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Diversification through 'fun in the farm': analyzing structural factors affecting agritourism in Tennessee

RESEARCH ARTICLE

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Abstract

With recent development, agritourism – visiting a working agricultural setting such as farm and ranch for leisure, recreation, or educational purposes – is gaining popularity in the US. Agritourism can be considered as a viable alternative agricultural enterprise to enhance income and sustainability of farms. This study maps agritourism locations and analyzes the structural factors affecting agritourism location and establishments. Using zip-code level location information, county-level data from Tennessee and spatial regression models, we found significant effects of rural factors, demographics, and educational-, economic-, and cultural- capital factors and their interactions on the location and establishment of agritourism farms. The counties lagging behind in agritourism can focus on educational and capital related factors to enable farms to participate in agritourism activities. Rural areas can capitalize the recreational and natural aspects of agriculture complementing it with agritourism activities. Additionally, our significant spatial terms and tests suggest for the need to test and account for potential spatial effects on studies focused on structural factors and location decision models.

Keywords: agritourism, structural factors, spatial models, location, fun in the farm, diversification, recreational
JEL code: Q13, Q26, Z30, Q10, R00

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1. Introduction

Farm diversification is one of the important risk management strategies among agricultural farms (Harwood *et al.*, 1999). Some previous studies (Kurosaki, 2003; Mishra and El-Osta, 2002; Nartea and Barry, 1994; Pope and Prescott, 1980; Purdy *et al.*, 1997; Schoney *et al.*, 1994; Sumner and Wolf, 2002) suggest that diversification is used as mechanism for risk reduction. Agritourism can be seen as an innovative on-farm diversification strategy for farms, by including recreation and leisure activities for tourists, with many economic and non-economic benefits for farmers, visitors and communities (Ilbery, 1991; Tew *et al.,* 2012). Agritourism is perceived as the 'missing link in a quality territorial system that integrates agricultural, touristic, environmental, cultural and historic resources' (Sonnino, 2004). It likely represents 'the most radical product innovation that has ever concerned the national agriculture' and has different characteristics in comparison with other more traditional forms of agricultural farms (Lupi *et al.*, 2017). Moreover, as shown in Tchetchik *et al.* (2008), differentiation and synergies in joint production of agricultural goods and tourism services could incentivize for agritourism industry growth by increasing the number of businesses or number of accommodation units per business, and government could facilitate for larger scale adoption.

Agritourism participation is one of the important on-farm strategies adopted among Tennessee farms, specifically by offering recreational, touristic, and hospitality activities offering on farms and ranches to increase farm or community income by attracting the public to visit agricultural operations and outlets. It creates an opportunity for educational or recreational experiences and to help sustain and build awareness of the rural quality of life. The role of agritourism has been suggested as a viable option for on-farm diversification (Amanor-Boadu, 2013; Bagi and Reeder, 2012; Galinato *et al.*, 2010; Joo *et al.*, 2013). Amanor-Boadu (2013) examined agritourism related activities as means of diversification and found that economic and education factors are positively motivating factors in such activities, in addition to the influence of demographics. Joo *et al.* (2013) found that small farms participating in agritourism generated a greater household income than larger farms. However, some farm specific characteristics such as operator's farming experience, access to capital, and the size of the farm operation play a significant role in determining a farm's participation in agritourism.

Tennessee is in a unique position to participate in the agritourism industry with both the agriculture and tourism industries contributing greatly to the state's economy. According to a 2013 study by the University of Tennessee, the study receiving 171 Tennessee agritourism responses, the estimated total agritourism visits per year is more than 1.75 million (Jensen *et al.*, 2013). The estimated economic impact was $35 million, with a $54 million ripple effect – more than double from 10 years before. Agritourism provides Tennessee farmers a chance to build and diversify farm income by bringing the public to the farm to purchase farm products and to learn about agriculture and enjoy recreational activities. Among the farms currently operating an agritourism business, the most common types of businesses were on-farm retail markets, school field trips/ tours, event hosting, pick-your-own operations, hayride or wagon rides, and farm tours other than school field trips, on-farm gift shops, weddings, other family fun activities, and pumpkin patches (Jensen *et al.*, 2013). The number of farms in Tennessee offering these services increased by 20.8% from 2007 to 2012 (510 to 616 farms), the value of agritourism and recreation increased by 83.1% in the same period, from $6.5 million to $11.9 million (McDaniels, 2015). The average agritourism sales per farm increased 51.6% ($12,759 to $19,342) in this five-year period while the average sales growth per farm during this period on a national level was negative, at -12.5%.

Although agritourism is one of the important alternative agricultural enterprises with greater scope for enhancing farm income and profits, academic research on agritourism farm establishment, location, and feasibility on producer's perspectives has been limited in the US. There are a number of studies that focused largely on consumer motivations, demand, and visitor characteristics, demand for agritourism destinations, and broader rural perspectives (e.g. Barbieri *et al.*, 2016; Che *et al.*, 2007; Jensen *et al.*, 2006, 2014; McGhee *et al.*, 2007; Melstrom and Murphy, 2018; Nickerson *et al.*, 2001). In the state level, it is interesting to analyze specific questions such as 'where agritourism and 'fun type activities' farms are located' and 'why

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they are located or clustered there' at least for two reasons. First, to the potential agritourism farmers, farm managers, investors, researchers, as well as consumers can derive meaningful applications and inferences from such findings. Second, to the State-level policy makers, the study provides meaningful information about agritourism location map in each county and extent of agritourism related activities so as to contribute to regional and local economies. Moreover, structural factors have not gained enough attention in the literature, but could play an important role determining where agritourism businesses are likely to be clustered. This study fills this gap in literature by analyzing these questions in Tennessee.

