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Closures and Consolidation: Schools, Farms, and Population Decline in Rural Illinois

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CLOSURES AND CONSOLIDATION: SCHOOLS, FARMS AND

POPULATION DECLINE IN RURAL ILLINOIS

Eric J. Porter

87 Pages May 2012

This thesis reports the results of a quantitative research project examining the causal relationships between population decline, agricultural consolidation and school closures in rural Illinois.

THESIS APPROVED:

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Date Joan M. Brehm, Co-Chair

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Date Michael Dougherty

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This thesis reports the results of a year-long quantitative research project that examined the causal relationships between population loss, agricultural consolidation and school closures in rural Illinois—three primary facets of the overall decline in rural America. Conventional wisdom conceptualizes the following progression: a shifting U.S. economy from agriculture to manufacturing moved jobs to urban centers, which along with the reduced need for labor from industrialization in farming, caused out-migration from rural America; eventually this led to many rural schools closing due to dropping enrollment. However, it is hypothesized that these processes create exacerbating feedback loops. Specifically, loss of population leads to further agricultural consolidation, and school closures lead to increased population loss. This position is consistent with and informed by Human Ecology's POET model, which emphasizes the simultaneous interaction of influences affecting human settlement patterns.

Using county-level data from the U.S. Census of Population and Housing, U.S. Census of Agriculture and the Illinois State Board of Education, two-stage least squares modeling—a form of linear regression capable of correcting for multidirectionality in causal relationships—was used to investigate potential such feedback loops in the processes of rural decline. Results showed that while the models were valid and reliable, only weak support exists in the data for a feedback loop between school closures and population loss, and no support for population loss and agricultural consolidation. It is recommended that future research use a smaller scale of study, place level, in attempt to reveal feedback loops which are likely being masked at the county level.

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ERIC J. PORTER

A Thesis Submitted in Partial
Fulfillment of the Requirements
for the Degree of

MASTER OF ARTS

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This thesis is dedicated to my family and especially in the memory of my grandfather, Jim 'Pa' Porter. You carried this family through so much, with incredible steadfastness, delightful stories and ceaseless laughter. We love and miss you.

E.J.P.

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CHAPTER I

INTRODUCTION

INTRODUCTION TO DECLINE

Few events in American history are as widespread, protracted, and monumental as the shift from a nation made up of rural family farmers to one of urban service workers. The great significance of this reorganization also makes its ongoing expressions some of the most intriguing areas of scholarly investigation. For over a century Americans have been urbanizing and suburbanizing while shifting from the agricultural to the manufacturing to the service industry as their primary occupational sector (for a detailed description see Castle 1995a; or Kandel & Brown 2006). It's true that rural spaces may no longer hold the majority of U.S. residents nor does agriculture the majority of U.S. workers. Yet, it is also true that those spaces still hold a significant proportion of the population as well as the majority of land and natural resources, and that industry still provides the country's sustenance, still has a substantial impact on urban areas and continues to constitute an important piece of the overall economy (Holland, Lewin, Sorte & Weber 2009; Weber 1995; Lipton, Edmonson & Manchester 1998). Beyond these more concrete aspects, rural spaces still hold a special place in the minds and hearts of Americans and in our discourses (e.g., Castle 1995b; Howarth 1995). Understanding both the tangible and intangible facets of rural America is not merely a means to satiate academic curiosity but also an important step towards crafting appropriate policies that support a thriving nation.

An institution that has been experiencing significant changes for as long as rural spaces have been losing residents to urban—and family farms consolidating to industrial enterprises—is education. The evolution of the conventional model for schooling reflects the transition made by the nation's model of social organization, following a process of centralization. From a network of many, loosely and informally associated country schools, education has moved towards fewer and fewer schools, with control centralized in districts, states and the federal government.

Many have investigated the differences between urban and rural educational attainment and the effectiveness of large schools in comparison to small (e.g., Berry & West 2008; McGranahan & Ghelfi 1991; Teixteira 1995), the rationale and processes behind school consolidation (Hobbs 1995; Reynolds 1995), and the connections between education and communities' economic vitality (Fitchen 1981, 1991; Fitzgerald 1995). In a similar vein, much has been written of the linkages between the shift from family farming to industrial agriculture and community well-being (Goldschmidt's 1947 case studies are foundation in this area; see Lasely et al. 1993; Lobao et al. 1993; or Welsh 2009 for a review of related literature). However, few have attempted to connect school consolidation and closures with rural demographic change (Billger & Beck 2012) or to see what kind of interaction might be taking place between rural population loss, farm consolidation and school closures. Considering the importance that both these institutions are accorded, and the generally accepted importance of maintaining or gaining population for community vitality, it is important to explore the relationship these three phenomena have, both for rural communities and the nation as a whole.

The current study investigates the interaction between farm consolidation and school closures and population decline in Illinois with special attention given to counties with significant agricultural presence. This research is quantitative, using data from the U.S. Census of Agriculture, U.S. Census of Population and Housing, and Illinois State Board of Education. Specifically, addresses the following research question: to what extent, if at all, are the effects of population decline, farm consolidation and school closures interacting to create feedback loops that exacerbate rural decline? Illinois is an appropriate choice as it aptly characterizes each of the three national phenomena listed above. Moreover, Illinois is a part of the Corn Belt, which—along with the Great Plains—contains a major proportion of America's farms and has experienced the greatest, most protracted rural population decline and farm consolidation.

The potential significance of this study rests primarily with the possibility of better informing the spirited debates and important policy decisions that surround school closures/consolidations and the disappearance of family farms in favor of industrial, corporate agriculture. All sides of these debates have strong views and arguments, some of which are supported by empirical data and some for which empirical data does not exist. The proposed study seeks to shed light on some of the linkages between school closures and farm industrialization, and how they impact community demographic change. It is hoped that the findings will provide insights into the causes and consequences of these processes and inspire future research in these areas, ultimately leading to better *understanding of* and *policies for* addressing our rural and agricultural communities.

In reviewing the literature, I start with the history of rural population change in the United States. From there, I'll move into the capitalization and consolidation agriculture has experienced during the shift from family to corporate farming. The process of school consolidation and closures will follow, highlighting the aspects that are most talked about and contested within the longstanding debate between communities and policy makers over the closure of schools and consolidation of districts. Taking this body of literature into account, I make the case for how these processes of consolidation and decline may be interacting and influencing one another.

CHAPTER II

LITERATURE REVIEW

GENERAL REVIEW OF LITERATURE

Population Change

To speak of rural population change in the United States since 1900 is to speak of steady decline, save for two isolated periods of time (for discussions of the rural rebounds see Beale & Fuguitt 1990; Brown & Kandel 2006; Fuguitt 1995; Johnson & Beale 1994; Lichter & Fuguitt 1982; Long 1981). As a proportion of the national population, rural America has been steadily dropping as the growth of urban centers has outstripped that of rural areas (Hart 1995). This centralization trend in U.S. spatial demography has shifted the nation from one primarily rooted in widespread rural spaces to one clustered in urban cities (Castle 1995b). These booming urban populations owe less to natural increase than to the in-migration of rural residents and immigration from other countries.

Out-migration from rural to urban America was spurred by a shifting industrial basis of the national economy (to be addressed in the next section) and largely a movement of youth looking for employment opportunities (Lichter, McLaughlin & Cornwell 1992; Weber, Marre, Fischer, Gibbs & Cromartie 2007; Domina 2006). Rural spaces began a protracted loss of economic viability, leading to the urbanization of the nation’s youth (Hobbs 1995). Net out- migration of youth is a phenomenon that is unique to rural spaces in America (Brown & Kandel 2006) and one that raises serious concerns for the future of rural communities (Cushing 1994).

Such concern is due to the ‘brain-drain’ and a loss of vitality (Domina 2006). Brain-drain is caused by low economic returns for education in rural areas (Carr & Kefalas 2009) and has led to

migration of youth is a phenomenon that is unique to rural spaces in America (Brown & Kandel 2006) and one that raises serious concerns for the future of rural communities (Cushing 1994). Such concern is due to the ‘brain-drain’ and a loss of vitality (Domina 2006). Brain-drain is caused by low economic returns for education in rural areas (Carr & Kefalas 2009) and has led to major changes in rural communities, for example: leaving older populations, with less education and fewer skills in communities struggling more and more to provide services due to their shrinking tax bases (Lichter et al. 1992). This aging of the rural population is intensified by in-migration of the elderly, in spite of lower rates of natural increase in older populations than urban areas (Fuguitt 1995; Fuguitt & Beale 1993).

Rural population change is, both the majority decline and the isolated rebounds, also a story of spatial unevenness. At the individual level, substantial differences exist between rural communities in their experiences of population change (Fuguitt 1995). Rural populations can be divided into two groups: traditional rural communities and ‘other’ rural communities, which are dominated by urban residents migrating to peri-urban areas to live in suburbs or for retirement, recreation and other similar reasons (Hart 1995). As the traditional communities, largely organized around agriculture and other extractive activities, have declined in population, this other category has grown. Albrecht (1993) and Fuguitt (1995) point out, for example, that counties in the Great Plains with a high dependence on agriculture have experienced disproportionate out-migration without the benefit of a turn-around in the 1970s. Drabenstott and Smith (1995) categorize this difference as one between ‘winners and losers,’ and it extends to economic opportunities in rural communities (also see Smith 1992). Winners have a combination of growing service sectors and lifestyle amenities, as well as substantial educational opportunities (e.g., notable local government spending on education, the presence of colleges or universities, and a significant percent of population with sixteen-plus years of education) and more stable economies (Drabenstott & Smith 1995). The importance of natural amenities (draw retirees, recreational residents) and diverse economic bases (engender economic development) is reinforced by Johnson and Cromartie (2006).

A great deal of the growth in rural communities in peri-urban areas has been the suburbanization process of urban populations shifting to the rural/urban fringe (Mieszkowski & Mills 1993; Mills & Hamilton 1993; Riley 1985). Fueled by the advent of automobiles, roads, consumptive land policies and compartmentalized communities, suburban sprawl became the primary rural growth of the 20th century (Lewis 1987), a process documented for east-central Illinois by Riley (1985). This phenomenon led Riley to note rural America has become more of a locational amenity rather than a way of life or productive system (1993). This too has led to a drop in the number of rural (or 'non-metropolitan') counties as populations grew in areas surrounding urban centers (Fuguitt 1995), such loss has been most pronounced in the Great Plains and Corn Belt where agriculture is most prominent.

Farm Consolidation

A significant factor contributing to the out-migration from rural America has been the mass exodus from family farming. Lobao and Meyer (2001) assert this shift, from most citizens being directly connected to farming to a majority living in urban or suburban setting, as one of the top sociological and economic changes in United States history. Since the end of the nineteenth century, the number of farmers, farms and the percentage of Americans farming have been decreasing (Hart 1986). For example, as of 2000, the United States had one-third as many farms producing twice as much food and with tremendously larger average size as in 1930 (Gardner 2002). This decline became dramatic after 1940 with increasing industrialization and the shift to a manufacturing based economy (Hart 1995; Lynne 2002). Farmers constituted 65% of America's rural population (35% national) as of 1910 but were down to only 6.3% of rural residents (1.6% nationally) by 1990, and the number of farms has decreased from approximately seven million in 1934 to two million by 1987, finally stabilizing in 1990 (Vias & Nelson 2006). Since then, the total number of farms has continued to hover around 2.2 million (U.S. Department of Agriculture (USDA) 2009). In Illinois alone, the number of farms went from 203,000 to 73,000 between 1950 and 2004, while the total acreage cover only decreased from 31.7 million acres to

27.5 million, resulting in average farm size more than doubling (Varner 2005). A century of decline in the number of farms and farmers has been accompanied by decreasing income generated by farming (Weber 1995).

The impetus for the decline of American family farms (and thus out-migration from rural spaces) was the shift from an agricultural to industrial manufacturing-based economy (Castle 1998). The population centralized in urban spaces as jobs in manufacturing gave greater employment and income opportunities, but also occurring was the rapid growth in the size and capitalization of farming and farm work (Gardner 2002; Lobao 1990). Between 1934 and 1987, the average farm size tripled from 153 to 462 acres (Hart 1995). Since 1987, this trend has continued while the total acreage of cropland in the U.S. has slowly declined (USDA 2009). Agricultural output per hour of farm work increased 1,300% from 1940 to 1989 (Beale 1993), and productivity per acre more than doubled (Albrecht & Murdock 1990; Gardner 2002). The introduction of industrial agriculture greatly reduced the number of farmers and farming operations needed to supply the nation's food by increasing in the number of acres each farmer was able to cultivate and harvest, thanks to mechanization extending the *impact of* and decreasing the time *needed for* their labor.

Resultant of this radical transformation is the fact that 'rural' is no longer synonymous with 'farm', as it once was (Hart 1995). Rural peoples have become increasingly mobile and rural economies increasingly diverse, meaning we can't expect residents of America's rural spaces to be working traditionally rural jobs. Farming employment now makes up a meager proportion of rural jobs, leaving the U.S. with the world's highest percentage of rural workers employed outside of agriculture (Mills 1995). As Hart points out, this entails an influx of people without agricultural backgrounds, jobs, outlooks or values, and leads to urban and rural lifestyles and perspectives becoming more and more similar (Fuguitt 1995; Fuguitt, Brown & Beale 1989; Lichter & Brown 2011). Ultimately, mobility has made many small villages and towns—once functioning as suppliers and service centers for farmers with limited ranges of movement—redundant (Hart 1995), and out-migration has coupled with political pressures towards rationalization to exacerbate the decline of rural communities, a process playing out notably in education.

School Closures

Hobbs (1995) deftly connects the spatial, economic, local communal and institutional organization of rural America, detailing how national trends and political policies have impacted rural organization. He notes that this overall process toward institutional uniformity in America is best exemplified by the school system. As farms and population bases in rural America have gone, so too have the number of school districts and schools to consolidation.

