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Spring 2006

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Nelson, Rex; Johnson, Bruce; and Darling, David, "Underlying Causes and Implications of Nebraska Retail Trade Patterns" (2006). *Great Plains Research: A Journal of Natural and Social Sciences*. 802.
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UNDERLYING CAUSES AND IMPLICATIONS OF NEBRASKA RETAIL TRADE PATTERNS

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ABSTRACT—Declining retail trade in rural America is a concern for rural residents, their leaders, and rural development professionals. This cross-sectional study presents a framework for understanding relationships between changes in retail trade and rural population declines. The study uses county trade pull factors as a benchmark for retail trade in Nebraska and develops a theoretical and a statistical model to explain changes in this measure. The model suggests that retail trade in a given county is a function of the customer base, the buying power of those customers, and the quality of the retail environment.

Key Words: retail trade pull factors, rural economic development, rural retail development,

INTRODUCTION

Population declines are well documented in rural America, and by some indications the trend is accelerating. It is conventional wisdom to lay the blame for rural population decline at the feet of agriculture. To be sure, changing technology has steadily reduced the labor need in the farm fields of America. There is more at play, though, than just consolidation in agriculture. Reflecting changes in the overall culture in America, rural families are having fewer children and demographically there are fewer families of childbearing age living in our rural communities than before. The 2004 population estimates published by the U.S. Census Bureau indicate that 70 of

Nebraska's 93 counties (75%) lost population from 2000 through 2004, even while the state as a whole experienced a 2.1% gain. Thirty-four of those counties lost in excess of 1% per year. The annual rate of population decline for the majority of losing counties had accelerated from the previous decade (U.S. Census Bureau 2005).

Declines in retail trade are a result of, and to a lesser degree also a cause of, population decline. The nature and practice of retailing have changed considerably; changes in transportation, changes in consumer attitudes and expectations, the dramatic rise of the big box retailers and franchise restaurants, and the increasingly global nature

of the marketplace are all examples of changes that have come to bear on small-town retailers. This discussion focuses on changes in the retail environment and seeks to measure the primary underlying factors that drive increases or decreases in trade in a given community.

Relevance of Retail Trade to Rural Development

Retail trade is an essential element in economic development, not only because of recent shifts toward a service and knowledge-based economy, but also because of the quality-of-life benefits associated with an improved retail environment (Gibson et al. 2003). The challenge of capturing retail trade in rural areas is formidable, however.

Leistritz et al. (1992) found that rural counties in Iowa, Kansas, Missouri, and Nebraska experienced retail leakages of 15% in the 1970s and, in many of the counties, more than 20% during the early 1990s. The researchers found significant drops in the number of retail outlets such as grocery stores, which translates into a sizable loss in both jobs and convenience for many rural residents (Leistritz et al. 1992).

The quality of retail shopping and dining experience is increasingly important to retaining and recruiting a quality workforce as well as the companies that employ them. When the loss of retail trade leads to shrinking retail districts that have less-enticing offerings for customers, then the challenge of rural economic development becomes that much more difficult. If a community must diversify economically from its reliance almost entirely on agriculture or another basic sector, then it is best done before the local retail district is irreversibly diminished.

Central Place Theory and Retail Trade Analysis

Various models have been used to explain the size and geographical configuration of retail trade areas. Reilly's Law of Gravitation (Reilly 1931) is a model that estimates the maximum distance that customers travel to shop in a given community. In essence, this gravitation model suggests that the relative size of a trade center will directly influence the distance from which customers can be drawn.

Christaller's work in central place theory defined the retail range of a community as the maximum distance consumers would travel to purchase a particular commodity and the threshold as the minimum level of demand needed for the vendor of the product to be economically viable (Craig et al. 1984). This creates a hierarchy of trade centers with all but the largest (the central place) being part of a larger center's trade area.

Indeed, history has confirmed that large trade centers do in fact draw customers from larger areas. It is not, of course, the population of a community but rather the retail district the population sustains that is attractive. The complexity of that attraction may be greater than these previous models suggest, however. It is not one commodity but the breadth of products and service offerings that often make the shopper seek the larger stores or groups of stores. For example, the retailing range of a community may be strongly influenced by the types of restaurants found near the discount stores or by the entertainment and cultural activities in the area. Nonretail services such as specialized medical or educational services may also contribute to the customer drawing power of a retail center. Improved transportation has no doubt increased the distance that some customers will travel for these needs.