This study involves an extensive literature review about the structural factors and investigate the role of structural factors in agritourism location using county level data and accounting for spatial factors. It investigates the likelihood of agritourism farm establishment with respect to a number of factors, such as: (1) establishment of other agricultural sector related establishments; (2) urban-ness & rurality, metro or rural location; and (3) county-specific demographic factors indicating income and wealth status, race and ethnicity, minority and females, population density and total residential household /housing units. For this, we first map the spatial location of agritourism farms in Tennessee. Then we collected county characteristics and data from US Census and County Business Patterns (United States Census Bureau, 2016a). And finally, we test hypotheses about each of these structural factors affecting agritourism location decisions. Based on the previous literature, there are potentially two sets of structural factors of interest and their interactions in location choice: (1) factors related to urban status/ distance from urban center/ urbaneness of the county; and (2) factors related to capital (such as income level of residence and education capital). However, there have been mixed findings about the roles of these factors. It is an important empirical question yet to analyze in Tennessee. Using location, demographic, economic, and agritourism data collected from different sources and appropriate econometric methods, we investigate a number of research questions test the hypotheses, for example, and not limited to as follows:

- Question 1: is rural status of the farm or proximity to urban centers (metro area) a significant factor in agritourism location choice and establishment?
- Question 2: could per capita income of residence (proxy of economic capital) and other public capitals affect agritourism location and establishment?
- Question 3: is combined and interaction effect of rural status and capital attributes of the county important factors in agritourism location choice?

2. Literature review

There have been some studies that discussed factors affecting location and establishment of agritourism. The first set of studies highlight the importance of location near population centers. For example, Bernardo *et al.* (2004) noted that agritourism has geographic advantage to locate near urban areas. Bagi and Reeder (2012) also found that farms near central cities were more likely to participate in agritourism. Brown and Reeder (2007), on the other hand, found that as the distance between the farm and a city of at least 10,000 population increases, there is a greater likelihood of a farmer operating an on-farm recreation business. Yet they found that county population density has a positive impact on income from farm-based recreation.

Figueiredo *et al.* (2002) suggest that agglomeration or external economy could be a determining factor for location of any small businesses. Additionally, Donaldson and Momsen (2011) discussed that clustering is motivating by factors of networking among operations as well as by an easy flow of visitors among operations. However, the factors mentioned above could potentially affect the initial farm location decision, but not necessarily in the decision to start an agritourism operation. According to Amanor-Boadu (2013), farms that offer recreational events tend to be located closer to cities to benefit from the larger populations that exist there while those offering hunting tend to be in rural areas. Because most operators are motivated by the potential for success or profit, it is important to discuss the links between business location and success. Wadhwa *et al.* (2009) found that entrepreneurs from different parts of the US weigh the importance of location on business success differently. Minai and Lucky (2011) also found that entrepreneurs believe location to be an indispensable factor that determines the success or failure of development and business activities.

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Literature supports that urban people tend to visit agritourism farms and take active part in the fun activities (Che *et al.,* 2005; McGehee, 2007; Wilson *et al.,* 2006) but how (and whether) the urban status of a county affects agritourism still needs to be investigated and likely to be placed in a specific context. Illbery (1991) found that proximity to a major urban market did influence the diversification decision on the urban fringe of the UK's West Midlands. A similar trend was observed in New Jersey. Schilling and Sullivan (2014) identified that farms nearer to the urban center of New York city were significantly more likely to offer agritourism attractions than farms further away from the urban core. However, few other studies support the opposite. Joo *et al.* (2013), for example, using nation-wide large US data, found that the likelihood of farms participating in agritourism activities increased as they are further from an urban center.

Studies suggest that proximity to consumer markets, the structure and composition of consumer markets (income, population density and growth), transportation, and the natural amenities/recreational scores of a county could play a key role in the propensity to start an agritourism operation (Lucha *et al.*, 2016. Another factor – income – has often been described as an important factor in outdoor recreation participation. Research on outdoor recreation commonly cites income as one of the most important predictors of participation (Alexandris and Carroll, 1997; Brown *et al.,* 2001; Kelly, 1980; Lee *et al.*, 2001; Scott and Munson, 1994; Searle and Jackson, 1985; Shores *et al.*, 2007; White, 1975). Joo *et al.* (2013) found that higher household income in a county and the number of agritourism farm operating in the county have a significantly positive relationship in the US.