Beginning in 1920, a sizeable political process towards nationalization of education and schools started in the United States (Hobbs 1995). Funding of education transitioned from local to state and federal sources (Jansen 1991) and with it went control over the structure and organization of education. Tyack (1974) describes the effort to develop and implement the 'one best system' for schools, which included affordability, necessitating an enrollment large enough to provide adequate revenues. Thus consolidation of the rural school network was dictated, 120,000 schools and 100,000 districts were eliminated between 1930—when the consolidation movement gained traction—and 1970 (Berry & West 2008; Goldin 1999). The number of districts shrank further to 15,000 by 1987, having started at 128,000 in 1930. Many small town high schools were removed, but the biggest outcome was the one-room, first-through-eighth schoolhouse vanished.

Increasing external control of schools resulted in the social and intellectual isolation of those institutions from the communities they serve. This was seen as necessary by administrative reformers, according to Berry and West (2008) in order to curb corruption in city school systems as well as the parochialism in rural school systems by way of concentrating authority into professional hands. Modern corporations and the power of the scientific method inspired and guided this process. Professional employees and administrators took over the operations of schools and development of curriculum. Educating more students, with greater consistency and using fewer teachers (i.e., enhancing efficiency) was a primary goal and accomplishment of consolidation (Holland & Baritelle 1975), however it also increasingly created an environment embodied of the national character rather than of the local (Gamradt & Avery 1992). This loss of social integration involves a loss of local autonomy and self-sufficiency (Gartrell 1983), undermining social capital (Coleman 1987) and inspiring ever-growing resistance of community residents while school administrators/politicians attempt to demonstrate the benefits of curriculum standardization, the development of best practices and how using economies of scale allow for better facilities at lower costs (Berry & West 2008; Reynolds 1995; Banovertz & Dolan 1990; Fuller 1982). Proponents of consolidation also cite improved student performance and greater academic opportunities as benefits of consolidating, which—like all other facets of this debate—have both arguments for and against (for a thorough discussion, see Rooney & Augenblick 2009; and Schmidt 2011).

Proposals for consolidation or closure of schools draw strong opposition from members of targeted communities and are generally debated along lines of community well-being pitted against educational and financial efficiency (Bender 1978). By the early 1990s, administrators had been advocating for consolidation as a means to improve student attainment and cut costs for over a hundred years (DeYoung 1992). Administrators have reason to stand by their arguments, as Duncombe and Yinger (2007) find that doubling enrollment cuts operation costs by 31.5 percent for a 300-pupil district and 14.4 percent for a 1,500-pupil district, after accounting for capital spending. This makes consolidation an effective fiscal option, especially for the smallest of districts. Further, Rangazas (2002) finds that between 1870 and 1970, wherein the most intensive consolidation took place, investments in schools were also increasing greatly, likely causing between thirty and forty percent of the five-fold increase in U.S. worker productivity during that period.

Communities, on the other hand, feel threatened by the potential loss of a significant monument of their neighborhoods and small towns, fearing the removal of a significant part of their identities and social connections (Hobbs 1995; Schmidt 2011). Such social consequences combine with the economic to spur resistance (Rooney & Augenblick 2009; Sher 1986), as do rural perspectives of schools as part of the local identity (Alvord 1960). Though the true import of school locality is debatable, there is some evidence for the local argument (Coleman 1987) or that political ends are more at root than effectiveness of schools (Reynolds 1995), and certainly the backlash of communities against consolidation shows the perception is strongly entrenched. This can cause not only conflict between school officials and communities but also within and between communities, as Peshkin's 1982 study of a twenty-year long battle in rural Illinois demonstrates.

RATIONALE FOR STUDY

Importance of Rural Studies

With a resident base that is ever decreasing as a percentage of the national population and, in some ways, coming to more closely resemble urban inhabitants, one could make an argument that rural studies are losing importance. Yet, even though they are being outstripped by the rate of growth in urban areas, rural spaces still hold a steady and slowly growing population, one that was larger than twenty-two of the world's nations as of 2000 (Population Reference Bureau 2000) and is deserving of being understood and aided by academics. Beyond simple counts of inhabitants, Castle (1995b) makes clear that there remain many important characteristics of rural spaces and peoples worthy of study. There is the land itself, which constitutes the bulk of the U.S., holds the majority of our natural resources, and is in the hands of rural peoples. Moreover, to dismiss rural studies on the basis of a non-significant population size would be to fail to recognize the tremendous amount of ties between rural and urban spaces (Sorokin & Zimmerman 1929), ties that represent an interdependence Lichter and Brown (2011) contend is growing.

The interdependence between urban and rural areas in America is both cultural and economic in nature. With longstanding cultural values seen as being safeguarded in rural spaces, new ideas are often born and emanate out of urban areas. In this way, cities can explore and create, generating new technologies, while rural America provides stability and grounding (Fischer 2010; Howarth 1997). This is a somewhat romantic vision, but considering the brain drain experienced by rural communities and economic transformations within urban cities, it does make a measure of sense that at least new technologies and methods would tend to be developed in urban centers where the educated, professional populace congregates most heavily. On the reverse end, where education is lacking, consistent intergenerational cultural transmission may predominate (for a well-balanced discussion of this issue see Inglehart & Baker 2000).

Economically, extractive industries are generally situated in rural landscapes, yet have enormous impacts on urban centers—food and energy production, natural resources, input products (Weber 1995; Holland, Weber & Waters 1992; Holland, Lewin, Sorte & Weber 2009). In fact, greater benefits are typically reaped by those in urban than those in rural areas, thanks to the channeling of resources by industries needing inexpensive and abundant land for production but large metropolitan populations to sell to (Weber 1995). Furthermore, such sociocultural and economic integration and ties continue to grow more pronounced as persons migrate between urban and rural spaces (Fuguitt 1995; Lichter and Brown 2011). Clearly, those in urban areas have a vested interest in understanding rural peoples and spaces, and in ensuring a high level of vitality therein, thus the importance of changes in schools, agriculture and population in rural America.

Rural Education Concerns

School buildings are one of few and most important public symbols for rural communities, standing for the population’s commitment to the ideal of community (Driscoll 2008; Post & Stambach 1999; Rooney & Augenblick 2009; Salamon 1995). Along with churches, schools were the basis for rural neighborhoods and towns as they were forming, being the institutions through which residents came into contact, built social capital and consciously created their communities (Fowler 1991; Hobbs 1995; Park 1952). In the Midwest, schools were valued as a core institution since the frontier days, used not only for education but also for voting centers, group meetings, recreation, and producing community-minded students (Ilvento 1990; Salamon 1995). Being so multi-purposed, the very school building is central to the social fabric of rural communities, facilitating what Feudenberg (1986) calls 'high density acquaintanceship' wherein a high percentage of residents all are linked through primary social relationships. These tight social networks are critical for creating a sense of community. So important are these features, communities have even been known to over-tax themselves in order to preserve their schools (Salamon 1995).

Then there is also the literal purpose of schools: education. Again, Rooney and Augenblick (2009) do an admirable job exploring the research on the academic effects of consolidation, noting that the findings are split on whether consolidation enhances academic performance, but too many limitations exist within the research to determine which side is correct. They cede that evidence is lacking to either support or contradict the claim consolidation enhances student performance. There is evidence, however, that consolidated school districts are able to offer wider curriculum options as well as extra-curricular activities (Hall & Arnold 1993; Rooney & Augenblick 2009; Self 2001). Also, recruiting, retaining and developing teachers may be an easier task for larger districts, but as with student performance, the research is inconclusive as to whether consolidation leads to more highly qualified teachers (Driscoll 2008; Duncombe & Yinger 2005; Self 2001; Young & Green 2005). In conclusion, Rooney and Augenblick (2009: 18) state:

> "The literature on district size, consolidation, and academic achievement is mixed. The research suggests that smaller districts often produce higher academic achievement. However, course offerings and extracurricular opportunities may be much greater in larger districts. Small remote districts may also have a difficult time recruiting, retaining, and providing professional development to teachers. As a result, it is unclear whether district consolidation would be academically beneficial to students."

The primary ostensible outcome of educating is creation of human capital in order to prepare youth for being productive members of society. Lack of human capital is strongly associated with poverty (Fitchen 1981; 1991; Hirschl & Brown 1995), as it is crucial in determining workers' competitiveness in getting local jobs (Thurow 1975). Rural poverty rates are greater than urban, suggesting lower levels of human capital. However, while McGranahan and Ghelfi (1991) note rural youth lag behind urban in attainment, Teixeira (1995) finds educational achievement (i.e., standardized test scores) is essentially equivalent between rural and urban spaces and that human capital is generally rising in rural America. Howley (1996) as well as Bickel and Howley (2000) and Reeves (2005) support Teixeira's academic claims, finding over the course of several studies that larger schools and districts are by and large equaled if not outperformed by smaller schools and districts in overall achievement.

In spite of educational advances in rural areas, economic outcomes of individuals seem to be diminishing (Lichter & Jensen 2002). Rural workers are more likely to be underemployed and underpaid than their urban counterparts (Shapiro 1989; Lichter, Johnston & McLaughlin 1994), poverty rates are higher in rural areas for all levels of education (O'Hare 1988), and some research has found no significant relationship between local educational levels and employment growth (McGranahan 1993). This has prompted Fitzgerald (1995) to argue that increasing education levels will not be enough to improve economic conditions in rural America, that legislation encouraging demand for educated labor is needed. That education alone cannot improve rural economic outcomes is reinforced by Dewees and Velázquez (2000) in their case study of a school-based community development program for Hispanic students. However, this does imply that increasing educational attainment is also integral to rural development, for which educational opportunities and schools are obviously necessary. Also of potential importance is social capital. Coleman (1987) finds that increasing amounts of social capital (both at the family and community levels) leads to increasingly positive educational outcomes, as does Redding

(2000), and rural communities' social capital is undermined by school consolidation. Similar concerns have been raised over the shift from family to industrial farming.

Industrial Agriculture Concerns

Starting with Goldschmidt's 1947 book comparing two California farming communities, many studies have been conducted investigating the impact of industrial farming on quality of life and economic vitality in rural America (Gardner 2002; Pretty 2002; Swanson 1988). Findings have generally shown an association between farming structure and both quality of life and economic vitality, wherein the shift to industrial from family farming is detrimental for communities (Butler & Carkner 2001; Frisbie & Poston 1977; Fujimoto 1977; MacCannell 1988; Petterson 1977). However, others have posited the greater importance of economic diversification as opposed to farm structure (Swanson 1982). Further tempering the fervor of the anti-corporate farming movement, Welsh (2009) points out that while such negative impacts have been demonstrated, the structure and surrounding markets of farming have undergone major transformations since many of these studies were conducted, Goldschmidt's most notably. Therefore, he argues, new studies are needed with methodologies adapted to the current state of agriculture in the U.S. in order to adequately assess the effect of industrialization.

Yet, between 1955 and 1990, agriculture lost three million workers, diminishing its role in employment and income generation (Smith 1993). Within this timeframe (1975 to 1989), the service sector grew by 89%, and this rise of the service industry is linked to the 'new poor' or working poor (Shapiro 1989). Also during this shift, unemployment in rural labor markets increased from 4.4% to 6.5% (Fuguitt 1995; Brown & Beale 1989), coinciding with unemployment rates switching from generally lower in rural than urban areas (1950s to early 1980s) to lower in urban than rural by the early 1980s (Hirschl & Brown 1995). Therefore, significant evidence seems to suggest farm consolidation may be having negative social and economic impacts on rural communities. Furthermore, White (2008) finds some support for the hypothesis that mechanization of farms drove population decline in counties dependent upon agriculture in the Great Plains. Her results are mixed, showing a positive association between population change and mechanization at the turn of the 20th century but then a significant negative association in the years following. The question truly is: how are these phenomena (population, farms and schools) connected?

Bringing Population, Farm and School Change Together

A highly urbanizing society leads to an increased portion of the population depending upon smaller groups of rural peoples and places for food, energy development, recreation and entertainment (Lichter & Brown 2011). Some academics also claim rural America is a stronghold of cultural values that provides stability in fast-changing urban-suburban America (Horwarth 1997). They contend that these values go, if the communities go, a fear that has engendered longstanding concern for population loss in rural America, especially in the farming base (Reynolds 1995; Danbom 1979). Though difficult to determine, there is substantial support for this idea of 'American values' as coming from rural, agricultural areas (Clugston 1997; Hayden 2000; Pyrkozs 2001). Moreover, interest in community and local-level organization has been growing nationally while traditional rural communities have been losing their ability to maintain social integration (Bellah, Madsen, Sullivan, Swidler & Tipton 1985). This decline in rural society has come with the decreasing number of farms and schools as both institutions consolidate and rationalize, and it has ultimately come with decreasing rural populations. The popular conception is that population loss results from farm consolidation and leads to school consolidation (National Education Association 1897; Tyack 1974). Yet little or no empirical evidence exists to establish whether this is the case.

Some have made arguments that, in the instance of school closures, population loss may not be the true cause, and, as described above, many have shown reason to be concerned about the rise of industrial farming. Reynolds (1995) details Iowa's example, where political ends seemed more at play than population loss or ineffectiveness of country schools as compared to consolidated state schools, and a host of authors have questioned the arguments claiming educational improvements derive from consolidating schools, though most also acknowledge that existing research neither confirms nor disconfirms such claims (Driscoll 2008; Duncombe & Yinger 2005; Dunne 1977; Goodlad 1984; Monk & Haller 1986; Rooney & Augenblick 2009; Self 2001; Turner 1985; Young & Green 2005). Nachtigal (1990) goes further explaining that the characteristics which make a school educationally effective are not tied to school size.

