EXAMINING THE RELATIONSHIP BETWEEN SPRAWL AND NEIGHBORHOOD SOCIAL CONFLICTS: PRELIMINARY RESULTS

by

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ABSTRACT

The objective of the paper is to examine the relationship between sprawl and neighborhood social conflicts between non-farm residents and farmers in north Alabama. To accomplish the objective, the paper employed a probit and ordinal probit regression models and analyzed 2000 census data and 2004 data from the multi-county survey of farmers in areas where sprawl has been identified to be a problem. The findings shed some light to the ongoing social conflict between non-farm residents and farmers in north Alabama.

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INTRODUCTION

As the United States has become increasingly urban, with approximately 79 percent of the population currently residing in urban places, residential and commercial development has spread further from city centers, consuming more agricultural land in traditionally rural areas (Barnard, 2000; Plantinga and Miller, 2001, p. 56). The unplanned, relatively low density growth (sprawl) is often characterized by discontiguous residential development (often interspersed with idle land, and often connected by commercial corridors along busy roads) that relies on automobiles for transportation. The level terrain that makes farmland advantageous for agricultural production also makes these lands attractive for housing and commercial uses (Barnard, 2000). This conversion process through time could have implications on quality of life, preservation of small and family farms, sustainable agricultural production, as well as on public interests of open space, farming tradition, and landscape preservation standards (Hailu, 2002; Carver and Yahner 1996).

In Alabama, sprawl has taken two main forms: urban sprawl in the form of expanding urban areas that has pushed outward into the countryside at densities of 1500 or more people per square mile; and scattered residential sprawl outside established settlements at densities of 500 to 1500 people per square mile. Even though the state and local governments have devised efforts to reduce the opportunity costs of farming in areas where the city has encroached, the problem is proving to be overwhelming, especially at the periphery of the state's largest metropolitan areas. The seriousness of the issue is highlighted by recent statistics which show that over the last 20 years sprawling

development patterns have resulted in the conversion of more than four million acres of farm land in Alabama (Crew and Runge, 2000). Between 1992 and 1997, agricultural land was converted at five times the rate of population growth, an indication of increased competition for incompatible uses of agricultural land in the state (Table 1 and Figure 1).

In northern Alabama the increasing demand for these non-agricultural land uses has fragmented the agricultural land base, and has driven up land values, as the "market value" for such non-agricultural land-use is normally significantly higher than the value of the land for agricultural production. The new land-use patterns in the region feature: (1) Single-family houses on large lots—anywhere from 1/4 acre to 10 acres; (2) Elaborate road networks to serve auto and truck travel; and (3) Huge shopping malls and office parks. The negative impacts of the new land-use patterns are most readily felt on the farm in terms of: a reduction in the number and size of farms, an increase in the average age of farmers, with fewer young people venturing into farming, neighborhood social conflicts, a general weakening of resource-based rural economies and a variety of other economic and social problems (NASS 2001; Workman and Allen 2002).

This paper focuses on neighborhood social conflicts. Conflicts can arise between urban neighbors using secondary roads as commuter routes and farmers traveling to and from distant fields with farm equipment. Other problems for farmers can include increased incidence of vandalism and theft, including damage to crops from urban neighbors driving through fields. Nuisance complaints may also increase, as more neighbors voice opposition to the sounds and smells of typical agricultural operations (Barnard 2003). The specific objective is to examine the relationship between sprawl (measured through residential density and new development within five miles or less

from a farm) and neighborhood social conflicts between non-farm residents and farmers in northern Alabama. At the present time, farmers in northern Alabama, like many others across the country, are fighting to retain land for agricultural purposes.

LAND USE CONFLICTS

Land use conflicts result when one person interferes with the way that another person wants to use their land. These conflicts are, of course, two-sided (Table 2). Agricultural operations can interfere with residential uses while rural dwellers can hinder the use of land for agricultural purposes. These conflicts increase as more and more rural non-farm land uses take place and additional people move into agricultural areas. Any one of a number of land use conflicts can arise and the problem is compounded by the fact that these conflicts tend to occur simultaneously (Green County Farmland Preservation Plan 2000; Roakes 1996; Dowling 2000). Land use conflicts, or nuisances, frequently cited by farmers include: residents' complaints (that may become law suits) or zoning related complaints over farm odors, flies, noise, dust, chemicals and pesticide spraying; predation of livestock by domestic pets, especially dogs; indiscriminate refuse disposal and littering; trespassing, theft and vandalism; traffic congestion; and significantly altered traffic patterns. Highway improvements necessitated by increased traffic can also result in farmland being taken out of production for road widening. Farmers can also be held financially responsible for any damage caused to residential areas by wandering farm animals. Coping with these nuisances has proven highly annoying as well as financially burdensome for farmers (Green County Farmland Preservation Plan 2000; Raad and Kenworthy 1998; Jakle and Wilson 1992).