In the discussion of capital, studies also discuss economic, cultural and educational capital as potential factors for agritourism (Andres and Looker, 2001; Dumais, 2002; Rye, 2006) and for pro-environmental attitudes (Kollmuss and Agyeman, 2002), ecologically based valuation of the environment (Ignatow, 2006) as well as for preference of traditional farming landscapes (Kaltenborn and Bjerke, 2002), perhaps deriving recreational and environmental aspects of agriculture. Urban and capitals are expected to influence agritourism presence separately, combining them may even multiply this effect. Bernardo *et al.* (2004) and Baskerville (2013) have found urban spaces that also have high levels of capitals, may enhance the support of agritourism.

Among very few studies related to agritourism in Tennessee, we found a study of Jensen *et al.* (2006). Jensen *et al.* (2006) focused on the visitors of agritourism farms in Tennessee and the reslationship to their demographics (age, income, education) and residency. However, the study lacks the discussion about farm establishment perspective and the effect of various structural factors like, proximity to urban centers, rurality or income of residents of counties on the likelihood of agritourism locations and establishments in Tennessee.

Documenting all these findings from literature, this study investigates the structural factors such as whether proximity to urban centers, capital and income factors, the combined effect of rurality and capital factors, as well as the role of population composition, density, and the concentration of agricultural related firms in the county and their effect on agritourism farm location and establishment in Tennessee.

3. Data

Most recent data and information was collected from various sources. A brief description of those is presented below.

3.1 Number of agritourism farms and fun type activities

In this analysis the dependent variable is the number of agritourism farms in each county in Tennessee. The study collected and maintained a database about operations with fun-type activities and agritourism based on information from Pick Tennessee Products and Tennessee Agritourism Association (a part of the Tennessee Department of Agriculture and a non-for-profit service dedicated to connecting people to Tennessee farms, farmers, markets and other food businesses). We have collected the information of 486 farms operating under

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6 different types of fun activities which are: bed and breakfast/lodging on farm, hosting wedding on farm, corn and hay mazes, pumpkin patch, winery, and wagon rides.

3.2 Agritourism location

The farm details were collected with the zip code level information and detailed addresses so that they can be spotted rightly over the Tennessee state map with the distinct 95 county boundaries on it. ArchGIS software was used to map the farm locations over the counties of Tennessee. Each farm's location (east, west, and middle Tennessee regional classification) was also noted and included in the econometric model.

3.3 Agricultural related business establishments (NAICS sectors)

Number of agribusiness and agricultural related industry establishments data were collected for each 95 counties in Tennessee. The North American Industry Classification System (NAICS), was used to identify these agricultural related industries which includes: food manufacturing (NAICS 311), beverage and tobacco product manufacturing (312), textile mills (313), textile product mills (314), apparel manufacturing (315), leather and allied product manufacturing (316), wood product manufacturing (321), paper manufacturing (322) industries/business. NAICS is the standard classification system used by federal statistical agencies in classifying business establishments for collecting, analyzing, and publishing statistical data related to the US business economy.

We collected data from 2016 County Business Patterns (United States Census Bureau, 2016a) and Non-Employer Statistics (NES; United States Census Bureau, 2016b) combined report of Tennessee. CBP refers to 'establishment' as a single physical location at which business is conducted or services or industrial operations are performed. It is not necessarily identical to a company or enterprise, which may consist of one or more establishments. When two or more activities are carried out at a single location under a single ownership, all activities generally are grouped together as a single establishment. The entire establishment is classified on the basis of its major activity and all data are included in that classification. Establishment counts represent the number of locations with paid employees any time during the year.

Moreover, a NES establishment generally refers to an establishment in a single physical location at which business is conducted, services are rendered, or industrial operations are performed. For non-employer (a business that has no paid employees, has annual business receipts of $1000 or more, and is subject to federal income taxes), the Census Bureau uses the terms 'firm' and 'establishment' interchangeably. Since a non-employer business may operate from its owner's home address or from an unspecified physical location, most geography codes are derived from the business owner's mailing address, which may not be the same as the physical location of the business activity. If an industry does not appear in any county, CBP or NES did not identify any establishments in the geography (the value is 0). A sum of CBP establishments and NES establishments is used here for agricultural related industry establishments in the Tennessee counties.

3.4 Rurality/ rural status and metro/non-metro counties

The Index of Relative Rurality (IRR; Waldorf, 2006) was counted to measure the rurality/urbaneness of the 95 counties. This IRR is a continuous measure of rurality for each county based on four dimensions: population size, density, percentage of urban residents and distance to the closest metropolitan area. The index varies from 0 (most urban) to 1 (most rural). Using the index as an indicator of rurality has some merit because it is continuous and does not suffer from problems of arbitrary thresholds to separate discrete categories. For instance, Davidson County has the least IRR value of 0.143, indicating the most urban county and Pickett county depicts the highest IRR value of 0.633, referring to the most rural county in this study (Roehrich-Patrick *et al.*, 2016).

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To classify the rural/metro counties the study follows the lists provided by the Office of Rural Health Policy through census report issued in 2013 and updated in 2016 (Office of Rural Health Policy, 2018). The report lists 53 counties of Tennessee as rural (non-metro) and 42 counties as metro. The Census Bureau's urban-rural classification is fundamentally a delineation of geographical areas, identifying both individual urban areas and the rural areas of the nation. The Census Bureau's urban areas represent densely developed territory, and encompass residential, commercial, and other non-residential urban land uses. The Census Bureau's definition of 'urban' is largely based on residential population density and a few other land-use characteristics to identify densely developed territory (Ratcliffe *et al.*, 2016).