Darling found that minimum population thresholds existed for viable retail trade centers in nonmetropolitan Kansas. At populations of 5,000 and more, these complete retail centers generally had mean and median retail pull factors of 1.0 or greater. (A retail pull factor of 1.0 implies the community is capturing the trade of a consumer base equivalent to their population, while a pull factor of greater than 1.0 suggests they are capturing more than their population would suggest.) According to Darling and Tubene (1996, 99), "cities of over 5,000 are large enough to be considered minor trade centers that support a critical mass of businesses." While Darling's statistical analysis showed that population is a good predictor of gross taxable sales, scattergram analysis indicated that there still exists an exceptional class of cities under the 5,000 population threshold that exhibited better than expected retail performance, above 1.0.

Population and Demographics

Population is obviously needed to form the customer base for businesses, so these numbers would be an indicator of retail trade potential. A resident population drives the formation of a retail shopping district, and so it may be an indicator of the potential to draw trade from afar. But population is not just an indicator; it can also be viewed as a driver of economic change. Adamchak et al. (1998, 49) found that with declining populations to serve, retail and wholesale employment declines were the result.

Retail and service demand thresholds are published in several states, and these thresholds use population to predict the potential demand for new businesses. In effect, they represent the "critical mass" of population needed for many businesses to be economically viable. While these

measures have limitations, they point out the importance of a population base for retail trade and the vast differences in requirements between different types of firms (Deller and Ryan 1996; Stone and Artz 2001).

The makeup of the population can have an effect as well. The rural population is aging faster than the general population: in 2001 the share of the U.S. nonmetro population over 65 years of age was nearly 20% versus 15% in the population overall (USDA-ERS 2004). Older persons may have different shopping patterns than the general public, as indicated by surveys of rural residents. Allan Corr's work on consumer shopping patterns in communities across Nebraska found that retirees were strongly motivated by convenience and ease of access to retail services (Corr 2002). This older group responded that they frequently use local businesses (70%) while they were the least likely to use the large retail discounters (26%).

Some demographic factors may be less influential than intuition would suggest. Income level, for example, is typically believed to directly influence retailing. However, in the Nebraska data set for this study, of the top 15 counties by income, only three had retail trade pull factors of 1 or more.

Income

Income is not any more stationary than are the number of residents in an area. As people travel for work, shopping, or recreation, their money travels with them. Workers that commute across political boundaries can distort economic measures. The U.S. Bureau of Economic Analysis calculates and publishes a number called "county adjustment for residence," which attempts to measure the flow of income across county borders. Ariyarante and Darling (1995) took this measure one step further by developing the county income interdependence value. This index provides a measure of the interdependence of residents in one county on income from out-of-county sources and vice versa.

Other Factors Influencing the Retail Environment

Not all municipalities of similar size have similar retail performance. The combination of amenities, accessibility, attractiveness, diversity, and market appeal of the stores, proximity to other retail centers, and many more factors can be influential. Both Seitz and Darling (2002), and Seitz et al. (2003) found that the per capita value of commercial property, both real and personal, was a highly significant indicator of county trade pull factors (Seitz and

Darling 2002: 9), (Seitz et al. 2003). The number of retail outlets in a county and a segmented age-demographic variable were used by Yanagida et al. (1991) to help explain retail pull in Nebraska. Seitz and Darling (2002, 10) and Seitz et al. (2003) found that location on an interstate highway significantly effected retail pull.

The Theoretical Model

This study is designed to measure the primary factors affecting retail trade while acknowledging that in reality a myriad of lesser factors are involved as well. At the core, retail trade can be viewed as follows. In order for retail trade to take place, three things must be present: people, money, and a place to trade. This forms the basis for the study and frames the simple causal model. As stated in Seitz and Darling (2002):

$$CTPF = f(CB, BP, RE), \quad (1)$$

where the dependent variable of retail strength is approximated by county trade pull factors (CTPF). The independent variables are customer base served (CB), buying power of the customer base (BP), and retail environment (RE) (Seitz and Darling 2002: 7). However, in our model and subsequent analysis, the selection and combination of independent variables differ somewhat from those used by Seitz and Darling; they are shown in Equation 2 and the variables and expected signs are presented in Table 1.

$$CTPF = f(MJRHWHY, DIST, INCOME, CHIV, VALUE, POPROOT) \quad (2)$$

County Trade Pull Factor (CTPF) is the per capita taxable retail sales for a county divided by the state per capita retail sales. It is a measure of relative retail-trade capture or retail pull. Values greater than 1 indicate relatively strong retail-trade performance, with per capita trade greater than the state per capita value. It generally indicates that trade is pulled in from outside the county but may indicate higher than average internal retail performance as well. We assume that taxable retail sales for sales tax purposes in Nebraska serve as a proxy for all retail goods and services when calculating CTPF.