DATA

To accomplish the study objective, we analyzed 2000 Census data and 2004 data from the multi-county survey of farmers in areas where sprawl has been identified to be a problem in north Alabama. The survey collected information on issues encountered by farmers, which can serve as proxies for neighborhood social conflicts, and the census block group of each respondent (Table 3). The question was mailed to a random sample of about 400 farmers in north Alabama in spring 2005. The initial response rate was 30 percent. A follow-up remainder with a replacement questionnaire was mailed out to the non respondents (we are still waiting for responses from the second mail out). Thus, this paper presents preliminary analysis based on the initial 30 percent response rate.

Using survey responses, two dependent variables measuring neighborhood social conflicts are developed: 1) Whether or not the survey respondent had encountered any neighborhood social conflict (based on responses to questions asking respondents whether they have encountered complaints from non-farm residents about "nuisances" that come with living in an agricultural area or had encountered any problem resulting from urban growth); and 2) the number of such conflicts, ranging from zero to thirteen.

The first group of independent variables is drawn from the 2000 census block group data and consists of census block group density, the proportion of individuals in the neighborhood who drive to work alone and census block group poverty rate. The second group which consists of presence of new development within five miles or less from a farm, respondent's age, gender, race/ethnicity, educational attainment, household incomes, farm size, tenure, family structure and length of time at present residence is drawn from the questionnaire. Because of the small sample size however, and the need to

increase the degrees of freedom, only five variables (2000 census block group density, the proportion of individuals who drive to work alone, 2000 census block group poverty rate, presence of new development within five miles or less from a farm, and farm size) are included in this preliminary analysis. The rest of the variables will be included when the sample size increases.

Model 1: Binomial Probit Model

Model 1 is a binomial probit equation which assumes that while we only observe the values of 0 and 1 for whether or not the survey respondent had encountered any neighborhood social conflict (CONF), there is a latent, unobserved continuous variable $CONF^*$ that determines the value of CONF. We assume that $CONF^*$ can be specified as follows:

$$CONF_i^* = b_0 + b_1 x_{1i} + b_2 x_{2i} + ... + b_k x_{ki} + u_i \quad (1)$$

and that:

$$CONF_i = 1 \text{ if } \text{CONF}^* > 0$$
$$CONF_i = 0 \text{ otherwise}$$

where x_1; x_2, … x_k represent vectors of random variables, and u represents a random disturbance term. Now from equation 1,

$$\Pr(CONF_i = 1) = \Pr(b_0 + b_1 x_{1i} + b_2 x_{2i} + ... + b_k x_{ki} + u_i > 0) \quad (2)$$

Rearranging terms,

$$\begin{aligned} &\Pr(CONF_i = 1) = \Pr(u_i > -(b_0 + b_1 x_{1i} + b_2 x_{2i} + ... + b_k x_{ki})) \\ &= 1 - \Pr(u_i < -(b_0 + b_1 x_{1i} + b_2 x_{2i} + ... + b_k x_{ki})) \\ &= 1 - F(-(b_0 + b_1 x_{1i} + b_2 x_{2i} + ... + b_k x_{ki})) \end{aligned} \quad (3)$$

where F is the cumulative density function of the variable *u*. By asserting the usual assumption that *u* is normally distributed, then:

$$\begin{aligned}\Pr(CONF_i = 1) &= 1 - \Phi(-(b_0 + b_1 x_{1i} + b_2 x_{2i} + ... + b_k x_{ki})) \\ &= 1 - \Phi(-X_i b) \\ &= \Phi(X_i b)\end{aligned} \quad (4)$$

where Φ represents the cumulative normal distribution function.