A shifting industrial basis may have been at the heart of population decline when it started in rural America, but dwindling economic and educational opportunities might now be exacerbating that trend and bringing a growing crisis. The protracted loss of young adults compromises vitality and entrepreneurial spirit, and it's having an impact on organizational and technological innovations, which require human capital (Johnson & Rathge 2006). As skilled youth flee, rural communities are seeing their tax bases shrink, leading to private and public shutdowns or consolidations. Thus, decreases in population lead to closing hospitals, schools and Main Street businesses (Brown 1981). Likewise, as the farm population drops, demand for goods and services in rural areas drops, leading businesses to close, decreasing employment, and a decreased ability of communities to attract non-farm populations, ultimately leading to increased population loss (Von Reichert 2006). When such a lack of services combines with remoteness, it leads to a loss of population (McGranahan & Beale 2002). This is a crisis that policy could play an important role in continuing or curtailing, but policy needs to be informed and, right now, we don't have enough research illuminating the interrelationship between these phenomena. In fact, the only study I found linking rural communities, schools and agriculture focuses on how confined animal feeding operations represent a 'second enclosure,' wherein market-driven needs dispossess rural populations through detrimental social, health and environmental effects (Theobald & Rochon 2006). Rural schools are only mentioned as a vehicle for resisting such consequences, consolidation being left out of the discussion.

HYPOTHESES

The following are hypothesized:

1) Population loss and farm consolidation are reciprocally related, wherein increases in farm consolidation lead to decreases in population, which in turn lead to greater farm consolidation.
2) Population loss and school closures are reciprocally related, especially for youth and young adult age groups, wherein population decline leads to increasing school closures, which in turn lead to further youth population loss.

Theoretical Basis

Support for these hypotheses can be found within the Human Ecology field of thought. Specifically, the POET model developed by Duncan and Schnore (1959)—and further clarified by Duncan (1964), Hauser and Schnore (1965) and others in the Ecological Complex School—presents a framework to understand the claims above. In the POET model, four components influencing human settlement patterns are analyzed as they simultaneously interact: Population, Organization, Environment and Technology (Catton 1994). It is used in attempt to understand how societies adapt to environments that are always changing and presenting restrictions (Albrecht 1992). The four facets are interrelated, wherein a change of one leads to changes in the others (Sjoberg 1965). Cottrell's classic 1951 study of the impact the introduction of diesel trains had on small towns, built to service steam engines, provides a foundation for this theoretical approach. He deftly shows the importance of population size, social organizations, environmental features and technological innovation, and how all four act—both as causes and effects—while influencing human settlement patterns.

For the current study, the POET model can be effectively applied for both hypotheses. In the first, economic shifts and technological innovation (mechanization of farming) lead to organizational changes (farm consolidation), which in certain environmental circumstances (counties with a significant agricultural presence) significantly reduces economic opportunities, leading to population changes (outmigration). Such population loss naturally constricts the availability of human and social resources for farmers and farming (labor, customers, small businesses, etc.), which in turn may harm farmers' ability to operate and lead to increased consolidation.

Changes in population link the second hypothesis to the first, and bring organization more prominently into the picture. As population loss occurs, the need for schools in such communities declines, leading to school closures and consolidations. As places lose their schools, they become less attractive to residents and potential residents, especially those with school-aged children. This leads greater outmigration and slackened in-migration—population loss. Together, the two hypotheses utilize the four aspects of POET modeling to better understand the process of rural decline.

CHAPTER III

DESIGN AND METHODS

OVERALL APPROACH AND RATIONALE

The phenomena in question are large in scale, have ample high-quality data available for analysis and a history of being studied quantitatively by sociologists. Accordingly, the study is quantitative in nature, using secondary data from the Illinois State Board of Education, U.S. Census of Population and Housing and the U.S. Census of Agriculture. Statistical modeling is an especially apt approach as the study seeks to determine what, if any, reciprocal causal relationship exists between these trends. Furthermore, the study is limited temporally and financially, precluding original data collection. However, even if these limitations did not exist, it would be unlikely that better data could be generated than what has already been created by the U.S. Census Bureau and Illinois State Board of Education (ISBE).

DATA

Data on farms and agriculture was drawn from the U.S. Census of Agriculture, which is overseen by the USDA (Haines & ICPSR 2010). It began in 1840, was originally conducted decennially, and—starting in the 1920s—it shifted to being conducted once every five years. Forms are mailed to farm operators in December of the survey year, which have been the second and seventh years of decades since the 1980s (e.g., 1982 and 1987). By surveying all farms and ranches, in all states and counties of the United States, this census is intended to gather comprehensive data on domestic agriculture, and participation is legally mandated. Data

Data include but are not limited to: number and size of farms, acres of farmland and down to harvested cropland, total value of agricultural sales and breakdown of number of farms per value of sales category, value of machinery and equipment as well as land and building, types of produce and animals raised. The variety and detail of measures within the census is extensive.

The U.S. Census of Population and Housing provides demographic data for the present study. Even longer standing than the Census of Agriculture, it has been conducted for over two centuries, since 1790. Performed decennially, the U.S. Census bureau counts every person in the country. It is well acknowledged as a principle source of demographic data for residents of the United States, in addition to determining the number of seats in the House of Representatives each state is allotted. Every household is mailed forms, and then census workers canvas American neighborhoods to complete the data collection.

Finally, for schools, the data set used was collected from the ISBE and compiled by Billger and Beck (2012). This data set is again comprehensive, accounting for all schools in all counties of Illinois from 1972 until 2005. Billger and Beck had many purposes in compiling the data, intending to: inform policy on rural school closures in Illinois and elsewhere; utilize long-range longitudinal data to address the relationship between school size and things such as educational quality and budgets; shed light on how the closure of a school impacts its community; and investigate the role of schools as economic engines. The data were gathered, entered into SPSS and are unfortunately incomplete for the full time series in certain variables, such as school enrollment, property values and so on. The key variables for the current study—number of schools, enrollment and operating expenses per pupil—are present for all counties, from 1985 through 2005, allowing for analysis between 1987 and 2007.

SAMPLE

Illinois has been chosen for study as it is a large, regionally diverse, important agricultural state, situated within the Corn Belt—a region that has exemplified the trends discussed above. Over 43% of Illinois' 102 counties have substantial farming activity, as shown by Jackson-Smith and Jensen's (2009) 'agriculturally important' classifier (discussed below). More importantly, they are spread across a wide variety of counties in terms of acreage, population size, presence of and distance from metropolitan centers. Furthermore, in 2004, Illinois overtook Texas to become the nation's third largest exporter of agricultural products (Varner 2005), and since that time, the two states have vied with each other and Nebraska for that rank, Illinois never dropping below fourth (USDA 2012). These characteristics are crucial for teasing out the importance of rurality and the significance of agricultural activity in relation to demographic change.

The state also is engaged within a substantial education debate currently, regarding a long-standing process of district consolidation and rural school closures. There are strong arguments on both sides of the dialogue, and as the nation's fifth largest state as of 2010 (U.S. Census Bureau 2011), it has sizeable student and resident populations involved. Thoroughly rigorous, quantitative data could go a long way in assisting to inform positions and guide policy. In this regard, the existence of the ISBE data, along with the censuses, makes Illinois an even more attractive case for study. The data set holds reliable and key information needed for the present study, and such data is challenging to acquire as it is not normally compiled or made available by state or national government agencies.

MEASURES

Timeframe and Level

Starting in 1969/1970, the study looks at approximately five-year changes, aligning with the years in which the U.S. Census of Agriculture was conducted, through 2007 for agricultural consolidation and population loss, spanning more than thirty years. For school consolidation and population loss, the timeframe is shorter, from 1987 through 2007, due to the limited availability of two-out-of-three key educational measures. Analysis will cover approximately five-year time spans. The time spans were chosen to match the U.S. Census of Agriculture years, which prior to the 1980s were not yet standardized to the second and seventh years of each decade (i.e., 1992 and 1997). Earlier years of that census included in the present study are 1969, 1974 and 1978.

Both models are conducted at the county-level, which is appropriate largely because the most complete and temporally expansive data are available at this level. Place-level data would enhance regression by providing a greater number of cases, data points and amount of variation. However, such data are not readily available in full for farms due to privacy concerns when too few farms are operated within a specific place, so as to compromise anonymity. State-level data, on the other hand, does not allow for as detailed of comparisons to be made, negating the use of regression.

Population

Population data will include measures for *total population*, *youth population*, *unemployment* and *rurality*. The *total population* measures indicate the percentage change in total county populations. *Youth population* is operationalized as under-thirty years of age, and those measures indicate the percentage change in the segment of the total population that is under-thirty years old. This age group was chosen as it captures the movements of both school-aged residents and the young, job-seeking population—the two populations expected to be especially active in/affect by rural decline. A percentage change in the total number of persons under thirty years of age was chosen instead of the percentage change in the *proportion* of the population under-thirty to avoid entangling the results with the general aging of the United States as the baby boom generation shifts age distributions throughout the decades (Auerbach & Lee 2009; Lee & Tuljapurkar 1994). *Unemployment* measures the change in percent of the population classified as unemployed and is used as a predictor for population trends. These first three measures are numeric. The measure for *rurality*, on the other hand, is a series of three binomial (or 'dummy') variables.

As Fuguitt, Heaton and Lichter (1988) demonstrate, it is important to control for reclassification in county statuses (rural versus urban, agriculturally important versus not agriculturally important) to maintain consistency in analysis. Thus a classifier for *rurality* that distinguishes between large urban counties, rural counties adjacent to large urban counties, and rural counties non-adjacent to metropolitan counties is utilized. Rural-Urban Continuum Codes (RUCC), developed by the United State Department of Agriculture, were used to derive this measure. The RUCC are a nine-part coding measure that does two things: 1) distinguishes between three sizes of metropolitan (metro) counties; 2) distinguishes between six levels of non-metropolitan (non-metro) counties based on proximity to metropolitan counties (*adjacent to* or *not*) and the degree of urbanization (number of urban residents) within the county (USDA 2004). Metro counties are coded '1' through '3', with '1' being the largest counties, '2' the second largest, '3' the third. Non-metro counties are coded '4' through '9', with even numbers signifying adjacency to metropolitan counties (non-metro-adjacent), odd numbers non-adjacency (non-metro-non-adjacent), '4' and '5' having the highest level of urbanization, and '8' and '9' the lowest level of urbanization. The RUCC have been recorded in 1974, 1983, 1993 and 2003. For this study's *rurality* measure, three binomial variables were created. The first distinguishes metro counties (coded '1') from the two non-metro categories (coded '0'). The next distinguishes non-metro-adjacent (coded '1') counties from metro and non-metro-non-adjacent counties (coded '0'). The third distinguishes non-metro-non-adjacent counties (coded '1') from the other two (coded '0').

Organization

Farm data will include the *number of farms*, *average size*, and *average sales*. Like total population, each of these measures records percentage change over five year periods—as delineated by Census of Agriculture years. The *number of farms* measure indicates percentage change in each county's total number of farming operations. The *average size* of farms is determined by the percentage change in average acreage of utilized cropland per farm—as opposed to the more finely parsed average acreage of harvested cropland or the more general average acreage of farmland. The purpose behind choosing cropland is to use a measure for operated acres, as opposed to total acres, which might obscure the true size of operations with vast tracts of unmanaged land, or only harvested acres, which would not account for managed land that does not directly produce (i.e., fields with failed crops).

Average sales is operationalized as the percentage change in average amount of agricultural products sold per farm, held in constant dollars for 2007. Ironically, it is *average sales* which gives a more accurate measure of 'small' versus 'large' farming operations than *average size*. As the USDA (2003) points out, acreage is not synonymous with the amount of farming activity or the prominence or output of a particular operation. A cattle rancher with relatively few cattle may graze over a large swath of acres, while an operator of a concentrated cattle farming operation may use a similar or smaller amount of acres while producing a much larger number of cattle each year. Therefore, the third-party measure of sales serves as a substitute, abstracting the amount of products grown/raised on a farm to a common measure. All these measures are numeric.

School data include *number of schools*, *operating expenses*, and *enrollment*. These five-year change variables start in 1987 and go through 2002, again matching the U.S. Census of Agriculture years, allowing for analysis of population trends from 1992 through 2007. *Number of schools* indicates the percentage change in number of schools. *Operating expenses* are operationalized as the percentage change in average operating expenses per pupil for each county, held in constant dollars for 2007. This measure is derived from each school district's reported per pupil operating expenses, aggregated by county. *Enrollment* is measured in terms of percentage change in total county student enrollment, which is derived from reports on individual schools' enrollment, again aggregated by county. These measures are all numeric.

Environment

The salient environmental feature identified in this study is the quality of agricultural land in counties. Jackson-Smith and Jensen's (2009) method for identifying *agriculturally important (AI)* counties is used to identify and account for those counties which have especially high yielding agricultural land. Agriculturally important counties are defined as those counties which are either: 1) in the top quartile of counties in the United States, by *total sales of agricultural products*; or 2) in the second quartile of counties in the U.S. by *sales of agricultural products* AND in the first quartile of U.S. counties by EITHER *sales per acre of farmland* OR *sales per acre of cropland*.

This method is preferable to the more traditional 'farm dependent' measure, wherein a county is considered dependent on agriculture if the farming sector constitutes 15% or more of total land-and-proprietor income within the county (USDA, 2006). The shortcoming of the farm dependent (FD) measure is that such counties have been steadily declining to the point that the vast preponderance of farms are no longer found within them, as well as the percentage of the national population (Kassel & Carlin 1999; Salsgiver & Hines 1993; Schluter & Edmondson 1999). As Jackson-Smith and Jensen (2009: 48) point out,

> "Over 70 percent of total farm sales and milk-cow inventories, two-thirds of farm workers, over 50 percent of cattle and calf inventories, and over 40 percent of farms and cropland were found in AI counties. By contrast, FD counties represented less than 30 percent of the U.S. totals on all these measures."