3.5 County demographics, population, and socio-economic information

The study collected data on total population estimates, age and sex, race and ethnicity, population characteristics, housing, families living arrangements, education, economic status, transportation status, income and poverty and business status of each county. All these data were collected from the United States Census Bureau (2017). Population estimates data from July 2017 census was used. In age and sex category data on percentages of population under 5 years, percentage of population 65 years and older and percentage of female in each county were collected.

Race and ethnicity information includes data on percentages of White, Black or African American, Hispanic or Latino, and percentage of foreign born persons (2013-2017) in Tennessee counties. The number of housing units was taken as housing indicator and the number of households (2013-2017) was regarded as families and living arrangements in a county.

Regarding education attainment, the percentage of high school graduates among 25 years (or older) and percentages of bachelors or higher degree holders among the same population were collected.

Some indicators of income and wealth were collected, such as median household income (2013-2017, in 2017 dollars), per capita income in the past 12 months (2013-2017, in 2017 dollars) and percentage of the county population under poverty level. Finally, data on the number of women-owned firms (2012 census), minority-owned firms (2012 census) and veteran-owned firms (2012 census) in each county was collected to measure the effect of businesses on agritourism in Tennessee counties.

4. Method: conceptual and empirical model

Our conceptual model is guided by economic and regional location theories. We assume that location and establishment decision of agritourism depends on the economic, educational and cultural capital as well as the rural/urban environment. Regarding rural/urban environment, two aspects are apparent: agritourism establishment with proximity to city or metro may attract more tourists but it could also have adverse effects on the visitors valuing a rural recreational environment and traditional historical farms. Additionally, regional location theories suggest for the potential spatial dependence on location and establishment decisions. Therefore, it is an empirical question specific to a State and place of whether rural or urban setting is preferable to agritourism. Guided by these regional theories and empirical findings from literature, we conceptualized a model describing agritourism farm establishment in a county as a function of demographic, economic, educational and cultural capital related factors and rural or urban status, which can be shown in the following general form:

$$Y_j = f(D_j, K_j, M_j, KM_j) \quad (1)$$

where, the number of farms involved in agritourism in a county j is the function of different characteristics representing demographic related factors of county j captured in D_j. Educational, cultural and economic capital related factors are captured in K_j, rurality or rural/urban proximity related factors captured in M_j, and potential interaction of these variables in KM_j.

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We need an appropriate econometric framework to parameterize the variables described in the conceptual model to estimate the extent of relationship of each factors. We used a generalized linear model (GLM; McCullagh and Nelder, 1989) regression framework with a maximum likelihood approach. We also conducted a set of factor analyses among the group of similar variables. Specifically, for agricultural sector business establishments, we finalized 3 sectors among eight on the basis of factor analysis – statistical method used to describe variability or commonality among correlated variables and helps to guide variable selection.

Importantly, location and establishment decision is likely to have spatial dependence and one needs to check for that. The Moran test (Moran, 1950) of spatial dependence with error lags suggested for the use of spatial regression analysis for our data. Therefore, we have used spatial regression with weighted contiguity and distance matrices as our primary econometric framework.

Specifically, the following steps were taken to appropriately acquire spatial component for our data: (1) obtain the 2018 US nation and current county level shapefile from the US Census Bureau, Department of Commerce website and translate the data in an appropriate format; (2) merge the formatted shapefile data with our Tennessee specific data with county and zip code level information; (3) prepare merged data that includes data with county specific characteristics, spatial information, and agritourism farm information for analysis; (4) create spatial weighting matrices: contiguity matrix W based on nearest neighbors and matrix M as inverse of distance between counties and allow spectral normalization; and (5) fit the spatial autoregressive model in the maximum likelihood framework specifying weighted matrices. Linking the conceptual model and empirical fit accounting for spatial weights and error lags, our econometric model in general form can be represented as:

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k + \beta_w W y + (I-\rho M)^{-1}\epsilon \quad (2)$$

where, y represents the number of agritourism farms in a county, X_1, X_2, ..., X_k represent demographic, economic, educational, and cultural capital and rural or urban status related variables (D_j, K_j, M_j, KM_j) described in the conceptual model and β_1, β_2, ..., β_k are their corresponding relationship with the dependent variable, respectively for X_1, X_2, ..., X_k . We have controlled for spatial effects with spatial weighted matrices W and M for spatial lags of dependent variables and spatial autoregressive errors.

5. Results and discussion

Table 1 shows that, on an average, 5 agricultural farms operate on-farm agritourism activities among Tennessee counties, while the maximum number of on-farm fun activities in a single county is 20 and there are a few counties with no agritourism activities among the 486 studied farms. Wood product manufacturing, beverage and tobacco product manufacturing, and textile mill establishments were also present in most of the counties (Table 1).