Using maximum likelihood technique the estimates of the coefficients (βs) and their corresponding standard errors that are asymptotically efficient are computed. The probabilities of an individual for each response category are given by:

$$\text{Prob}[CONF_i = 0] = \Phi[m_0 - aX] \quad (5)$$

$$\text{Prob}[CONF_i = 1] = \Phi[m_1 - aX] - \Phi[m_0 - aX] \quad (6)$$

with $\alpha = \beta/\sigma$ and $q_j / s = 0,1$. Note that only the ratios β/σ and q_j / s are estimable (Dustman, 1996). Equation (5) basically gives us the probability of obtaining a no-response to the social conflict question (Prob($CONF_i = 0$)) while equation (6) the probability of obtaining a yes-response to the social conflict question (Prob($CONF_i = 1$).

Model 2: Ordinal Probit Model

The only difference between model 1 and 2 is the way the dependent variable is measured. While the dependent variable in model 1 is binary (0, 1), the dependent variable in model 2 is developed by counting the number of social conflicts encountered by a respondent, ranging from zero to thirteen. Based on this self-reported responses, a new variable was created, defined as 0 if the response was zero or one conflict, 1 if the

response was two or three conflicts, 2 if the response was four or five conflicts, 3 if the response was six or seven conflicts and 4 if the response was eight or more conflicts.

RESULTS

As mention above, we estimated two different measures of social conflicts. The first model used a binomial regression model to assess the impact of sprawl on the likelihood that a respondent has encountered neighborhood social conflicts. Most of the signs of the coefficients are as expected, though results were weaker than we had expected. For example, while the coefficient for the density term has a positive sign, the coefficient is not statistically significant, indicating no relationship exists between density and the likelihood of someone encountering neighborhood social conflicts. Traffic congestion as an indication of sprawl is examined using the proportion of individuals in a neighborhood (census block group) who drive alone to work. The coefficient of the variable has the expected positive sign and statistically significant, indicating that a strong relationship exists between traffic congestion and the likelihood of someone encountering neighborhood social conflicts. The marginal effect for this variable suggests that a 1 percent increase in the number of individuals who drive alone to work is associated with a 71 percent increase in the likelihood of someone encountering neighborhood social conflicts.

Similarly, the variable measuring the existence of a new development within five miles or less has a strong and statistically significant relationship on the likelihood of someone encountering neighborhood social conflicts. The marginal effect for this variable suggests that a 1 percent increase in the number of new development within five

miles or less is associated with a 43 percent increase in the likelihood of someone encountering neighborhood social conflicts. To the contrary, the results suggest that no relationship exists between census block group poverty rate, farm size and the likelihood of someone encountering neighborhood social conflicts.

In the second model, ordinal probit regression model, the density term was statistically significant, indicating a strong relationship between density and the number of neighborhood social conflicts encountered. The result for this variable suggests that a 1 percent decrease in the census block group density is associated with a 51 percent increase in the likelihood that a respondent will encounter relatively more neighborhood social conflicts. Again, traffic congestion as measured by the proportion of individuals who drive alone to work has a strong influence on the number of neighborhood social conflicts encountered. The marginal effect for this variable suggests that a 1 percent increase in the number of individuals who drive alone to work is associated with a 59 percent increase in the likelihood that a respondent will encounter relatively more neighborhood social conflicts.

The presence of new development within five miles or less has a statistically significant and positive relationship with the number of neighborhood social conflicts encountered. The result shows that a 1 percent increase in the presence of new developments within five miles or less of a farm is associated with a 42 percent increase in the likelihood that a respondent will encounter relatively more neighborhood social conflicts. Again, the results for census block poverty rate and farm size are unexpectedly weak, suggesting that no relationship exists between these variables and the number of social conflicts someone is likely to encounter.

Conclusion

Sprawl is a multifaceted problem with several related characteristics. The interest in this paper was the potential neighborhood social conflicts between farmers and non-farm residents. While the analysis is preliminary, the findings derived from this paper shed some light to the ongoing social conflict between non-farm residents and farmers. Particularly, the finding that the proportion of individuals who drive to work alone increases the likelihood of neighborhood social conflicts has some policy ramification. Also, policies focusing or affecting the conversion of agricultural land to other uses need to take proper judgment as to the possible implications on the agricultural and non-agricultural communities.