About fifty-percent of the U.S. population lives in *agriculturally important* counties, versus less than two-percent living in farm dependent counties. *Agricultural importance* is a binomial (dummy) variable.

Technology

Technological change is operationalized via the average *level of industrialization* of farms. This is operationalized as the percent change in average value of all machinery and equipment per farm over five-year time spans—as delineated by the Census of Agriculture years. All machines and vehicles are included, recorded at market value and have been transformed into constant dollars for 2007. It is a numeric variable.

ANALYSIS PROCEDURES

As hypothesized, the phenomena of population loss and 1) agricultural consolidation; and 2) school closures/consolidation have bidirectional causality, which is why the POET theoretical model—with its simultaneous consideration of influences—is fitting. Population, organization, environment and technology are seen to be the primary factors guiding human settlement patterns and to be interacting non-hierarchically, each affecting all others (see figure 1). That is to say, the direction of causation is not a straight line, but rather contains loops wherein not only do changes in exogenous variables lead to changes in the endogenous variables of the model but, also, changes in some endogenous variables will cause changes in certain other endogenous variables. Cottrell's classic 1951 study on how the introduction of diesel trains affected the town of 'Caliente'—as it did many small towns developed to service steam engines—is an adept example of the POET model.

What Cottrell found is that a technical innovation altered the social organization of towns built around servicing the railroads, especially in environments otherwise untenable for settlement, and eventually led to massive outmigration. However, the implementation of that technological change was facilitated by demographic and social organizational features of the time it came about in. Diesel trains have a much larger range than steam engines, so they can cover greater distances between refueling, consequently bypassing many towns that were previously indispensable to the rail lines. In the Southwest, these towns had sprung up in the desert, in barren areas far removed from population centers and fully dependent on regular resupplying by the trains. Simultaneously, the influences of 1) technological innovation, dieselization; 2) organizational change, loss of economic basis; and 3) environment, remote desert, converged to significantly alter the settlement patterns in that part of the United States. Yet, the ability to shift to diesel from steam was greatly assisted by wartime labor shortages and the unacceptability of labor disputes. Thus, demographics and social organizational features were impacting technological change at the same time that innovation and environmental features came to affect the population and organization in the Southwest.

Like the case study of Caliente, the present project is aimed at understanding the dynamics between population, organization, environment and technology, which are not directly linear but contain feedback loops. Therefore, the more commonly used ordinary least squares, with its assumptions of direct, linear and hierarchical causation is not an ideal statistical tool. To investigate the relationships between population loss and agricultural consolidation, as well as school closures and population loss, a model that can correct for the bias introduced through bidirectional causation is needed, specifically, a nonrecursive model. To this end, two-stage least squares (2SLS) statistical modeling is utilized.

Like recursive models, such as ordinary least squares (OLS), nonrecursive models, such as 2SLS, are able to test causal relationships by holding variety of exogenous variables constant in order to determine the effect of each on an endogenous variable. However, unlike OLS, 2SLS does not assume that error terms in the structural equations are uncorrelated with the predicting variables (called the 'recursivity assumption'). The problem then becomes, error terms in regression are *by definition* correlated to the predictors, as the error term is the remaining variation *not* accounted for by the predictors. This is why two stages are needed.

Two-stage least squares assumes that although certain measures (endogenous variables) in the model are problematic and not themselves useful in OLS for predicting the dependent—because they are affected by the dependent—there exist *instruments* or substitute variables that are correlated with the values of the predictors but not the error term. Thereby these instruments are freed from the effects of the dependent variable. This is important because it frees the model from the rigid hierarchy of OLS and allows us to correct for situations when endogenous variables are reciprocally related. That is, in those instances we suspect a causal feedback loop exists between the dependent variable and a predicting variable, we can adjust for the effect of the dependent measure and remove the bias it would introduce to the model. It is the first stage of 2SLS that creates these instruments.

In the first stage, instrumental variables are used to predict the problematic measures. The instrumental variables are thus predictors and the problematic measures responses. Using the generated instruments, and whatever exogenous (or independent) variables have also been included, an OLS model is created. The second stage is running that OLS model, regressing the dependent variable on those instruments and independent variables to produce coefficient estimates. For a more detailed, calculus-based, discussion of the mathematics of nonrecursive modeling, see Berry (1990).

CREATING THE MODELS

To test the study's two hypotheses, two causal models are constructed for each: 1) using *total population* trend; 2) using *youth population* trend. The first hypothesis—population loss and farm consolidation are reciprocally related, wherein increases in farm consolidation lead to decreases in population, which in turn lead to greater farm consolidation—requires a single, valid measure for farm consolidation. The *number of farms*, *average size* of farms, *average sales* and the average *level of industrialization* all have arguments to be utilized for this purpose. The *number of farms* seems a straightforward measure, but is complicated by the fact that it does not account for the type of farms entering or exiting a given area. If the change in the percentage of the *number of farms* is the result of small, minimally mechanized farms versus large, highly mechanized farms entering the area, then the interpretation of consolidation would be much different. Simple counts do not make this distinction. *Average size* is compelling, as increases or decreases in the average acreage of farms' cropland would indicate whether farmers were generally managing more or less land, requiring more or less industrial methods. However, the change in average acreage of farms does not directly account for farms entering or exiting a given county. *Average sales*, likewise could account for consolidation, as it indicates quantities of production, and increases in averages would likely indicate higher producing farms operating in a county, or at least fewer, lower producing farms. *Level of industrialization* might also work, as it directly measures changes in the average amount of mechanization on farms.

Correlations of the measures (see tables 2.1 through 2.10) show the *average size* of farms is strongly associated with *level of industrialization* in the full time series, and only failing to reach significance in one of the five-year interval correlations. *Average sales* shows a similar though slighter association with *level of industrialization*. Both also show fairly consistent association with the *number* *of farms*. Taking these results and the literature into account, the *number of farms* appears the most direct measure of assessing the impact of shifting demographic patterns on farming, a choice aided by controlling for the *average sales*. However, the *number of farms* in a county affects the *average sales* of farms in that county. Therefore, *average sales* is a problematic predictor and needs to be converted to an instrument. As the *average size* and *level of industrialization* of farms are strongly correlated with—and logically can be seen to affect—sales, those measure will be used to create an instrument *for average sales*. This makes sense, as larger and more mechanized farms are able to grow/raise more products for sale, and it is such intensification of agriculture that is theoretically linked with population decline.

In the full model for agricultural consolidation and population decline, *number of farms* will be used as the dependent measure, predicted by *average sales*, *total/youth population* trends, *rurality* and *agricultural importance*. *Rurality* and *agricultural importance* will be used to as previously detailed, to focus on rural spaces by accounting for county size, and highlight counties with natural environments particularly adapted for agriculture. *Total/youth population trends*, being considered problematic need instruments created, and are predicted by the previous five-year *total/youth population* and *unemployment trends*. The best predictor for population change is the previous trend, and as discussed in the literature review, economic opportunities (or the lack thereof) are considered a driving force in the urbanization of America. Likewise for *average sales*, an instrument is created using *average size* and *level of industrialization*.

The second hypothesis—population loss and school closures are reciprocally related, especially for youth and young adult age groups, wherein population decline leads to increasing school closures, which in turn lead to further youth population loss—is more straightforward than the first. To test whether school closures affect population, the appropriate dependent measures are clear: *total/youth population* trends. Changes in *number of schools* is the problematic predictor. It is expected the number of students and per pupil costs for running schools are the most salient features in leading to school closures. Accordingly, *operating expenses* and *enrollment* are used to create an instrument for *number of schools*. Also included in the models are *unemployment* and the previous *total/youth population* trend (see figure 2 for diagram of complete rural decline model).

RUNNING THE MODELS

The two versions for both the schools and farms 2SLS models (total and youth population) are run using IBM's Statistical Package for the Social Sciences (SPSS). In SPSS, there are three types of variables to designate for 2SLS: 1) dependent; 2) explanatory; 3) instrumental. While only one variable can be used as the dependent—and it cannot be included additionally as either explanatory or instrumental—several variables may be designated as either explanatory or instrumental and can also be designated as both. Those variables designated as only explanatory are the problematic predictors believed to have a reciprocal causal relationship with the dependent. Variables designated only as instrumental are used to create the instruments for the problematic explanatory variables but not the dependent. Variables designated as both explanatory and instrumental are entirely exogenous, being used to create the instruments (though possibly not holding much predictive power) and to predict the dependent.

CHAPTER IV

RESULTS

As detailed above, the current study tests two hypotheses, each with two (2) two-stage least squares (2SLS) causal models, for different population trends: 1) total population and 2) youth population. Results will be reported first for notable themes in the descriptive statistics on each of the measures used, across all five-year intervals, then for the full time series of each larger model (farms and schools). Next attention will be turned to the significant correlational findings and the patterns of interest therein. Reported last are the 2SLS findings. For the 2SLS findings, the farms models will be considered first, starting with results for *number of farms* as predicted by *total population*, moving on to those for *youth population*. Next come the schools models, first as *number of schools* predict *total population*, then *youth population*.

DESCRIPTIVE STATISTICS

Population

Table 1.1 shows the descriptive statistics for the percent change in total county population counts over each of the study's five-year intervals. The minimum and maximum values for each interval demonstrate an enduring discrepancy that exists between counties in this regard: certain counties experience significant growth in population size while others experience significant decline. What's more, the size of this discrepancy appears to have been widening since the late 1980s, at least between those counties either growing or declining the most. Mean values for these measures show county populations to generally be growing over time, save for the 1982-1987 interval—the only five-year span where counties lost population on the average. Also evident is that the variability in average population change has been increasing over time, as the standard deviation has grown sizably larger by 2002-2007 than 1970-1974. This reinforces the impression that the gap between growing and shrinking counties is widening. In Table 1.2 are the youth population descriptive statistics. In terms of minimum, maximum and standard deviation, trends for the percent change in counties' under-thirty population more or less mirror those for the total population. A notable difference can be seen in the mean values. Whereas the total population grew on average in all but the 1982-1987 timespan, counties' youth population shrank on average for each interval between 1978 and 2002, in accordance with the baby boom/bust generational movements. This decline did hit its trough in 1982-1987, but began earlier and continued for several years further. For 2002-2007, the maximum values for both *total* and *youth population* are exceptionally high, recognizing the rapid growth of Kendall County, a suburb of Chicago greatly developed during the housing boom.

General trends for changes in the unemployment rate are quite different than those for population counts (Table 1.3). While population trends have seen growing variation and discrepancy between growing and shrinking counties, the unemployment rates show more of a cyclical pattern. Between 1970 and 1982, unemployment within counties was rising, on average, and then it fell between 1982 and 1997, before slightly rising again through 2002, finally dropping between 2002 and 2007. Variation begins relatively small in the 1970-1974 timeframe, builds to a peak in 1982-1987, then begins generally falling again through 2005. Given the ebb and flow of the economy, the fluid movement between periods of growth and recession, these results generally make sense.

Farms

The percentage change in number of farms for counties in Illinois (Table 2.1) shows a similar discrepancy as the population trends, with some counties experiencing significant growth and others significant decline. However, the mean percentage change seen *by* and the variation *amongst* counties, demonstrate a cyclical nature similar to unemployment. The average county lost over a tenth of its farms between 1969 and 1974, then the rate slackened between 1974 and 1982 before picking up through 1992 and reaching a peak of almost thirteen percent of farms lost on average. Such decline again abated and was even reversed, with 1997 to 2002 seeing slight growth (under one percent) and counties in 2002-2007 experiencing a nearly four-and-a-half percent increase in the number of farms on average. The standard deviation likewise saw cyclical changes but has also grown, more than doubling from 6.4 in 1969-1974 to 13.5 in 2002-2007. These findings highlight the way in which the number of farms links the population and unemployment/economic trends discussed above.

The recurring, growing gap between counties in their demographic and agricultural trends continues with percentage change in each county's average acreage operated per farm (Table 2.2). The range, between the county experiencing the greatest decrease and the county experiencing the greatest increase in average farm size, widens and widens until that disparity is shockingly large: farms decreasing in size by over fifty percent versus increasing by over fifty percent on average between 2002 and 2007. The ever-growing standard deviation, which more than doubles from 1969-1974 to 2002-2007, suggests this phenomenon exists in more than just the extreme cases. Then, the mean values show an interesting reversal of the dominant trend, which saw counties' average farm size growing from 1969 through 1997, then declining over the following decade. The slowing average growth, and eventual average decrease, in size of farms may signify a substantial shift taking place in the agricultural sector, which is supported by the mean values for number of farms switching from decline to growth in the same time span. The trend shows the growth is due to the addition of smaller farms in the decade between 1997 and 2007, which may be connected to current movements towards small scale, local and organic farming.

Percentage change in the average amount of sales per farm within counties is quite volatile (Table 2.3). The mean values fluctuate between positive and negative figures, the minimums and maximums dip and rise, and the standard deviation shows a parabolic effect with its trough in 1982-1987. Sales fell on average between 1978 and 1987, rose through the early to mid-1990s, before sharply declining from 1997 to 2002, and recovering modestly through 2007. Again we see a polarizing effect between the minimum and maximum. Though it doesn't build as consistently over time, the difference does seem to be trending towards greater disparity among counties.