Using spatial information, we plotted the number of agritourism farms in each county. Different ranges of agritourism related farms are indicated with different indices in Figure 1. With natural breaks applied using a mapping program, it indicates counties with 5 classes: with 0-2 agritourism farms, with 2-4 agritourism farms, with 4 to 8 agritourism farms, and with 8 to 20 agritourism farms (Figure 1). Figure 1 shows that counties with a higher number of agritourism farms are mostly located in middle Tennessee, followed by east, and west. Additionally, we plotted all 486 agritourism related farms by location and the activity types in Figure 2. Figure 2 shows the overall distribution of the farms involved in different agritourism related and fun activities in Tennessee counties. Middle Tennessee has the highest number of agritourism related farms (216) involved in various fun activities followed by east Tennessee (181) and west Tennessee (83). Overall, we examined 6 different types of agritourism related fun-type activities: (1) bed and breakfast/lodging on farm; (2) hosting wedding on farm; (3) corn and hay mazes; (4) pumpkin patches; (5) winery; and (6) wagon rides. Among 6 fun-types, 'hosting wedding on farm' is adopted by the highest number of farms (148) followed by 'bed and breakfast/lodging' (73), 'corn and hay mazes' (73), 'winery' (70), 'pumpkin patches' (64) and 'wagon

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Table 1. Demographic statistics agricultural farms (n=95).

Variables	Description/definition of variables	Mean	St. dev.[1]	Min.	Max.
numfunactivities	Number of farms involved in agritourism activities in counties in Tennessee	5.17	4.45	0	20
est_312	Number of beverage and tobacco product manufacturing industry establishments in Tennessee counties	0.93	4.16	0	26
est_313	Number of textile mills establishments in Tennessee counties	0.17	1.17	0	9
est_321	Number of wood product manufacturing establishments in Tennessee counties	10.50	11.26	0	65
u5percentpop	Percentage of persons under 5 years in Tennessee counties	5.57	0.71	4.2	8.4
over65popp~t	Percentage of population 65 years or over in Tennessee counties	18.82	3.35	9.10	30.2
white_percent	Percentage of White race in county population in Tennessee	89.45	11.03	41.2	98.3
black_percent	Percentage of Balack/ African American in county population in Tennessee	7.542	10.66	0.2	54.1
hispanic_percent	Percentage of hispanic or latino origin population in Tennessee counties	3.69	2.45	0.5	12.1
highschool_educ	Percentage of high school graduates or higher (among >25 years old, 2013-2017) in county population	82.56	4.55	73.2	95.5
tnum_households	Number of households (in thousands) (July 1, 2017) in Tennessee counties	26.81	50.42	2.15	349.21
hwomenowned	Number of women-owned firms, in 2012 census (in hundreds) in the county	20.64	54.54	0.89	450.31
hveteranowned	Number of veteran-owned firms, 2012 (in hundreds) in the county	6.31	13.02	0.15	94.86
tmedianhhinc	Median household income in Tennessee counties (in thousands USD) (2013-2017 census; in 2017 dollars)	43.02	9.87	29.62	103.54
tpercapitainc	Per capita income (in thousand USD) in past 12 months (2013-2017 census; in 2017 dollars), in Tennessee counties	23.16	4.47	14.23	48.48
rural	Rural or metro status of Tennessee counties listed by the Office of Rural Health Policy (1=rural, 0=metro)	0.44	0.50	0	1
rural_index	Values in the Index of Relative Rurality (Waldorf, 2006) for Tennessee counties	0.45	0.11	0.13	0.63

[1] St. dev. = standard deviation.

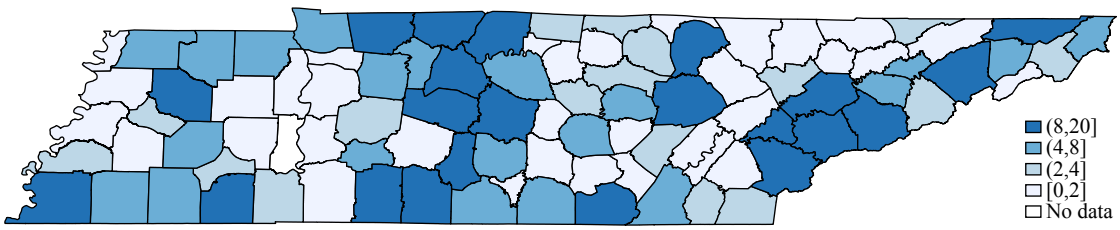

Figure 1. Map with number of farms involved in agritourism activities in each county of Tennessee.