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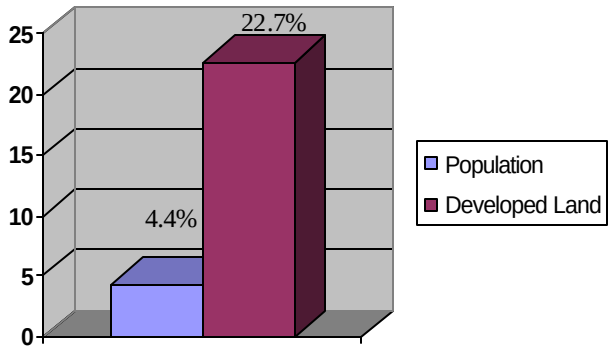
Table 1. Land Conversion by State*

State	Ranking	% increase in developed land
WV	1	38.8%
NM	2	35.7%
PA	3	35.0%
GA	4	33.1%
TN	5	30.5%
SC	6	30.2%
ME	7	29.0%
MS	8	23.3%
NC	9	23.0%
AL	10	22.7%

* Adjusted by acreage and population, 1992-1997

Data Sources: USDA, US Census Bureau and Jim Self Center on the Future, Clemson University.

Figure 1. Comparison of Population Growth to Increase in Developed Land in Alabama, 1992-97



Data Source: USDA, US Census Bureau

Table 2. Positive and Negative Impacts of Proximity of Farms to Urban Areas

Positive Urbanization Impacts on Farming	Negative Urbanization Impacts on Farming
• Proximity to urban centers may provide a larger pool of seasonal or part-time labor that is especially important to harvest high-value crops. o One reason metro farms can adopt high-value crops is because local sources of labor are available at peak periods (Jordon, 1989).	• Suburban neighbors' complaints about farm odors and chemical spraying may force farmers to turn to enterprises that produce fewer negative side effects. o Some of the alternative enterprises will be more profitable and some will be less profitable (Reynnells, 1987; Van Driesche et al., 1987).
• Greater off-farm employment opportunities for the farmer or his/her family may help support the farming operation (Stallman and Alwang, 1991). o Opportunities from urban employment run in both directions. People in urbanizing areas may work part time on the farm or start recreational farms that eventually develop into full-time, part-time, or retirement businesses.	• Markets for traditional dairy products or field crops may be reduced, as milk-collection routes are curtailed and grain elevators go out of business. o In some areas, farm input suppliers, machinery dealers, and other forms of agricultural support may decline.
• Nationally, 90 percent of average farm household income was from off-farm sources in 1999, including part-time employment, spousal income, and other business income. o The percentage in recent years has varied from 83 to 90 percent.	• Conflicts can arise between growers and new suburban neighbors over early morning noise, and increased traffic can hinder farmers' ability to move their equipment along overcrowded rural roads being used as commuter routes.
• Expanding populations provide opportunities for farmers to grow new crops and to market them in new ways, such as through farmers' markets (Price and Harris, 2000). o High-value crops, such as fresh fruits and vegetables, can be sold through restaurants and gourmet grocery outlets or directly to consumers in roadside stands or U-pick operations.	• Real estate taxes may rise as land prices rise to reflect the potential for non-farm development. • Growers may face increased pressure from water- and land-use restrictions. • Farms may face deteriorating crop yields from urban smog, theft, and vandalism

Table 3. Descriptive Statistics

Variable	**Minimum**	**Maximum**	**Mean**	**Stand. Dev.**
Density	28.10	857.80	307.75	214.76
Poverty rate	0.34%	48.72%	12.03%	8.41
Drove to work alone	63.28	96.82	84.05	7.62
Farm size	Less than 20 acres	250 acres	77.5 acres	123.8
Number of conflicts	0	13	5	4

Table 4. Regression estimates for social conflict models

	BINOMIAL PROBIT		ORDINAL PROBIT	
Variable	Estimated Coefficients	Marginal Effects	Estimated Coefficients	Marginal Effects CONF = 4
Constant	-1.448* (0.764)	-1.052* (0.526)	-1.124** (0.418)	
Density	0.340 (0.391)	0.526 (0.364)	0.742* (0.409)	0.514
Drove to work alone	0.732* (0.316)	0.705* (0.347)	0.503* (0.215)	0.594
Poverty rate	-0.669 (0.718)	-0.424 (0.348)	-0.842 (1.126)	-0.047
Development	0.724* (0.382)	0.431* (0.183)	0.278* (0.126)	0.406
Farm size	0.146 (0.110)	10.4740 (0.438)	0.146 (0.110)	0.374
μ_1			0.506** (0.142)	
μ_2			0.525** (0.175)	
μ_3			0.631** (0.215)	
Log-L	-20.67		-100	
Chi-square	1.89		2.88	
Model Prediction	56%		62%	

Notes: *, ** denote significance at 1 and 5 percent levels; standard errors in parenthesis.
CONF = 4 represents dependent variable category for 7 to 13 reported social conflicts