Another cyclical pattern emerges when contemplating percent change in the average value of all machinery and equipment per farm—or *level of industrialization*—within each county (Table 2.4). Counties were universally experiencing increased mechanization between 1969 and 1974—the same timeframe in which universal growth in average sales was seen—but it was short-lived. Industrialization slackened over the next five years, then decreased on average for the following decade. An industrial resurgence occurred between 1987 and 2002 with the most heavily industrializing counties ramping up their efforts, but it was not seen universally, as certain counties saw significant decreases in the average value of machinery and equipment on farms. Finally, in 2002-2007, Illinois counties experienced a sharp decline in the level of industrialization on average, swinging from an increase of 12.7% in 1997-2002 to a decline of 14.5% for 2002-2007. The trends here seem somewhat more uniform than those discussed heretofore, as the standard deviation does not seem to follow a general trajectory of increase, rather bouncing up and down. However, it is higher in the final three intervals than those prior, and the range is relatively large in those years as well.

Schools

Table 3.1 displays descriptives for the three schools measures. Like farms and population, the counties appear to be experiencing greater disparity between those growing and shrinking the most in terms of percentage change in the number of schools, as time goes on. Of particular note is that counties declined on average in their number of school, save for 1997-2002. The percentage change in operating costs (Table 3.2) per pupil follows this same trend, decreasing on average in all intervals except for 1997-2002, and with increasing disparity in the experience of counties. The percentage change in enrollment (Table 3.3) interestingly shifts from an average increase through 1997 to decreasing on average over the following decade.

Full Time Series

Descriptive statistics for the full time series of each model at reported in Tables 4.1 through 4.4. Between 1970 and 2007, we see the total population generally grew in counties as a result of those declining (up to nearly thirty percent) being hugely overshadowed by those growing (up to 265%). At the same time the youth population declined on average for counties, whereas the minimum and maximum figures are not largely different from their total population counterparts. This suggests that more counties saw a negative percentage change in the under-thirty population than did for the total population, and the under-thirty segment seems to behave differently than the total population. The average percent change in unemployment increased, but weakly and with relatively little variation.

All counties saw a percentage decrease in their number of farms between 1969 and 2007 with an average decline of almost forty percent of farms. The extent of this trend was, however, clearly much greater in some counties than others, as evident in the minimum and maximum values (-82.2% and -7.64%, respectively). The average acreage of cropland, amount of sales and level of industrialization show significant differences between counties—some declining considerably while others experienced remarkable growth—but counties on average increased for each measure. These figures, along with the dropping number of farms, are consistent with the literature on agricultural consolidation.

The population trends between 1985 and 2005 were similar to those for 1970 to 2007 for both total and youth populations, though less pronounced and less varied. The number of schools and enrollment both saw an average decrease in percent change over the timeframe, but had substantial variation between counties. Operating expenses experienced a percentage increase on average but also saw significant variation. All three schools measures have a sizeable range between their minimum and maximum values, reinforcing the perception of disparity.

CORRELATIONS

Farms Model

Tables 5.1 through 5.8 display the correlational findings for the overall farms model and particularly shed light on the relationship between the four farm measures. Significant findings include n*umber of farms* being negatively associated with *average size* and *average sales* in seven-out-of-eight and six-out-of-eight correlations, respectively. *Average size* and *average sales* are accordingly positively correlated and reach significance in seven-out-of-eight of the correlations. The correlations between *level of industrialization* and *average size* as well as *average sales* are positive and reach significance in seven-out-of-eight and five-out-of-eight models, respectively. Taken together, these findings support the supposition that the decline in number of farms is connected to the industrialization process, wherein farms mechanize and grow and experience tremendous gains in productivity/sales. As discussed in the previous chapter, these results informed the conceptual flow of the two-stage least squares model for farms and population.

Schools Model

Correlational findings for the schools are found in Tables 6.1 through 6.4. The *number of schools* is seen to be significantly and positively associated with *enrollment*, *youth population* and *total population* in four-, three- and two-out-of-four correlations, respectively. Correlations for both *youth* and *total population* reach significance in positive association with *enrollment*, which is intuitive. Interestingly, *number of schools* only achieves moderate strength of association with *enrollment*, suggesting other factors contribute to the percent change in number of schools. As with farms, these correlations informed construction of the 2SLS model for schools and population.

Full Time Series Models

Results in Tables 7.1 and 7.2, for the full timeframe of each overall model (farms and schools, respectively), show interesting patterns. Table 7.1 displays significant, negative associations between both of the population trends and *average size* as well as *average sales*. The suggestion is then that counties with growing average acreages of cropland and higher average amounts of sales per farm also tend to experience decreases in their total population as well as the under-thirty segment of the population. The same is true for the number of farms in relation to average size and average sales. Average size, average sales and level of industrialization are all significantly and strongly positively associated. Again, the process of agricultural consolidation is affirmed, but also, the potential for a negative relationship between that process and population change is revealed. Table 7.2 reinforces the findings from the five-year intervals: population trends are significantly, positively associated with the number of schools and enrollment. Though not significantly associated with the number schools, this lends importance to the *operating expenses* measure for creating the instrument substituting for *number of schools*. The correlations between population, schools and enrollment make enrollment and population strong predictors for the number of schools, but operating costs are considered a driving force in school closures decisions and thus an important variable to include.

2SLS AGRICULTURAL CONSOLIDATION AND POPULATION TRENDS

Total Population

For each five-year interval, *number of farms* is regressed on the same five-year interval values for: 1) an instrument for *total population*; 2) an instrument for *average sales*; 3) *agricultural importance*; and 4) *rurality*. Each of the predictors is designated an explanatory variable, while *agricultural importance* and *rurality* are also designated instrumental variables. *Total population* and *average sales* are problematic endogenous variables—the others, exogenous. To create an instrument for *total population* in each 2SLS regression the preceding five-year interval values for: 1) *total population*; and 2) *unemployment* are used, being designated as solely instrumental variables. To create the instrument for *average sales* in each regression: 1) *average size*; and 2) *level of industrialization* are used, designated only as instrumental variables. For example, in the regression for 1992 to 1997, the values for *number of* *farms (1992-1997)* are regressed on: 1) an instrument for *total population (1992-1997)*; 2) an instrument for *average sales (1992-1997)*; 3) *agricultural importance*; 4) *rurality*. The instrument substituting for *total population (1992-1997)* is created using: 1) *total population (1987-1992)*; and 2) *unemployment (1987-1992)*. The instrument substituting for *average sales (1992-1997)* is created using: 1) *average size (1992-1997)*; and 2) *level of industrialization (1992-1997)*.

Of these seven models, six have significant F-values—all at the 99% confidence interval—ranging from 3.26 to 12.65 (Table 8.1). In those six models, we can be confident that the variation in *number of farms* is caused by variation within the predictors and not by chance. The predictive power—measured by R Square—is between .145 and .397, which shows weak to moderate overall predictive power of the models. Beta coefficients and t-values are reported for each measure within models reaching significance. Two of them—*average sales* and *rural non-adjacent*—consistently show a significant effect upon *number of farms*. *Average sales* is significant at the 99% confidence interval level in five of the six models, whereas *rural non-adjacent* is significant at the 95% confidence interval level in four. The influence of *average sales*, as determined by the Beta (or standardized coefficient) values, is strong and negative, indicating that for every unit of standard deviation increase in *average sales*, *number of farms* decreases by somewhere between .691 and 1.324 standard deviations. *Rural non-adjacent* status is a less profound and less consistent effect, showing significantly larger gains at certain times and significantly larger losses at others than urban/suburban counties (as a dichotomous measure, it demonstrates a difference of means between the two classifiers). For 1992-1997 and 1997-2002, *rural non-adjacent* counties experienced a mean increase of .268 and .374 standard deviations in *number of farms* above urban/suburban counties, respectively, whereas in 1978-1982 and 2002-2007, they experienced a mean decrease of .309 and .355 standard deviation in *number of farms* beyond urban/suburban counties, respectively. All other results were non-significant, save for *agricultural importance* in the 1982-1987 model.

Youth Population

For each five-year interval, *number of farms* is regressed on the same five-year interval values for: 1) an instrument for *youth population*; 2) an instrument for *average sales*; 3) *agricultural importance*; 4) *rurality*. Each of the predictors is designated an explanatory variable, while *agricultural importance* and *rurality* are also designated instrumental variables. *Youth population* and *average sales* are then problematic endogenous variables—the others measures, exogenous. To create an instrument for *youth population* in each 2SLS regression the preceding five-year interval values for: 1) *youth population*; and 2) *unemployment* are used, being designated as solely instrumental variables. To create the instrument for *average sales* in each regression: 1) *average size*; and 2) *level of industrialization* are used, designated only as instrumental variables.

All seven of these models have significant F-values—six at the 99% and the last at the 95% confidence interval level—ranging from 3.14 to 12.49 (Table 8.2). In each model, we can be confident that the variation in *number of farms* is caused by variation within the predictors and not by chance. Values for R Square range between .14 and .394, which shows weak to moderate overall predictive power for the models. Beta coefficients and t-values again show two consistently significant measures affecting *number of farms —average sales* and *rural non-adjacent*. *Average sales* is significant at the 99% confidence interval level in six of the seven models, whereas *rural non-adjacent* is significant at the 95% confidence interval level in four. The influence of *average sales* is relatively strong and negative, as it was in the *total population* models. This indicates that for every standard deviation unit increase in *average sales*, *number of farms* decreases by somewhere between .693 and 1.413 standard deviations. *Rural non-adjacent* is a less profound and less consistent measure, demonstrating both significantly larger gains and larger losses than urban/suburban counties, in the same manner as the *total population* models. For 1992-1997 and 1997-2002, *rural non-adjacent* counties gained .285 and .359 standard deviations increase in *number of farms* over urban/suburban counties, respectively, whereas in 1978-

1982 and 2002-2007, they experienced a decrease of .337 and .366 standard deviations in *number of farms* beyond urban/suburban counties, respectively. All other results were non-significant, save for *agricultural importance*, again in 1982-1987.

2SLS SCHOOL CLOSURES AND POPULATION TRENDS

Total Population

For each five-year interval, *total population* is regressed on the values for: 1) an instrument for *number of schools*; 2) *previous population*; 3) *unemployment*; 4) *rurality*. Each of these predictors is designated explanatory, and the three population variables are also designated instrumental variables. *Number of schools* is then a problematic endogenous variable, the others exogenous. To create an instrument for *number of schools* in each 2SLS regression the same five-year interval values for: 1) *operating expenses*; and 2) *enrollment* are used, being designated as only instrumental variables. For example, in the regression for 1992 to 1997, the values for *total population (1992-1997)* are regressed on: 1) an instrument for *number of schools (1992-1997)*; 2) *total population (1987-1992)*—a.k.a. *previous population*; 3) *unemployment (1992-1997)*; 4) *rurality*. The instrument substituting for *number of schools (1992-1997)* is created using: 1) *operating expenses (1992-1997)*; and 2) *enrollment (1992-1997)*.

Three of the four models have significant F-values—each at the 99% confidence interval level—ranging from 26.57 to 37.72 (Table 9.1). The fourth is approaching significance (90% confidence interval), with an F-value of 2.23. In each of the three significant models, we can be confident that the variation in *total population* is caused by variation within the predictors and not by chance. These F-values far outstrip those in the farms models, and the consequent effect can be seen in predictive power. The R Square values fall between .581 and .663, which show moderate to strong overall predictive power for the models. Beta coefficients and t-values are reported for each measure within models reaching significance. One measure—*previous total population*—has a consistent effect on *total population*, reaching the 99% confidence interval in each model. *Number of schools* reaches significance in two of the three models, at the 95% confidence interval for 1987-1992 and then at the 99% interval in 2002-2007. Both predictors have positive coefficients, indicating increases in either lead to increases in *total population*. *Previous total population* shows a stronger influence, than *number of schools*, with a one standard deviation unit increase leading to between a .457 and .796 standard deviations increase in *total population*. A similar increase in n*umber of schools* leads to a .216 standard deviations increase in *total population* for 1987-1992 and .712 standard deviations in 2002-2007. All other measures achieve significance in only one model, all for 1987-1992.

Youth Population

For each five-year interval, *youth population* is regressed on the values for: 1) an instrument for *number of schools*; 2) *previous (youth) population*; 3) *unemployment*; 4) *rurality*. Each of the four predictors is designated explanatory, and the three population variables are also designated instrumental variables. *Number of schools* is then a problematic endogenous variable, the others exogenous. To create the instrument for *number of schools* in each 2SLS regression the same five-year interval values for: 1) *operating expenses*; and 2) *enrollment* are used, being designated as only instrumental variables.

The same three models as for *total population* have significant F-values—each at the 99% confidence interval level—ranging from 17.18 to 30.91 (Table 9.2). The fourth is non-significant. In each of the three significant models, we can be confident that the variation in *youth population* is caused by variation within the predictors and not by chance, but the same is not true for the fourth. These F-values outstrip those in the farms models but not by as much as for *total population*. The R Square values fall between .472 and .619, which show moderate to strong overall predictive power for the models. Beta coefficients and t-values are reported demonstrate the pattern for *previous youth population* is consistent with that seen above for *previous total population*, reaching the 99% confidence interval in each model. *Number of schools* reaches significance in only one of the three models, in 2002-2007 and at the 99% confidence interval. Both predictors have positive coefficients, indicating increases in either lead to increases in *youth population*. *Previous youth population* shows a strong influence, with a one standard deviation unit increase leading to between a .571 and .742 standard deviations increase in *youth population*. A similar increase in n*umber of schools* led to a .875 standard deviations increase in *youth population* for 2002-2007. Two other measures—*unemployment* and *rural-adjacent*—achieve significance in only one model, both for 1987-1992.

When considered collectively, these results are consistent with previous research but also add to the discussion of rural decline. The two-stage least squares models are seen to be valid, though their significance is largely carried by only a few of the measures included for analysis. In the following chapter, the interpretation of these findings will be explored in more depth, following a summary of the full project.