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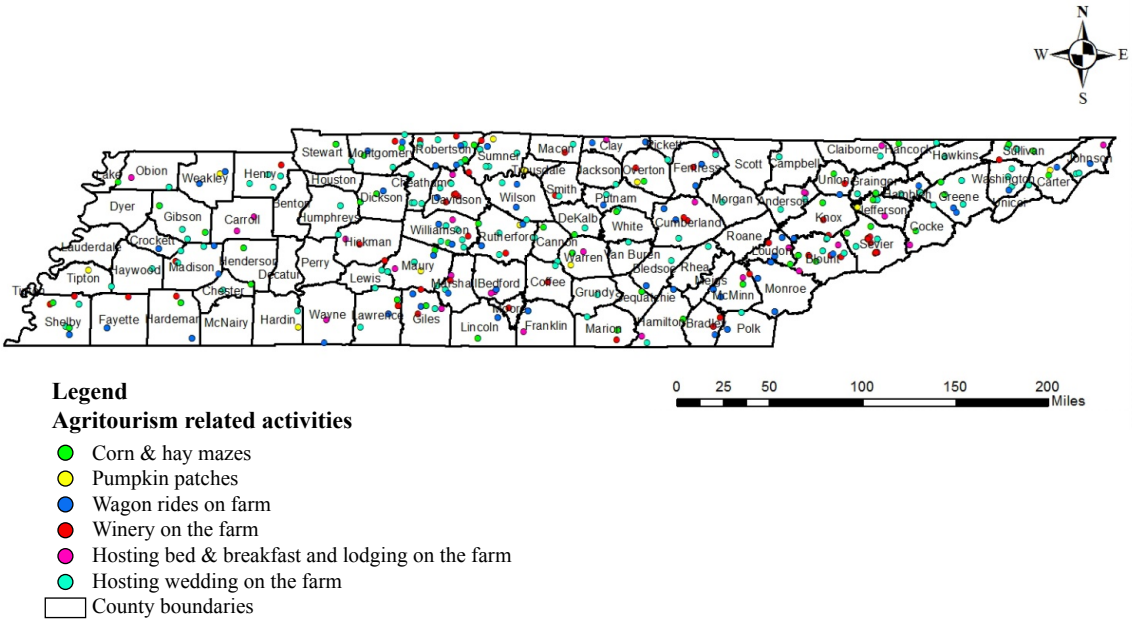

Figure 2. Map with distribution of farms in Tennessee involved in different agritourism related activities.

rides on farm' (58). Additionally, Table 2 provides breakdown of the east, middle, and west region showing the number of counties in each region, the number of rural counties in each region, and the frequency of counties with an above average (>5) and high (>10) number of agritourism farms. This shows briefly the characteristics of these regions and counties. Middle Tennessee has the highest number of rural counties and hosts the highest number of counties with more than 10 agritourism farms. By agritourism activity types, activities such as 'host wedding on the farm', 'pumpkin patch', and 'host bed and breakfast' are three top agritourism related activities on middle Tennessee agritourism farms. 'Host wedding on farm', 'winery', and 'bed and breakfast' are the top 3 common agritourism activities in east Tennessee, while 'corn and hay maze' and 'pumpkin patch' make up the top 3 in west Tennessee farms, in addition to 'hosting wedding' (Table 2).

Table 3 shows the results of the spatial regression analysis. Note that models in Table 3 use the number of farms involved in agritourism activities in a county as dependent variable, which is regressed with a set of independent variables controlling for spatial weight and spatial error lags. We have 95 observations for 95 counties in Tennessee. We presented two models, specifically to account for two rurality measures in separate regressions. First, model 1 uses a metro/rural classification of the county as dummy variable while model 2 uses an index of relative rurality (Waldorf, 2006) pertaining to each county. Note that rurality index uses population density, size, percentage of urban residents and distance to the closest metropolitan area to build

Table 2. Tennessee regions, rural counties, and agritourism farm activities.

Region	Number of counties	Number of rural counties	Counties with ≥1 agritourism farm (num)	Counties with >5 agritourism farm (num)	Counties with >10 agritourism farm (num)	Top 3 agritourism-related/ fun type activities (in order)
East	35	14	31	12	4	Host wedding on farm, winery, bed and breakfast on farm
Middle	40	25	37	16	6	Host wedding on farm, pumpkin patch, bed and breakfast on farm
West	20	14	15	6	1	Host wedding on farm, corn and hay mazes, pumpkin patch

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Table 3. Spatial regression results for factors influencing agritourism adoption decisions in Tennessee (dependent variable: number of farms involved in agritourism activities per county).[1,2,3]

Variables	Model 1				Model 2			
			Marginal effects/ impacts (dy/dx)				Marginal effects/ impacts (dy/dx)	
	Coefficients	*t*-values	Direct	Total (direct + indirect)	Coefficients	*t*-values	Direct	Total (direct + indirect)
Est_312	-0.691***	-3.31	-0.691***	-0.721***	-0.315**	-2.22	-0.315**	-0.334**
Est_313	-0.571	-1.47	-0.571	-0.596	-0.044	-0.12	-0.044	-0.046
Est_321	0.175***	3.53	0.175***	0.183	0.222***	4.37	0.222	0.235
Rural county	7.108*	1.72	7.111*	7.423*				
Under5_percent	1.081*	1.69	1.08*	1.12*	0.780	1.09	0.780	0.827
Over65_percent	0.134	0.90	0.134	0.140	0.322**	2.00	0.322**	0.341
White_percent	1.450**	2.55	1.451**	1.515**	0.440	0.77	0.440	0.467
Black_percent	1.478***	2.60	1.479***	1.544***	0.496	0.87	0.496	0.526
Hispanic_percent	0.381**	2.29	0.381**	0.398**	0.092	0.47	0.092	0.098
Highschool_percent	0.216*	1.73	0.216*	0.226*	0.222	1.48	0.222	0.235
Median HH income (×1000)	0.200***	3.02	0.200***	0.209***	0.136**	2.39	0.136**	0.144
Relative rurality index					-4.038	-0.55	-4.038	-4.281
No. of households (×1000)	0.002	0.04	0.002	0.002				
No. of women owned firms (×100)	-0.0651*	-1.93	-0.065*	-0.068*				
No. of veteran owned firms (×100)	0.500*	1.82	0.500*	0.522*				
Rural X HH income	-0.107	-1.08	-0.107	-0.111				
East TN region	2.465*	1.80	2.465*	2.574*	0.461	0.33	0.461	0.488
Middle TN region	2.403*	1.89	2.403*	2.510*	0.636	0.49	0.636	0.674
Constant	-174.1***	-2.96			-73.87	-1.23		

