402	-.445	-.196	.147	-.001	.138	-.224	-.331
Indiana	.018	.031	.015	.034	-.018	-.076	.024	-.089	.001	-.025
Iowa	-.081	-.015	.052	-.032	.268	-.196	.177	.022	-.074	-.043
Kansas	-.161	-.161	-.133	-.160	-.176	.196	.084	.069	.044	.346
Michigan	.181	.093	.129	.078	-.257	-.215	-.150	-.152	.092	-.058
Minnesota	.039	.064	-.013	.080	.183	-.146	-.140	.014	-.065	-.013
Missouri	.054	.144	.238	.112	.136	-.157	-.175	-.261	.345	-.076
Nebraska	-.142	-.156	-.181	-.141	-.082	.282	.440	.301	-.121	.047
North Dakota	-.151	-.162	-.178	-.149	-.095	.271	-.258	.062	-.102	-.099
Ohio	.056	.044	-.027	.060	.009	-.105	-.120	-.228	.042	-.018
South Dakota	-.115	-.132	-.133	-.124	-.130	.274	-.029	.076	-.080	-.086
Wisconsin	.392	.321	.241	.325	.119	-.191	-.026	-.007	-.062	-.083

Table H-8. Continued

	ResMob	Poverty	Elderly	Indiana	Iowa	Kansas	Michigan	Minnesota	Missouri	Nebraska
UCR Total										
Part 1 Total										
Violent Crime										
Property Crime										
# Farms										
Av. Farm Size										
% Corporations										
% Hired Labor										
% Black										
% Hispanic										
Residential Mob	1.000									
% Poverty	.108	1.000								
% Elderly	-.585	-.039	1.000							
Indiana	.009	-.052	-.135	1.000						
Iowa	-.036	-.238	.054	-.059	1.000					
Kansas	.097	-.017	.100	-.058	-.171	1.000				
Michigan	.101	-.007	-.129	-.047	-.139	-.136	1.000			
Minnesota	-.094	-.129	-.020	-.049	-.145	-.141	-.114	1.000		
Missouri	.317	.323	-.110	-.046	-.137	-.134	-.108	-.113	1.000	
Nebraska	-.031	-.044	.103	-.054	-.160	-.157	-.127	-.132	-.125	1.000
North Dakota	-.339	.145	.237	-.041	-.123	-.120	-.097	-.101	-.096	-.113
Ohio	-.027	.029	-.170	-.023	-.067	-.066	-.053	-.056	-.053	-.062
South Dakota	-.035	.205	.016	-.038	-.113	-.110	-.089	-.093	-.088	-.103
Wisconsin	-.008	-.131	-.124	-.043	-.128	-.125	-.101	-.105	-.100	-.117

Table H-8. Continued

	ND	Ohio	SD	Wisconsin						
UCR Total										
Part 1 Total										
Violent Crime										
Property Crime										
# Farms										
Av. Farm Size										
% Corporations										
% Hired Labor										
% Black										
% Hispanic										
Residential Mob										
% Poverty										
% Elderly										
Indiana										
Iowa										
Kansas										
Michigan										
Minnesota										
Missouri										
Nebraska										
North Dakota	1.000									
Ohio	-.047	1.000								
South Dakota	-.079	-.043	1.000							
Wisconsin	-.090	-.049	-.082	1.000						

APPENDIX I
SUB SAMPLE ANALYSES

Table I-1. Descriptive statistics (means with standard deviations in parentheses) for sub sample

	Time 1 - 1980	Time 2 - 1990	Time 3 - 2000	All 3 Times
UCR total	395.3439 (470.64)	546.9163 (757.61)	706.7891 (925.46)	549.3846 (751.99)
Part 1 total	80.0976 (105.20)	93.0530 (142.28)	82.4441 (112.09)	85.1884 (120.96)
Violent	7.5761 (9.93)	12.3272 (19.32)	16.4218 (24.49)	12.0996 (19.22)
Property	72.4987 (97.56)	80.7248 (126.27)	66.0120 (92.75)	73.0774 (106.64)
% Black	.5044 (1.75)	.5973 (1.78)	.7656 (1.84)	.6222 (1.79)
% Hispanic	.8603 (1.67)	1.1406 (2.46)	2.4053 (4.74)	1.4676 (3.29)
Residential mobility	40.0288 (6.89)	36.8340 (6.76)	37.4371 (6.01)	38.1037 (6.71)
% Poverty	14.1285 (4.61)	14.7070 (4.64)	11.5247 (3.99)	13.4547 (4.63)
Number of farms	840.92 (475.06)	750.30 (412.11)	657.48 (364.31)	749.75 (426.10)
Average size of farms	610.89 (782.76)	632.37 (698.85)	702.04 (733.64)	648.36 (739.85)
% Corporations	2.0466 (2.18)	3.2048 (2.74)	4.9029 (3.81)	3.3822 (3.21)
% Hired labor	40.2113 (9.24)	40.7801 (9.84)	36.1465 (9.79)	39.0482 (9.84)
% Elderly	16.4182 (3.56)	18.6370 (3.86)	18.38 (3.83)	17.8101 (3.88)
N	519	516[a]	516[b]	1551[c]