Customer Base is represented by two independent variables, **MJRHWHY** and **DIST**. The first, **MJRHWHY**, is the presence or absence of an interstate highway in a county. An interstate location is expected to increase retail pull as access in terms of time and convenience expands, resulting in a larger potential customer base.

TABLE 1
VARIABLE NAMES, EXPECTED SIGNS, AND
DESCRIPTIONS USED IN MODEL OF COUNTY
TRADE PULL FACTORS

Variable name	Expected sign	Description
MJRHWHY	+	Major four-lane interstate highway in Nebraska is or is not located in given county
DIST	+	Distance to nearest effective trade center
INCOME	+	Per capita household income of residents in the county in 2000
CIIV	+	Size and direction of flow of commuter income
VALUE	+	Per capita commercial property value
POPROOT	+	Square root of the population of the dominant city within each county

Second, DIST is defined as the distance to a major trade center of 10,000 population or more for towns of 2,500 or larger. For towns under 2,500, DIST is represented by the distance to the nearest intermediate or larger trade centers (intermediate being a city of 2,500 to 9,999 in population). DIST is a measure of the trade effects of an increasing trade area. We propose that when very small towns lose trade, it is first moving to intermediate trade centers and then to larger centers. This reflects the hierarchical pattern of trade centers suggested by Christaller's central place theory discussed earlier. We further postulate that major trade centers are primarily impacted by other trade centers of similar size or larger. The distance variable is not to be confused with the simple distance to the nearest town, because increasing distance from other county trade centers is expected to have a limited effect on trade if those counties lack a viable retail district.

Buying Power is represented by the two independent variables **INCOME** and **CIIV**. The variable **INCOME** is per capita income for the county, which is one measure of the buying power of the customer base. The variable **CIIV**, or county income interdependence value, is a measure of commuter income that travels with workers as they travel between job centers and residential communities. It is expected that workers spend a significant portion of their wages in the job-center community rather than in their residential community (Seitz and Darling 2002).

Finally, the **Retail Environment** is measured with two variables, the assessed commercial property values in each county and the population base that supports the

retail sector needed to draw outside customers in. In the case of commercial property, the higher this value, the greater the attractiveness of the county retail environment is assumed to be. This is represented by the independent variable **VALUE** and is an aggregate proxy for the attractive array of retail outlets, restaurants, services, and customer amenities that make up a strong retail district. **POPROOT**, the second of these variables, is the square root of population. It measures the population of the dominant city in the county that forms the "critical mass" available to support higher-order goods and services, as suggested by central place theory. The square root is applied to reduce the range of values and increase statistical significance. The population of a community does not in itself constitute the customer base described initially in the model, because changes in the resident population would by definition have no effect on per capita retail trade.

Expected Signs

The expected signs of the independent variables are as follows: MJRHWHY is expected to be positive, as a town's location on an interstate can be expected to enhance convenience and access and thereby increase customer traffic and retail trade. A town's greater distance from a major trade center should result in a positive value for DIST, as greater distance leads to increased shopping at a location nearer to home rather than far away. In other words, geographic isolation can reduce retail competition and strengthen the key trade community of the region. The expected sign for INCOME is obviously positive, as higher levels of income would be expected to lead to greater retail spending in a county. CIIV is expected to be positive because the income generated by those workers commuting to jobs within a county tends to be spent in that county as well. The variable VALUE is expected to be positive. This variable reflects both the number and quality of retail outlets in the county trade center. If that value is large it should have a positive impact on consumer preference for shopping there, and hence, a positive impact on CTPF. Lastly, POPROOT is expected to be positive, as counties with bigger central cities will have a greater array of retail goods and services to draw customers.