CHAPTER V

CONCLUSION: SUMMARY, DISCUSSION AND RECOMMENDATIONS

SUMMARY OF THE RESEARCH QUESTIONS, METHODS AND FINDINGS

Research Questions

Rural studies are a robust and engaging branch of the sociological discipline with a myriad of important topics for exploration. Existent research covers an impressive breadth of subject matter, theoretical perspectives and methodologies. No single phenomenon warrants a status as *the* primary focus of the field. However, when considering the history of rural America over the past century, one can identify rather clearly the prominence of three areas of discussion: population loss, farm consolidation and school closures. Causes and consequences of each have been investigated and commented on by many scholars in countless academic papers. Qualitative or quantitative in nature, focused on historic, economic, environmental or social trends, it is seemingly impossible to leave out more than one of these three phenomena. Yet just as uncommon is the attempt to include all three in a single model of the overall decline of rural America, but the pieces are all there in the literature.

The economic shifts of the United States over the course of the twentieth century are strongly connected to the process of farm consolidation and to patterns of migration within the nation—the massive movement towards urbanization. Likewise, the practice of nationalizing, consolidating and closing schools in rural America has been linked to the out-migration of hinterland residents. Together these lead to a concise, fairly simple proposition: the U.S.
shifted from a nation of farmers to one of manufacturers, concentrating workers and their families along with job opportunities in urban centers. The subsequent move to a service-based economy offset a manufacturing resurgence in rural areas, and prolonged urban concentration necessitated the

consolidation of school districts and students, resulting in the closure of many schools, especially within the least populated of places.

But what of the studies suggesting farm consolidation/industrialization and school closures have negative consequences upon communities, the very communities small farmers rely on for their livelihoods? Might there be more to the story than just economic patterns leading to a demographic redistribution and subsequent reorganization of education institutions? At least one theoretical camp within Human Ecology would argue that a neat linear path of causation is illogical: adherents to the POET model. With its simultaneous consideration of influences affecting human settlement patterns, the POET model asserts that reciprocal dynamics exists between Population size, social Organization, features of the natural Environment, and Technological innovation. The implication is that rather than being direct and linear, the causal relationships involved in settlement patterns are multidirectional. The questions for the current study are then: 1) is the population loss spurred by farm consolidation/industrialization undermining small farm viability, creating a feedback loop and exacerbating the consolidation process? And, 2) are schools closures, whether in response to population loss or not, undercutting the longevity of communities, creating a feedback loop and exacerbating out-migration?

Methods

These research questions are broad and probing, dealing with large scale phenomena covering a vast timeframe. They are well-suited for investigation with equally sizeable data on demographic, agricultural and educational trends over many years. Fortunately for the present study, the United States excels in the production of just this sort of data and has done so consistently over the past century. Exemplary not only within the U.S. but also globally are the U.S. Census of Housing and Population as well as the U.S. Census of Agriculture, conducted by the U.S. Census Bureau and U.S. Department of Agriculture, respectively. Less well documented are the dynamics of schooling around the country. However, within certain states there exists comprehensive, useful data for schools, down to the place level. Unfortunately, complete place-level data is hard to come by for farms. Having a limited number of states with readily available education data precluded national-level analysis, while the difficulty of obtaining place-level agricultural data did likewise for investigation on that scale.

Illinois was chosen in this study as an exemplar for its large population, robust agricultural presence and entrenched debate over rural school closures. Data at the county level, being the most complete and detailed available, made investigation at that scale the most attractive. While census data for population and farming extend back into the 1800s (1790 even for population), data compiled from the Illinois State Board of Education (ISBE) only reached as far back as the 1970s. In accordance with these realities, a data set was constructed spanning, in total, the years from 1969 through 2007, though each segment of the data is not perfectly consistent at both ends of that timeframe. Demographic measures were drawn from U.S. Censuses of Population and Housing from 1970 through 2000 and supplemented with Census Bureau estimates for interim years through 2007. Agricultural measures came via the U.S. Census of Agriculture from 1969 through 2007, which is conducted once every five years. Educational measures were taken from the ISBE, as noted above, which were compiled by Beck et al. (2005). Although the ISBE data ranged from 1972 through 2006, two key measures are only present for 1985 through 2005 and required examining a shorter timeframe. Taken together, and in light of the POET model, these measure were used to create two-stage least squares statistical analyses, correcting for the feedback loops that the more commonly used ordinary least squares cannot accommodate.

Results

Descriptive statistical findings for the variables measuring change in population, farms and schools suggested several interesting patterns. For population, specifically, the values for total population and youth population behave incongruously on the average, though they are relatively similar for minimum, maximum and standard deviation values. Trends in the agricultural measures reinforce descriptions of the process of agricultural consolidation: declining number of farms, increasing average size and mechanization and sales for remaining farms (i.e., a more industrialized agricultural sector). The variables for schools do not embody trends as strongly as the other two categories. However, parallels do exist between changes in the number of schools and operating expenses, while changes in enrollment are inconsistent, save for the maximum values, which increase as time goes on. Overall there appears to be a building disparity between counties growing and those shrinking—whether in terms of population, agriculture or schools—and for the full time series, additional support is seen for the processes of agricultural consolidation and school closures. Building upon these results, correlational findings further demonstrate the connections between loss of farms and average increases in the following: acreage of cropland, industrialization of farming, and amount of sales. Moreover, strong links are found between the number of schools, enrollment and population trends.

Within the 2SLS models, the study's hypotheses are put to the test. Whether in light of total population trends or exclusively of the under-thirty population trends, the farms model was consistently significant for predicting percent change in the number of farms. Far and away, the best measure within the model for predicting such change is the percent change in average sales per farm. After sales, being classified as a non-metropolitan county and non-adjacent to a metropolitan county was the next best predictor of change in the number of farms. *Average sales* are seen to negatively affect *number of farms*, whereas *rural non-adjacent* status can affect *number of farms* either positively or negatively, depending on the timeframe. The schools model is an even more powerful, showing a stronger ability to predict percent changes in population trends than the farms model is capable of doing for percent change in the number of farms. Of the predictive measures used, the most highly significant and strongest was clearly the previous population trend, which is a positive predictor for both total and youth population change. Although it only reaches significance in three out of eight models, the number of schools is the next most consistent, significant and powerful predictor. This is particularly true for *total population*, wherein two of the three significant models see a reliable, positive effect of *number of schools* on the population trends.

Having summarized the study and reported these results, we are lead to the crucial question: What understanding can be taken away from this research?

CONCLUSION

First and foremost, the results of this study—when taken altogether—align with previous research on the processes of rural decline. Agricultural consolidation can be seen most clearly in the descriptive statistics for the full time series, which display a universal percentage decrease in the number of farms for counties in Illinois, while mean values increased for average acres of cropland, average amount sales and the average value of machinery and equipment. The generally increasing standard deviation values for farm measures further display this intensification and concentration of farming. The overall decline in number of schools can similarly be identified in the full time series descriptive statistics.

Full time series correlational findings for the models lend credence to the connection between population decline and agricultural consolidation as well as school closures, and they also emphasize that these are rural phenomena. Total population trends are significantly and negatively correlated with both the *average sales* and *average size* of farms, and are positively associated with *number of schools*. That tells us that counties where farms are growing in size and sales also typically are losing population, while those gaining schools are generally growing in population. For number of farms, a significant negative correlation is found for non-metropolitan (non-metro) counties adjacent to metropolitan (metro) counties, while a significant positive correlation is present for non-metro counties that are non-adjacent to metro counties. This demonstrates the transformation of farm land on the metro fringe into suburban housing tracts, while pushing farming further into the rural hinterland.

For schools, a significant negative association with non-metro/non-adjacent status is found, showing that school loss is more strongly connected to more rural areas. Total population trends are similarly negatively correlated with non-metro/non-adjacent status, demonstrating rural population decline. This accordance with prior scholarship lends credence to the data set used and the operationalization of key measures. With this understanding, let us turn our attention to what can be gleaned from the two-stage least squares results.

The 2SLS models for agriculture and population trends do not support the hypothesis that population loss creates a feedback loop leading to further consolidation. However, these results do demonstrate two things persuasively. First, agricultural consolidation at the county level is most strongly driven by increases in the lucrativeness of farming operations, as a product of scales of efficiency. Bigger, more highly industrialized farms sell more products and perpetuate agricultural consolidation. Second, the significance and quality (positive or negative) of the effect rural non-adjacent status has on the number of farms aligns with historical events during the study's timeframe. Non-metro/non-adjacent county status is a significant negative predictor of the percent change in number of farms for 1978-1982, then a significant positive predictor for 1992-1997 and 1997-2002. This matches the occurrence and response to the farming crisis and economic recession of the 1980s, which were events prominently experienced by farmers in the most rural counties. After the farming crisis, things like musician-led Farm Aid and the Agricultural Credit Act of 1987 provided significant support to farmers. It seems likely that the positive predictive power of non-metro/non-adjacent counties for number of farms is due largely to such community and government assistance, as well as the economic boom of the 1990s reversing the damage done by the farming crisis. The sudden reversal to a negative predictor in 2002-2007 is probably indicative of the propensity of agricultural downturns to predate larger economic recessions, such as the one caused by the late 2007 housing market collapse in the United States.

Two-stage least squares models for school and population trends show more support for the study's hypothesis than do the farms and population models, but fall short of being strongly compelling. While the previous population trends were much stronger predictors of population change in any given timeframe, *number of schools* was a significant predictor in half of the models that reached overall significance. That previous population trends are such powerful predictors supports the validity of the models, as it is well-recognized that previous population change is the best indicator for later trends. Yet, it was expected that the impact of school closures would be more prominent in rural settings and amongst the youth population. Neither of these suppositions was consistently supported by the 2SLS results. The most that can be said is some small support exists for the hypothesis that changes in the number of schools have a direct causal effect on county population.

In regards to the ability of the POET model to account for settlement patterns in rural Illinois, the conclusions of this study fall somewhere between those for the farms and schools models tested, between no support and some small level of support. Correlational findings demonstrate a negative relationship between the scale of agricultural production and population trends, but detailed 2SLS regression demonstrate no feedback loop of exacerbation for agricultural consolidation created by population loss. The number of schools and size of county population are strongly associated, but only mild support is seen through the five-year interval 2SLS models for a feedback loop of number of schools directly affecting population trends. Yet, if not demonstrating significant evidence that a feedback loop exists between population loss and school closures, these findings certainly indicate an interesting area for future study.

RECOMMENDATIONS FOR FUTURE RESEARCH

The results of this study's two-stage least squares regressions marginally supported the hypotheses laid out, at best. However, I doubt this to be indicative that the reading of the literature, theoretical foundation or conceptualization of the overall model to be unsound or unfounded. Rather it is expected that limitations imposed by the scale and timeframe of the data masked these processes. Counties are such vast areas, containing tremendous variation within their borders and amongst their cities, townships and villages. It is highly plausible that the experience at one end of a county could overshadow or simply negate those at the opposite end. As for the timeframe, particularly for the schools model, much could likely be gained by reaching back as far as the beginning of the twentieth century. In the literature review, it was detailed that these are phenomena that have been taking place for over a hundred years, and reviewing the correlations for the five-year versus full time series models demonstrates how a longer lens can bring into focus relationships that fluctuate and breakdown over shorter periods.

Future research on this topic would benefit from a place level analysis of the interrelationships and potential feedback loops between rural population decline, agricultural consolidation and school closures. Such data would not be readily available, otherwise it would have been utilized for the present research, but the potential significance of findings more clearly detailing the presence or absence of exacerbating feedback loops in the process of rural decline should be incentive enough for the effort required. A longer interval of study, particularly for schools, could also be a fruitful endeavor for future studies, helping to stabilize the shorter term, more volatile effects of economic boom and bust. Finally, a heretofore unexplored finding could lead to compelling research on the nature of agriculture in the United States. Namely, the reversal of farm numbers, from declining on average from 1969 to 1997 to growing for the final decade of data could signify a substantial impact of the current movement towards local foods and small scale, organic agriculture.