Notes: (a) 3 cases missing, (b) 3 cases missing, (c) 6 cases missing

Table I-2. Variance inflation factor values for independent variables included in all models, sub sample

	Time 1 - 1980	Time 2 - 1990	Time 3 - 2000	All 3 Times
% Black	1.262	1.306	1.330	1.294
% Hispanic	1.686	1.670	1.584	1.551
Residential mobility	1.697	1.928	2.133	1.899
% Poverty	1.611	1.461	1.468	1.544
Number of farms	1.663	1.711	1.607	1.676
Average size of farms	2.367	1.951	2.149	2.002
% Corporations	2.523	2.164	2.193	2.397
% Hired labor	1.470	1.532	1.703	1.553
% Elderly	2.145	2.119	2.209	2.145
Indiana	1.336	1.304	1.301	1.282
Iowa	2.504	2.482	2.403	2.336
Michigan	2.314	2.264	2.108	2.118
Minnesota	2.234	2.093	1.969	1.994
Missouri	2.104	2.149	2.174	2.097
Nebraska	2.115	2.040	2.051	1.992
North Dakota	2.140	2.041	1.874	1.893
Ohio	1.398	1.443	1.457	1.408
South Dakota	2.022	1.744	1.650	1.717
Wisconsin	1.998	1.946	1.979	1.893
1990 dummy				1.531
2000 dummy				2.147

Table I-3. Means and overall, between and within sample standard deviations for indicators included in the time-series models, sub sample (N = 1557, n = 519, T = 3)

	Overall mean	Overall *SD*	Between *SD*	Within *SD*
UCR total	548.8654	751.197	689.7247	298.6441
Part 1	85.04185	120.7921	113.9259	40.35211
Violent	12.11914	19.25894	16.02357	10.69963
Property	72.91115	106.4821	100.3338	35.84019
% Black	.6271757	1.799923	1.759972	.3823622
% Hispanic	1.465405	3.291061	2.844824	1.657849
Residential mobility	38.08853	6.710935	6.12066	2.760844
% Poverty	13.48224	4.715358	4.070419	2.384866
Number of farms	746.9236	427.7022	416.5757	98.06577
Average size of farms	648.3604	739.8518	731.3509	109.9026
% Corporations	3.373285	3.208267	2.768152	1.6424856
% Hired labor	38.97564	9.97253	8.506606	5.213638
% Elderly	17.81166	3.892193	3.60781	1.466152

Table I-4. Pooled cross-sectional time series negative binomial regression results (and z-scores), 1980-2000, sub sample (N = 1557, n = 519, T = 3)