Variables	Model 1		Model 2	
	Coeff.	*t*-values	Coeff.	*t*-values
Contiguity-weighted matrix W parameter	0.048	0.34	0.064	0.42
Inverse distance-weighted matrix M parameter [e. dependent var]	0.941***	18.54	-0.589	-0.54
Variance [e. dependent var]	7.371***	6.76	9.261***	6.76
Wald-test of spatial terms	Chi^2 stat=349.20*** Prob > Chi^2=0.0000		Chi^2 stat=0.340 Prob > Chi^2=0.840	
Wald Chi^2 stat, overall model fit	145.73		107.47	
Pseudo-R^2	0.56		0.51	
Moran test of spatial dependence (H_0: error is iid)	Chi^2 stat=19.72*** Prob > Chi^2=0.0001			

[1] Model 1 uses metro/rural classification of the county as dummy variable; Model 2 uses index of relative rurality pertaining to each county.

[2] Direct, indirect, and total marginal impact (dy/dx) of each independent variable estimated using Delta method; total effect includes direct and indirect spillover effects.

[3] Significant differences in: $P<0.1^*$, $P<0.05^{**}$, $P<0.01^{***}$.

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an index (see 3. Data) in its construction. To avoid potential collinearity between independent variables, we dropped additional variables related to population structure, size, density, etc. in model 2. While the coefficient estimates between model 1 and model 2 are comparable, higher Wald statistics for overall model significance and a higher Pseudo R-square presented at the bottom rows of the Table 3 indicates that model 1 fits better for our data. Therefore, we will focus our model interpretation towards the coefficients of model 1.

First, we conducted a Moran's test (Moran, 1950) to test for spatial dependence. Test results are presented at the bottom of Table 3. Note that the highly significant chi-square statistics (chi-square statistic 19.72 with Prob > Chi^2=0.0001) rejects the null hypothesis of independent and identically distributed error terms (IID) and suggests for the use of spatial regression. Additionally, our highly significant Wald test statistic of spatial terms, significant parameter of spatial weighted matrix and/or spatial error lag and variance (Table 3, bottom rows) indicates that results might have been biased had we have failed to control for spatial effects.

Focusing on the model coefficient results, Table 3 shows the coefficients of each variables and marginal impacts in terms of direct and total. Note that total impact includes direct impact and indirect impact coming from spillover effects from neighboring or other spatially related farms. Our results show that beverage and tobacco product manufacturing establishments (Est_312) and the number of wood product manufacturing establishments (Est_321) have statistically significant effects on the agritourism involvement in Tennessee. Marginal impacts of -0.691 indicates that a 1% increase in beverage and tobacco product manufacturing establishments in a county is expected to decrease agritourism farms in the same county by around 0.7%. One of the explanations for this negative relationship could be due to negative externality effects of these manufacturing plants and competitive effects, especially for labor. Deployment of a greater portion of labor force to beverage and tobacco product industry establishments in the county may result in lower manpower in that county to initiate agritourism related farm.

Wood product manufacturing establishments, on the other hand, have positive effects on agritourism farm establishment – the direct marginal effect suggests that a 1% increase in wood product manufacturing establishment is likely to increase the number of agritourism farms by 0.18%. A positive effect of forestry-related wood product establishment is plausible, at least through two effects. First, through income or wealth effects of the county from the forest product industry, classified as part of agricultural industry in NAICS, which has a big economic contribution in Tennessee (around $21.7 billion was estimated as the contribution from wood, timber, and saw-log industry). Second, through the complementary of activities in the forestry industry with agritourism, as both sectors share common activities such as outdoor sports, fishing, hunting, and recreation. In this regard, James (2002) described that fishing and hunting activities alone contributed $2.5 billion to State's economy in 2000.

Our coefficient of rural variable suggests that agritourism related farms are more likely concentrated in the rural or non-metro areas as the rural variable is significantly positive. The marginal effect of the rural dummy variable suggests that if county is a rural county, it is expected to have around 7% more agritourism related farms, as compared to metro counties. The reason behind this may stem from the choice of people who give more value to spending some time in rural and natural environment, enjoying the serenity of a calm landscape, escaping from the busy metro life for a while. This is consistent with Carpio *et al.* (2006) who found that people from the US that value rural natural scenery and landscape as 'important' made 1.6 more trips to rural areas over those considering 'not at all important', and those considering 'somewhat important' made 0.8 more trips than those considering 'not at all important'. This is also consistent with Joo *et al.* (2013), who found that the likelihood of farms participating in agritourism activities increases as they are farther from an urban center, using the nation-wide US data. Moreover, Amanor-Boadu (2013) found that farms offering hunting, part of agritourism activities, tend to be in rural areas.