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Table 1.1. Descriptive Statistics for *Total Population* Variable

Interval	1970-1974	1974-1978	1978-1982	1982-1987	1987-1992	1992-1997	1997-2002	2002-2007
Min	-5.38	-4.68	-5.5	-11.55	-7.21	-5.15	-9.27	-10.06
Max	14.58	14.88	9.78	12.91	20.45	21.04	24.88	56.83
Mean	2.9857	3.2297	1.1823	-2.9546	0.0394	2.4828	0.4889	0.8319
Standard Deviation	3.77047	3.79729	3.10977	4.37739	4.65708	4.93305	6.06737	7.72099

Table 1.2. Descriptive Statistics for *Youth Population* Variable

Interval	1970-1974	1974-1978	1978-1982	1982-1987	1987-1992	1992-1997	1997-2002	2002-2007
Min	-8.38	-8.32	-8.59	-18.34	-14.02	-8.82	-19.34	-11.7
Max	19.52	12.8	7.27	6.27	13.81	16.77	25.12	76.06
Mean	3.6252	1.8027	-1.8159	-8.7423	-6.4875	-0.6196	-1.1089	1.922
Standard Deviation	4.94463	4.18013	3.48361	4.78324	4.72387	4.99516	7.28518	9.74535

Table 1.3. Descriptive Statistics for *Unemployment* Variable

Interval	1970-1974	1974-1978	1978-1982	1982-1987	1987-1992	1992-1997	1997-2002	2002-2007
Min	-4.2	-1.8	0.5	-10.5	-10	-5.5	-6	-2.9
Max	4.6	8.3	13.5	8.5	2.75	4.6	3.4	0.3
Mean	0.3873	1.9632	5.9564	-2.4926	-2.1701	-2.3941	0.6431	-0.7539
Standard Deviation	1.24158	1.75856	2.39554	3.30373	2.40713	1.37861	1.63135	0.58761

Table 2.1. Descriptive Statistics for *Number of Farms* Variable

Interval	1969-1974	1974-1978	1978-1982	1982-1987	1987-1992	1992-1997	1997-2002	2002-2007
Min	-35.12	-14.48	-15.12	-25.2	-40.99	-15.19	-21.43	-18.99
Max	6.56	9.67	2.48	-1.32	-3.14	24.4	24.15	27.68
Mean	-10.1607	-5.6937	-6.0449	-10.4572	-12.9134	-4.6828	0.1665	4.4249
Standard Deviation	6.39095	4.83235	3.74331	4.32778	4.90956	7.64614	9.03946	13.47064

Table 2.2. Descriptive Statistics for *Average Size* Variable

Interval	1969-1974	1974-1978	1978-1982	1982-1987	1987-1992	1992-1997	1997-2002	2002-2007
Min	-5.48	-10.45	-11.92	-3.98	-7.2	-23.04	-41.46	-50.43
Max	24.95	29.32	29.99	31.78	28.36	18.86	36.98	51.13
Mean	8.7525	10.3536	6.095	12.913	9.7518	5.0475	-0.2207	-1.5046
Standard Deviation	5.20595	5.69054	5.82118	6.02083	5.91006	7.71651	10.21229	12.27287

Table 2.3. Descriptive Statistics for *Average Sales* Variable

Interval	1969-1974	1974-1978	1978-1982	1982-1987	1987-1992	1992-1997	1997-2002	2002-2007
Min	9.19	-16.3	-35.47	-26.41	-12.9	-25.75	-45.15	-47.98
Max	90.67	39.58	22.38	13.81	65.41	77.12	20.69	48.25
Mean	49.2983	4.0106	-11.0133	-8.5671	17.5343	12.5542	-13.5943	2.9514
Standard Deviation	19.61701	12.39824	7.93213	7.53048	13.63111	15.39987	12.42178	16.36025

Table 2.4. Descriptive Statistics for *Level of Industrialization* Variable

Interval	1969-1974	1974-1978	1978-1982	1982-1987	1987-1992	1992-1997	1997-2002	2002-2007
Min	32.93	-9.85	-60.38	-41.59	-28.19	-29.34	-40	-56.15
Max	110.31	63.18	15.29	20.21	46.78	69.93	75.16	32.94
Mean	69.8725	25.6173	-18.3319	-7.4943	4.6056	16.3281	12.713	-14.5321
Standard Deviation	11.61678	12.92824	10.07226	11.64574	12.89952	17.74238	20.14768	15.17779

Table 3.1. Descriptive Statistics for *Number of Schools* Variable

Interval	1987-1992	1992-1997	1997-2002	2002-2007
Min	-50	-42.8571429	-41.66666667	-40
Max	25	11.1111111	66.66666667	60
Mean	-3.480289	-5.69636343	3.359090666	-1.796577505
Standard Deviation	11.444302	9.72576726	13.81975758	11.20424953

Table 3.2. Descriptive Statistics for *Operating Expenses* Variable

Interval	1987-1992	1992-1997	1997-2002	2002-2007
Min	-28.36	-18.2	0.47	-29.72
Max	4.86	17.78	37.64	88.62
Mean	-8.9954	-1.0236	20.0455	-12.012
Standard Deviation	5.41501	5.94054	6.79443	15.96654

Table 3.3. Descriptive Statistics for *Enrollment* Variable

Interval	1987-1992	1992-1997	1997-2002	2002-2007
Min	-52.55	-14.45	-20.05	-22.06
Max	18.57	25.7	30.8	42.9
Mean	0.3384	0.8586	-3.7202	-0.5708
Standard Deviation	9.03214	7.40809	9.17349	7.38497

Table 4.1. Descriptive Statistics for Population Variables (1970-2007)

Interval	Total Population	Youth Population	Unemployment
Min	-29.72	-39.58	-5.2
Max	265.48	221.14	4.7
Mean	12.7472	-7.909	1.1392
Standard Deviation	43.78927	37.4544	1.6938

Table 4.2. Descriptive Statistics for Farms Variables (1969-2007)

Interval	Number of Farms	Average Size	Average Sales	Level of Industrialization
Min	-82.2	-55.34	-63.52	-22.75
Max	-7.64	191	185.36	244.62
Mean	-37.5426	63.7381	46.5598	78.8024
Standard Deviation	10.90465	35.96763	43.72377	35.56015

Table 4.3. Descriptive Statistics for Population Variables (1985-2005)

Interval	Total Population	Youth Population	Unemployment
Min	-24.52	-34.06	-15.2
Max	112.06	99.13	-0.3
Mean	3.3368	-9.37	-6.3809
Standard Deviation	23.38345	22.50672	3.14631

Table 4.4. Descriptive Statistics for Schools Variables (1985-2005)

Interval	Number of Schools	Operating Expenses	Enrollment
Min	-62.5	-22.41	-60.22
Max	60	175.95	143.29
Mean	-8.5828	2.8213	-2.482
Standard Deviation	21.51733	23.56683	29.70015

Table 5.1. Farms Model Correlations (1970-1974)

Variables	Average Size	Average Sales	Level of Industrial-ization	Agricultural Importance	Total Population	Youth Population	Unemploy-ment	Rural Adjacent	Rural Non-adjacent
Number of Farms	**-.420*** **	-0.094	-0.108	0.028	-0.158	0.001	0.061	0.043	**.289** **
Average Size	--	0.115	**.445*** **	0.028	0.027	-0.086	0.026	0.056	-0.126
Average Sales	--	--	0.177	-0.037	-0.131	-0.117	-0.021	0.172	**-.231***
Level of Industrial-ization	--	--	--	**.301** **	0.055	-0.011	-0.067	0.065	-0.141
Agricultural Importance	--	--	--	--	-0.08	-0.148	0.046	0.093	**-.237***
Total Population	--	--	--	--	--	**.927*** **	0.003	-0.144	-0.032
Youth Population	--	--	--	--	--	--	0.052	-0.138	0.107
Unemploy-ment	--	--	--	--	--	--	--	-0.001	0.113
Rural Adjacent	--	--	--	--	--	--	--	--	**-.645*** **

*** Significant at the .001 level / ** Significant at the 0.01 level/ * Significant at 0.05 level (two-tailed)

Table 5.2. Farms Model Correlations (1974-1978)

	Average Size	Average Sales	Level of Industrial-ization	Agricultural Importance	Total Population	Youth Population	Unemploy-ment	Rural Adjacent	Rural Non-adjacent
Number of Farms	**-.579*** **	**-.249***	-0.128	0.118	0.172	0.042	0.057	-0.087	-0.08
Average Size	--	**.395*** **	**.440*** **	-0.041	-0.187	-0.043	0.017	0.086	0.132
Average Sales	--	--	0.057	**-.267** **	0.056	0.121	0.052	-0.136	**.249***
Level of Industrial-ization	--	--	--	-0.025	**-.205***	-0.121	-0.047	0.171	-0.02
Agricultural Importance	--	--	--	--	**-.247***	**-.301** **	**-.258** **	0.093	**-.237***
Total Population	--	--	--	--	--	**.947*** **	0.043	-0.112	-0.028
Youth Population	--	--	--	--	--	--	0.108	-0.102	0.076
Unemploy-ment	--	--	--	--	--	--	--	-0.142	0.193
Rural Adjacent	--	--	--	--	--	--	--	--	**-.645*** **

*** Significant at the .001 level / ** Significant at the 0.01 level/ * Significant at 0.05 level (two-tailed)

Table 5.3. Farms Model Correlations (1978-1982)

Variables	Average Size	Average Sales	Level of Industrial -ization	Agricultural Importance	Total Population	Youth Population	Unemploy -ment	Rural Adjacent	Rural Non-adjacent
Number of Farms	**-.529*** **	**-.322*** **	**-.293** **	0.019	-0.045	-0.123	0.042	-0.033	**-.244* **
Average Size	--	**.511*** **	**.321*** **	-0.036	-0.182	-0.105	-0.063	0.086	0.124
Average Sales	--	--	**.312*** **	0.044	0.145	0.124	-0.028	0.155	-0.025
Level of Industrial-ization	--	--	--	-0.096	0.132	0.132	-0.172	0.101	0.046
Agricultural Importance	--	--	--	--	**-.310** **	**-.360*** **	0.105	0.093	**-.237* **
Total Population	--	--	--	--	--	**.960*** **	-0.088	-0.094	0.03
Youth Population	--	--	--	--	--	--	-0.17	-0.093	0.107
Unemploy-ment	--	--	--	--	--	--	--	0.179	**-.233* **
Rural Adjacent	--	--	--	--	--	--	--	--	**-.645*** **

*** Significant at the .001 level / ** Significant at the 0.01 level/ * Significant at 0.05 level (two-tailed)

Table 5.4. Farms Model Correlations (1982-1987)

	Average Size	Average Sales	Level of Industrial -ization	Agricultural Importance	Total Population	Youth Population	Unemploy -ment	Rural Adjacent	Rural Non-adjacent
Number of Farms	**-.475*** **	**-.377*** **	-0.104	**.452*** **	-0.113	**-.199* **	**-.218* **	0.103	-0.106
Average Size	--	**.375*** **	-0.079	-0.18	**-.280** **	**-.224* **	**.309** **	0.067	0.094
Average Sales	--	--	0.05	-0.136	0.095	0.137	0.171	-0.186	**.199* **
Level of Industrial-ization	--	--	--	-0.06	**.246* **	**.246* **	-0.064	-0.091	-0.096
Agricultural Importance	--	--	--	--	-0.078	-0.142	**-.257** **	0.093	**-.237* **
Total Population	--	--	--	--	--	**.962*** **	-0.158	**-.207* **	-0.128
Youth Population	--	--	--	--	--	--	-0.084	**-.246* **	-0.017
Unemploy-ment	--	--	--	--	--	--	--	-0.002	**.274** **
Rural Adjacent	--	--	--	--	--	--	--	--	**-.645*** **

*** Significant at the .001 level / ** Significant at the 0.01 level/ * Significant at 0.05 level (two-tailed)

Table 5.5. Farms Model Correlations (1987-1992)

Variables	Average Size	Average Sales	Level of Industrial-ization	Agricultural Importance	Total Population	Youth Population	Unemploy-ment	Rural Adjacent	Rural Non-adjacent
Number of Farms	**-.436*** **	**-.360*** **	**-.196***	0.007	-0.125	-0.087	-0.17	0.065	0.189
Average Size	--	**.537*** **	**.261** **	0.118	-0.192	**-.227***	-0.11	0.098	-0.131
Average Sales	--	--	**.304** **	-0.093	**-.246***	**-.220***	**-.210***	0.029	-0.011
Level of Industrial-ization	--	--	--	-0.03	-0.079	-0.083	0.016	-0.008	-0.005
Agricultural Importance	--	--	--	--	0.154	0.08	**.247***	0.093	**-.237***
Total Population	--	--	--	--	--	**.964*** **	**.578*** **	-0.163	**-.283** **
Youth Population	--	--	--	--	--	--	**.503*** **	**-.221***	-0.172
Unemploy-ment	--	--	--	--	--	--	--	0.056	**-.399*** **
Rural Adjacent	--	--	--	--	--	--	--	--	**-.645*** **

*** Significant at the .001 level / ** Significant at the 0.01 level/ * Significant at 0.05 level (two-tailed)

Table 5.6. Farms Model Correlations (1992-1997)

	Average Size	Average Sales	Level of Industrial-ization	Agricultural Importance	Total Population	Youth Population	Unemploy-ment	Rural Adjacent	Rural Non-adjacent
Number of Farms	**-.618*** **	**-.545*** **	-0.188	**-.387*** **	-0.025	0.012	-0.145	**-.277** **	**.419*** **
Average Size	--	**.617*** **	**.207***	**.301** **	-0.131	-0.138	**.214***	**.257** **	-0.177
Average Sales	--	--	**.276** **	**.346*** **	0.001	-0.01	0.179	0.143	-0.145
Level of Industrial-ization	--	--	--	**.203***	-0.083	-0.116	0.128	0.059	0.018
Agricultural Importance	--	--	--	--	-0.016	-0.029	0.09	0.093	**-.237***
Total Population	--	--	--	--	--	**.986*** **	**-.292** **	-0.093	-0.189
Youth Population	--	--	--	--	--	--	**-.293** **	-0.1	-0.14
Unemploy-ment	--	--	--	--	--	--	--	-0.122	0.189
Rural Adjacent	--	--	--	--	--	--	--	--	**-.645*** **

*** Significant at the .001 level / ** Significant at the 0.01 level/ * Significant at 0.05 level (two-tailed)

Table 5.7. Farms Model Correlations (1997-2002)

Variables	Average Size	Average Sales	Level of Industrial -ization	Agricultural Importance	Total Population	Youth Population	Unemploy -ment	Rural Adjacent	Rural Non-adjacent
Number of Farms	**-.368*** **	**-.524*** **	-0.176	**-.381*** **	**-.212***	**-.221***	**-.373*** **	**-.211***	**.384*** **
Average Size	--	**.513*** **	**.221***	**.351*** **	0.054	0.106	0.071	0.151	-0.059
Average Sales	--	--	**.287** **	**.487*** **	0.14	0.121	**.338*** **	0.026	-0.155
Level of Industrial-ization	--	--	--	0.062	-0.139	-0.159	0.087	0.04	0.063
Agricultural Importance	--	--	--	--	0.047	0.072	**.379*** **	0.093	**-.237***
Total Population	--	--	--	--	--	**.939*** **	**.270** **	-0.042	**-.361*** **
Youth Population	--	--	--	--	--	--	**.285** **	-0.034	**-.348*** **
Unemploy-ment	--	--	--	--	--	--	--	0.136	**-.374*** **
Rural Adjacent	--	--	--	--	--	--	--	--	**-.645*** **

*** Significant at the .001 level / ** Significant at the 0.01 level/ * Significant at 0.05 level (two-tailed)

Table 5.8. Farms Model Correlations (2002-2007)