	UCR Total	Part 1	Violent	Property
% Black				
β	-.028339	-.0069699	-.0295467	-.0048255
Z	(-1.35)	(-0.32)	(-1.05)	(-0.21)
SE	.0209334	.0218006	.028098	.02275
% Hispanic				
β	-.0138078***	-.0095236*	-.015317**	-.0080691
Z	(-2.78)	(-1.75)	(-2.13)	(-1.39)
SE	.0049679	.0054449	.0071766	.0057953
Residential mobility				
β	-.0057653	-.008893*	-.0056442	-.0100419**
Z	(-1.35)	(-1.84)	(-0.84)	(-1.98)
SE	.0042567	.0048308	.0067256	.0050721
% Below poverty				
β	.0048982	.0065462	-.0026987	.0086312
Z	(0.94)	(1.06)	(-0.31)	(1.32)
SE	.0052219	.006164	.0086252	.0065155
Number of farms				
β	-.0004938***	-.0007573***	-.0009281***	-.0007042***
Z	(-4.86)	(-6.53)	(-6.38)	(-5.92)
SE	.0001017	.0001159	.0001454	.0001189
Average farm size				
β	.0002043***	.0001034	7.27e-06	.0001054
Z	(2.85)	(0.94)	(0.04)	(0.95)
SE	.0000717	.0001104	.0001859	.0001112
% Corporate farms				
β	-.0080454	-.0032858	.0019623	-.0039672
Z	(-0.97)	(-0.33)	(0.15)	(-0.37)
SE	.0082621	.0100904	.0133062	.0107644
% Hired labor				
β	-.007917	.0003087	.00133	.0001099
Z	(-0.41)	(0.14)	(0.43)	(0.05)
SE	.0019519	.0022521	.0030646	.0023774
% Elderly				
β	-.0104265	-.0096103	.0174607	-.0136853
Z	(-1.10)	(-0.87)	(1.15)	(-1.19)
SE	.0094389	.0110031	.0152055	.0114982
1990 Dummy				
β	.2708152***	.0404595	.2760142***	.0011978
Z	(7.63)	(1.03)	(5.02)	(0.03)
SE	.0355057	.0393634	.0549639	.040912
2000 Dummy				
β	.4436488***	-.2489798***	.3330952***	-.3421539***
Z	(9.90)	(-4.74)	(4.76)	(-6.21)
SE	.0047983	.0524789	.0700337	.0550846
Indiana				
β	-1.363439***	-1.798624***	-1.894399***	-1.686553***
Z	(-4.07)	(-5.08)	(-4.20)	(-4.76)
SE	.3348605	.3541247	.4510923	.354134

* $p < .10$ ** $p < .05$ *** $p < .01$

Table I-4. Continued

		UCR Total	Part 1	Violent	Property
Iowa					
	β	-.8378883***	-1.463008***	-1.222987***	-1.389928***
	Z	(-4.66)	(-6.87)	(-4.18)	(-6.54)
	SE	.1799008	.2129218	.2924429	.2125604
Michigan					
	β	-.1410377	-.3826761	-.010079	-.3529126
	Z	(-0.69)	(-1.61)	(-0.03)	(-1.49)
	SE	.2047797	.2373088	.3833309	.2367441
Minnesota					
	β	-.6754803***	-.6307844***	-.4735073	-.5478487**
	Z	(-3.50)	(-2.75)	(-1.44)	(-2.36)
	SE	.192904	.2293834	.3295894	.2318657
Missouri					
	β	-.9892079***	-1.21166***	-1.125353***	-1.005274***
	Z	(-5.01)	(-5.37)	(-3.70)	(-4.43)
	SE	.1973163	.2258044	.3044096	.2268056
Nebraska					
	β	.1232473	-.0134738	.1455135	.0635809
	Z	(0.67)	(-0.06)	(0.34)	(0.28)
	SE	.1829879	.2237493	.433992	.2254141
North Dakota					
	β	-1.028355***	-.2525517	-.4367297	-.0571368
	Z	(-5.08)	(-0.88)	(-0.82)	(-0.20)
	SE	.2024293	.2858342	.5339153	.2902809
Ohio					
	β	-1.388486***	-1.517225***	-1.750663***	-1.495179***
	Z	(-4.48)	(-4.35)	(-3.40)	(-4.20)
	SE	.3097298	.3491161	.5141653	.3563562
South Dakota					
	β	-.5029255**	-.0881448	.1393212	.0356834
	Z	(-2.32)	(-0.32)	(0.29)	(0.13)
	SE	.2166606	.273484	.4859041	.2828991
Wisconsin					
	β	-.10395	-.0587255	-1.273974***	.0630091
	Z	(-0.50)	(-0.25)	(-4.07)	(0.26)
	SE	.2070572	.2375454	.3133223	.2381917
Constant		-6.763229***	-6.272453***	7.001916***	-6.369946***
Log Likelihood		-6028.5609	-4518.1725	-2449.4663	-4018.2986
N Observations/Groups		1550 / 518 [a]	1547 / 517 [b]	1532 / 512 [c]	1547 / 517 [d]
Hausman Test		273.94***	381.64***	179.74***	331.47***

Notes: (a) 1 group (1observation) was dropped because of only one observation per group; (b) 1 group (1 observation) was dropped because of only one observation per group, and 1 group (3 observations) were dropped due to all zero outcomes; (c) 1 group (1 observation) was dropped because of only one observation per group, and 6 groups (18 observations) dropped due to all zero outcomes; (d) 1 group (1 observation) was dropped because of only one observation per group, and 1 group (3 observations) dropped due to all zero outcomes.

* $p < .10$ ** $p < .05$ *** $p < .01$

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BIOGRAPHICAL SKETCH

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