DATA AND METHODS

E-Views Statistical Analysis Software was used to perform regression analysis on annual retail data compiled from Nebraska cities and counties. This analysis

of retail pull factors was applied to all 93 Nebraska counties for the year 2002. The three major metropolitan counties, Douglas, Sarpy, and Lancaster, were included in the analysis. Although the Omaha metro area extends across the county line from Douglas into Sarpy County, they are treated as separate and with different principal cities.

In this study, county pull factors are used and referred to as county trade pull factors, or CTPF. Data for county trade pull factors and county dominant-city population were obtained from the University of Nebraska Department of Agricultural Economics "Nebraska Retail Pull Factors for Counties-2002." (Johnson 2003) Pull factor is simply the per capita retail sales of a county divided by per capita state retail sales. Retail sales data are collected from sales tax reporting in Nebraska. CTPF values of less than 1 indicate that trade was being lost to stronger trade centers. Values greater than 1 may indicate trade coming into a community from surrounding areas or greater than average income and spending in the resident population. As in many states, Nebraska data does not include sales of most food items. This may tend to understate small-town trade where staple items and more convenience-oriented items such as food tend to be a higher share of the trade dollar.

Population is represented in the model as POPROOT and is tested as the square root of population of the dominant city in each county. The square root was used in order to reduce the range of values and improve statistical significance of the variable. The dominant city is defined as the city with the largest population in the county.

CIIV, or county income interdependence value, is an index used to quantify the size and direction of flow of commuter income between counties. Data for CIIV was obtained from the U.S. Department of Commerce Bureau of Economics Analysis (BEA) report for 2001 (USDC-BEA 2002). The index is computed by dividing the absolute value of the BEA's "Adjustment for Residence" by the total of wage and salary income, other income, and nonfarm proprietor's income. The sign is then inverted to show a positive index for job centers and negative for residential communities.

In order to assess how easily retail customers can access the businesses in a given county, a major-highway dummy variable was developed from highway maps. Those counties whose dominant city is located on the four-lane Interstate 80, a part of the U.S. Interstate Highway System, were assigned a 1, and those without direct access to Interstate 80 were assigned a 0. Other four-lane expressways were not considered as interstates.

The propensity for shoppers to travel to a given shopping district is in part a function of the distance of travel required. The relevant distance that drives shopping behavior is not simply that distance to the nearest shopping area but also the distance to alternative shopping areas. In this study, DIST is the distance in miles for those towns of 2,500 or more to a trade center of 10,000 or more population, and for towns under 2,500 population, the distance to an intermediate or large trade center. Towns under 2,500 have not demonstrated adequate retail performance in recent years to be considered trade centers in Nebraska.

Per capita income for tax year 2000 is that reported by the U.S. Bureau of Economic Analysis and was obtained from the Nebraska Department of Economic Development. The income used in the model is the median per capita income for each county.

In an effort to assess the size and quality of the retail environment, commercial property values are used. The value of real commercial property was developed from data obtained from the Nebraska Department of Taxation and Assessment. The 2002 Certificate of Taxes Levied commercial and industrial property value is divided by the county population previously defined to arrive at a per capita value, while agricultural, recreational, and residential properties are not included; Nebraska data collection has no provision for separating manufacturing from other kinds of commercial property. However, it was still believed to be a reasonable benchmark for the commercial property investment within the respective counties.

RESULTS AND CONCLUSIONS

Descriptive Statistics

With pull factor, or CTPF, as the dependent variable in the study, descriptive statistics for CTPF are depicted in Figure 1. County per capita retail sales equal to the state aggregated value would result in a CTPF of 1.00. The mean pull factor of Nebraska counties is 0.556, meaning that an average Nebraska county only nets slightly above half of state per capita retail sales. The skewness of pull factor is high at 0.89, as shown in Figure 1, indicating a predominance of values below the mean. In other words, there are far more counties in Nebraska with pull factors less than this county average and even more with values less than one. CTPF data show a predominance of values in the 0.3 to 0.7 range, indicating that it is all too common for Nebraska counties to account for 30% to 70% of the state per capita retail trade. However, relatively few counties fall below the 30% level.