Regarding the effect of county population structure, we found the significant effects of racial/ethnicity factors on agritourism. Particularly, the proportion of White and Black/African American on county population has considerable effects. A marginal total effect of around 1.5 on White and Black variables suggests that around

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an increase of 3 agritourism farms is associated with a 2% increase in the White or Black's population in the county. However, the effect of Hispanic composition is smaller, albeit positive – the total impact of around 0.4 on the Hispanic coefficient suggests that a 1% increase of the Hispanic population in the county is expected to increase agritourism farms in the county by around 0.4. Analyzing the effects of age groups, it is interesting to note that counties with a greater percentage of children under 5 years are likely to have more agritourism farms – the magnitude of the marginal impacts of this variable around 1 suggests that an additional agritourism farm is expected with every percentage increase in children under 5's population in the county. The county with a higher number of kids below 5 years likely has a higher demand of agritourism farms, perhaps with the higher recreational farm tours and educational needs of the kids. While family accompany the kids, this results in overall higher demand and scope of agritourism in those counties.

Our results provide interesting insights into the effects of educational and economic capital related factors and the interaction of capital and urban factors on agritourism. All these factors have significant effects. The percentage of the population having high school and above level of education is one of the indicators of educational capital. This variable has a significantly positive effect on agritourism – a magnitude of marginal total impact of 0.226 from this variable indicates that around one additional agritourism farm is expected in a county for every 5% increase in population of people with high school or above level of education. Higher education may lead to high valuation for natural and environmental friendly activities and higher participation in nature and recreation related activities (Ignatow, 2006; Lee *et al.*, 2001; White, 1975) that may support the presence of agritourism farms.

The economic-capital related factor 'median household income' also has a significantly positive effect on agritourism farm establishment. Our results show that every $5,000 increase in median household income in a county is associated with an additional number of agritourism farm. The plausible reason for the positive effect may be due to positive income effect of the agritourism consumers – higher average household income increases financial ability of the local tourists to spend money on farm recreational activities as well as enable farm owners to invest and embrace recreational aspects on the farm.

Finally, we found significant effects of women- and veteran- owned firms and regional differences. A higher number of women-owned firms in the county was likely to decrease the number of agritourism farms, albeit the effect is very small. A higher number of the veteran-owned firms, on the other hand, had a significantly positive effect on agritourism. The estimated marginal effect of around 0.5 suggests that the presence of around 200 veteran-owned firms in the county is likely to add one agritourism farm in the county. As agritourism captures recreational and hobby aspects of agriculture, it could be a well-suited enterprise for retired veterans or veteran's family. Additionally, positive coefficients of east and middle regional dummies (west region is base) suggest that higher number of agritourism farms is expected if a county is located in east and middle regions, consistent with our discussion on Figures 1 and 2.

6. Conclusions

Though agritourism has been described as a potential viable option as an alternative agricultural enterprise with a scope of enhancing farm income and profits, academic research on these agritourism farms and structural factors have been scant in the US. Our paper fills this gap by analyzing the structural factors influencing agritourism location and establishments in Tennessee, using an appropriate spatial regression model. Documenting findings from literature, we investigated the relationship of agritourism location and concentration in a county with a number of factors, mainly represented as: (1) rural or urban environment; (2) capital and income factors; and (3) the combined effect of rurality and capital factors, as well as population composition, density, and the concentration of agricultural sector related firms in the county. We mapped the spatial locations of agritourism farms in Tennessee, collected county characteristics and finally tested hypotheses about each of these structural factors affecting agritourism location decisions.

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We found that the presence of forestry and wood industry related firms, rural/metro status of the county, and educational, economic and cultural capital significantly affect the location of agritourism farms. This information might be useful to farmers/investors considering starting an agritourism enterprise and also to development planners who are considering agritourism as an option to promote regional economic development. For the counties lagging behind in agritourism as a farm diversification tool, they can focus on educational and capital related factors to enable farms. Rural areas can capture the recreational and natural aspects of agriculture complimented with hunting, fishing, wagon rides, and fun type activities to generate additional income. Moreover, rural county farms also get benefit by involving in agritourism activities such as hosting weddings, winery, bed and breakfast, pick-your-own on the farm. Counties should support agritourism farms not only for well-being of the farmers but to make kids and urban people of this generation aware of the contribution of agriculture and history – educational and recreational activities perhaps serve this purpose in the best way. Finally, our findings on significant spatial terms and tests suggests that the study would have led to biased estimates if we did not control for spatial effects. This highlighted the importance of spatial models and the need to account for spatial effects in the studies aiming to estimate location decisions and structural factors.

This study examined agritourism in Tennessee. Widening the scope to other States, documenting the impact of agritourism industry as a whole, as well as more in-depth farm-level micro studies of agritourism could be the potential research for future studies.

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