	Average Size	Average Sales	Level of Industrial -ization	Agricultural Importance	Total Population	Youth Population	Unemploy -ment	Rural Adjacent	Rural Non-adjacent
Number of Farms	-0.047	-0.064	-.315***	0.006	.210*	0.169	0.055	-0.012	-.258**
Average Size	--	.586***	.278**	0.02	-0.065	-0.037	0.042	.234*	-0.162
Average Sales	--	--	.316***	0.007	-0.073	-0.019	-0.09	.322***	-0.067
Level of Industrial-ization	--	--	--	-0.049	0.009	0.022	-0.001	0.093	-0.024
Agricultural Importance	--	--	--	--	-0.01	-0.048	-0.058	0.093	-.237*
Total Population	--	--	--	--	--	.980***	0.111	0.059	-.302**
Youth Population	--	--	--	--	--	--	0.101	0.112	-.281**
Unemploy-ment	--	--	--	--	--	--	--	-0.071	0
Rural Adjacent	--	--	--	--	--	--	--	--	-.645***

*** Significant at the .001 level / ** Significant at the 0.01 level/ * Significant at 0.05 level (two-tailed)

Table 6.1. Schools Model Correlations (1987--1992)

	Youth Population	Unemploy-ment	Rural Adjacent	Rural Non-adjacent	Number of Schools	Operating Expenses	Enrollment
Total Population	**.964*** **	**.578*** **	-0.163	**-.283** **	0.188	**.312*** **	**.350*** **
Youth Population	--	**.503*** **	**-.221***	-0.172	0.18	**0.298** **	**.329** **
Unemploy-ment	--	--	0.056	**-.399*** **	0.079	**.314*** **	**.215***
Rural Adjacent	--	--	--	**-.645*** **	-0.044	-.018	0.005
Rural Non-adjacent	--	--	--	--	-0.104	**-.205***	-.192
Number of Schools	--	--	--	--	--	0.142	**.612*** **
Operating Expenses	--	--	--	--	--	--	0.147

*** Significant at the .001 level / ** Significant at the 0.01 level/ * Significant at 0.05 level (two-tailed)

Table 6.2. Schools Model Correlations (1992--1997)

	Youth Population	Unemploy-ment	Rural Adjacent	Rural Non-adjacent	Number of Schools	Operating Expenses	Enrollment
Total Population	**.986*** **	**-.292** **	-0.093	-0.189	**.302** **	-0.159	**.760*** **
Youth Population	--	**-.293** **	-0.1	-0.14	**.298** **	-0.173	**.742*** **
Unemploy-ment	--	--	-0.122	0.189	-0.155	**.282** **	**-.344*** **
Rural Adjacent	--	--	--	**-.645*** **	**-.215***	-0.126	-0.146
Rural Non-adjacent	--	--	--	--	0.028	0.077	-0.19
Number of Schools	--	--	--	--	--	0.179	**.343*** **
Operating Expenses	--	--	--	--	--	--	-0.189

*** Significant at the .001 level / ** Significant at the 0.01 level/ * Significant at 0.05 level (two-tailed)

Table 6.3. Schools Model Correlations (1997--2002)

	Youth Population	Unemploy-ment	Rural Adjacent	Rural Non-adjacent	Number of Schools	Operating Expenses	Enrollment
Total Population	**.939*** **	**.270** **	-0.042	**-.361*** **	0.185	-0.184	**.837*** **
Youth Population	--	**.285** **	-0.034	**-.348*** **	**.195***	-0.136	**.794*** **
Unemploy-ment	--	--	0.136	**-.374*** **	**.244***	-0.081	**.252***
Rural Adjacent	--	--	--	**-.645*** **	0.163	0.124	-0.052
Rural Non-adjacent	--	--	--	--	**-.282** **	0.035	**-.386*** **
Number of Schools	--	--	--	--	--	-0.111	**.281** **
Operating Expenses	--	--	--	--	--	--	**-.316*** **

*** Significant at the .001 level / ** Significant at the 0.01 level/ * Significant at 0.05 level (two-tailed)

Table 6.4. Schools Model Correlations (2002--2007)

	Youth Population	Unemploy-ment	Rural Adjacent	Rural Non-adjacent	Number of Schools	Operating Expenses	Enrollment
Total Population	**.980*** **	0.111	0.059	**-.302** **	**.321*** **	-0.098	**.834*** **
Youth Population	--	0.101	0.112	**-.281** **	**.354*** **	-0.083	**.848*** **
Unemploy-ment	--	--	-0.071	0	0.19	0.02	0.062
Rural Adjacent	--	--	--	**-.645*** **	0.034	-0.184	0.095
Rural Non-adjacent	--	--	--	--	-0.139	**.256** **	**-.252***
Number of Schools	--	--	--	--	--	**.197***	**.469** **
Operating Expenses	--	--	--	--	--	--	-0.029

*** Significant at the .001 level / ** Significant at the 0.01 level/ * Significant at 0.05 level (two-tailed)

Table 7.1. Farms Model Correlations (1969/70--2007)

	Average Size	Average Sales	Level of Industrial-ization	Agricultural Importance	Total Population	Youth Population	Unemploy-ment	Rural Adjacent	Rural Non-adjacent
Number of Farms	**-.266****	**-.316*****	-0.188	**-.211***	0.045	0.077	-0.176	**-.226***	**.299****
Average Size	--	**.777*****	**.752*****	**.221***	**-.252****	**-.233***	-0.006	**.384*****	-0.174
Average Sales	--	--	**.669*****	0.19	**-.249***	**-.237***	-0.047	**.283****	-0.129
Level of Industrial-ization	--	--	--	**.235***	-0.14	-0.13	-0.081	**.357*****	-0.171
Agricultural Importance	--	--	--	--	-0.038	-0.079	0.183	0.093	**-.237***
Total Population	--	--	--	--	--	**.988*****	0.161	-0.09	**-.234***
Youth Population	--	--	--	--	--	--	0.136	-0.085	-0.184
Unemploy-ment	--	--	--	--	--	--	--	0.186	**-.284****
Rural Adjacent	--	--	--	--	--	--	--	--	**-.645*****

*** Significant at the .001 level / ** Significant at the 0.01 level/ * Significant at 0.05 level (two-tailed)

Table 7.2. Schools Model Correlations (1985--2005/7)

	Youth Population	Unemploy-ment	Number of Schools	Operating Expenses	Enrollment	Rural Adjacent	Rural Non-adjacent
Total Population	**.988*****	**.479*****	**.587*****	-0.08	**.924*****	-0.077	**-.309****
Youth Population	--	**.439*****	**.577*****	-0.093	**.915*****	-0.077	**-.273****
Unemploy-ment	--	--	**.413*****	0.078	**.468*****	0.092	**-.418*****
Number of Schools	--	--	--	0.141	**.671*****	-0.037	**-.300****
Operating Expenses	--	--	--	--	-0.049	-0.187	**.197***
Enrollment	--	--	--	--	--	-0.033	**-.337*****
Rural Adjacent	--	--	--	--	--	--	**-.645*****

*** Significant at the .001 level / ** Significant at the 0.01 level/ * Significant at 0.05 level (two-tailed)

Table 8.1. Farms Model (Total Population)

	Coefficients for Interval Models						
Variables	1974-1978	1978-1982	1982-1987	1987-1992	1992-1997	1997-2002	2002-2007
Total Population	0.367	0.244	0.347	--	0.134	0.154	0.149
	(1.397)	(1.014)	(1.662)		(-1.104)	(1.041)	(1.091)
Average Sales	**-1.324*** **	**-.869*** **	**-.795*** **	**--**	**-.915*** **	**-.691*** **	-.213
	(-3.640)	(-4.126)	(-3.716)		(-5.515)	(-3.516)	(-1.190)
Agricultural Importance	-.095	0.067	0.43	--	-.011	0.032	-.059
	(-.501)	(.490)	(3.906)		(-.100)	(.250)	(-.577)
Rural Adjacent	-.108	-.081	0.197	--	0.015	0.052	-.176
	(-.543)	(-.525)	(1.161)		(.119)	(.392)	(-1.130)
Rural Non-adjacent	0.168	**-.309***	0.326	--	**0.268***	**0.374***	**-.355***
	(.786)	(-2.021)	(1.873)		(2.010)	(2.449)	(-2.346)
R Square	0.172	0.237	0.271	0.031	0.397	0.32	0.145
F-Value	**4.001*** **	**5.960*** **	**7.123*** **	0.617	**12.651*** **	**9.025*** **	**3.261** **

***. Significant at .001 level / **. Significant at 0.01 level / *. Significant at .05 level (2-tailed)

Table 8.2. Farms Model (Youth Population)

	Coefficients for Interval Models						
Variables	1974-1978	1978-1982	1982-1987	1987-1992	1992-1997	1997-2002	2002-2007
Youth Population	0.377	0.229	0.277	-.273	-.118	0.142	0.155
	(1.044)	(.746)	(1.336)	(-1.504)	(-.940)	(.877)	(1.030)
Average Sales	**-1.413*** **	**-.893*** **	**-.790*** **	**-.875*** **	**-.919*** **	**-.693*** **	-.208
	(-3.748)	(-4.146)	(-3.746)	(-4.300)	(-5.481)	(-3.505)	(-1.179)
Agricultural Importance	-.103	0.07	0.43	-.010	-.008	0.028	-.054
	(-.493)	(.442)	(3.868)	(-.088)	(-.076)	(.216)	(-.523)
Rural Adjacent	-.153	-.097	0.147	0.198	0.027	0.041	-.194
	(-.751)	(-.623)	(.912)	(1.177)	(.213)	(.310)	(-1.248)
Rural Non-adjacent	0.12	**-.337***	0.254	0.258	**0.285***	**0.359***	**-.366***
	(.548)	(-2.203)	(1.604)	(1.520)	(2.185)	(2.318)	(-2.419)
R Square	0.153	0.228	0.268	0.229	0.394	0.318	0.14
F-Value	**3.480** **	**5.685*** **	**7.031*** **	**5.702*** **	**12.491*** **	**8.941*** **	**3.138***

***. Significant at .001 level / **. Significant at 0.01 level / *. Significant at .05 level (2-tailed)

Table 9.1. Schools Model (Total Population)

	Coefficients for Interval Models			
Variables	1987-1992	1992-1997	1997-2002	2002-2007
Number of Schools	**0.216***	0.197	2.485	**0.712*****
	(1.996)	(.960)	(1.264)	(4.851)
Previous Population	**0.457*****	**0.796*****	0.225	**0.761*****
	(5.658)	(9.362)	(.559)	(8.380)
Unemployment	**0.28****	-.094	-.326	-.083
	(3.343)	(-1.400)	(-.836)	(-1.013)
Rural Adjacent	**-.229***	0.169	-.368	0.184
	(-2.379)	(1.716)	(-1.035)	(1.683)
Rural Non-adjacent	**-.238***	0.158	0.023	0.191
	(-2.238)	(1.732)	(.048)	(1.617)
R Square	0.594	0.663	0.104	0.581
F-Value	**27.794*****	**37.720*****	2.229	**26.572*****

***. Significant at .001 level / **. Significant at 0.01 level / *. Significant at .05 level (2-tailed)

Table 9.2. Schools Model (Youth Population)

	Coefficients for Interval Models			
Variables	1987-1992	1992-1997	1997-2002	2002-2007
Number of Schools	0.184	0.185	--	**0.875*****
	(1.765)	(.808)		(5.012)
Previous Population	**0.571*****	**0.742*****	--	**0.639*****
	(7.710)	(8.183)		(6.004)
Unemployment	**0.234****	-.115	--	-.094
	(2.975)	(-1.599)		(-.962)
Rural Adjacent	**-.203***	0.159	--	0.237
	(-2.204)	(1.525)		(1.840)
Rural Non-adjacent	-.180	0.107	--	0.216
	(-1.786)	(1.160)		(1.560)
R Square	0.619	0.615	0.075	0.472
F-Value	**30.911*****	**30.625*****	1.554	**17.178*****

***. Significant at .001 level / **. Significant at 0.01 level / *. Significant at .05 level (2-tailed)

FIGURES

Figure 1: POET Model

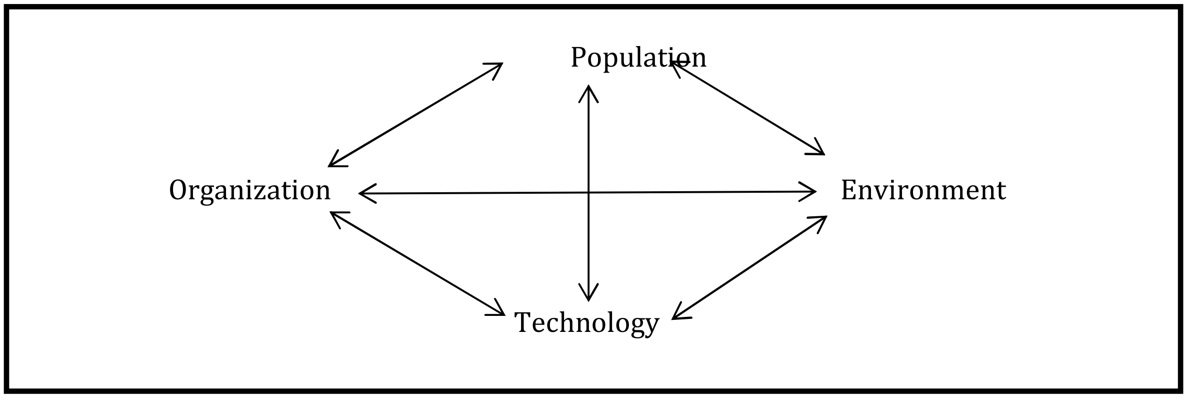

Figure 2: Full Rural Decline Model