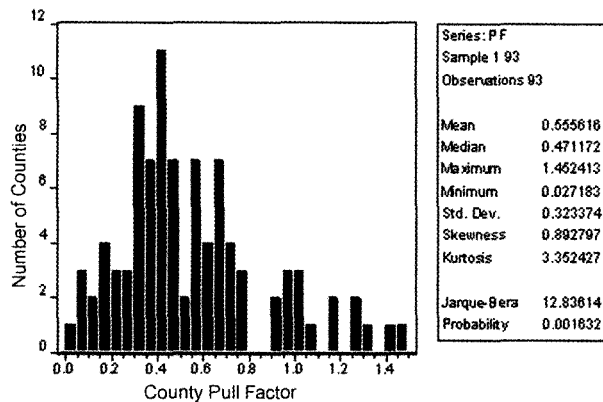


Figure 1. Pull-factor histogram of Nebraska counties, 2002.

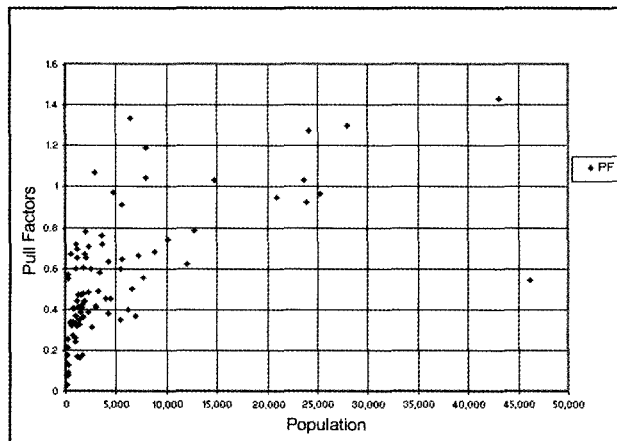


Figure 2. Scattergram of Nebraska county trade pull factors, 2002.

5.2 Scattergram Analysis

Figure 2 presents a scattergram of Nebraska CTPF values against the population of the dominant city in the county. One particularly revealing feature is how closely the observations are clustered under 0.5 CTPF and below for counties whose largest town has a population of 2,500 or less. The majority of Nebraska counties experience this low performance condition. In only one case did a county with a dominant city of less than 5,000 generate a CTPF over 1.0. However, it should be noted that city size over 5,000 was no ticket to high performance either, as the majority of counties with central cities between 5,000 and 15,000 still recorded CTPF values below 1.0.

For clarity in scaling, Nebraska's two cities of over 100,000 population are left out of the data in Figure 2. Those two cities, Omaha and Lincoln, generated CTPFs of 1.45 and 1.19, respectively, in Douglas and Lancaster counties.

TABLE 2
PULL-FACTOR REGRESSION RESULTS

Dependent variable: County trade pull factor				
Variable	Coefficient	Standard error	t-Statistic	Probability
MJRHWY	0.196584	0.061278	3.208058	0.0019
DIST	0.003109	0.000653	4.762339	0.0000
INCOME	8.69E-06	2.53E-06	3.432729	0.0009
CIIV	0.173836	0.065067	2.671637	0.0090
VALUE	3.32E-05	8.31E-06	3.994854	0.0001
POPROOT	0.000910	0.000293	3.100790	0.0026
R-squared	0.733197	Mean dependent variable		0.555616
Adjusted R-squared	0.717863	Log likelihood		34.97127
Standard Error of regression	0.171765	Standard Deviation of dependent variable		0.323374
Sum squared residual	2.566780	Durbin-Watson statistic		2.072378

Method: Least squares

Sample: 294

Included observations: 93

Regression Results

The results in Table 2 demonstrate a good fit between the variables in the model. The adjusted R-squared is 71.7%, with all independent variables being significant at the 1% level.

The presence of heteroskedasticity may cause the significance of variables to be overestimated, particularly in cross-sectional studies such as this. To test for this, the White heteroskedasticity correction was applied, and no troublesome levels of heteroskedasticity were found to exist.

Based on these results, a town's location on an interstate highway can be expected to have a strong positive influence on CTPF. However, that may not in itself be enough of an influence to guarantee retail success. This is illustrated quite well in Figure 3, which shows that of the 11 counties with 2002 CTPF levels of 1.0 or greater, seven of those counties were on the Interstate 80 corridor. However, these seven counties represented less than half the counties crossed by the interstate system.

Increased distance from competing trade centers was a positive influence on the CTPF values, a pattern deemed logical and consistent with our expectations.

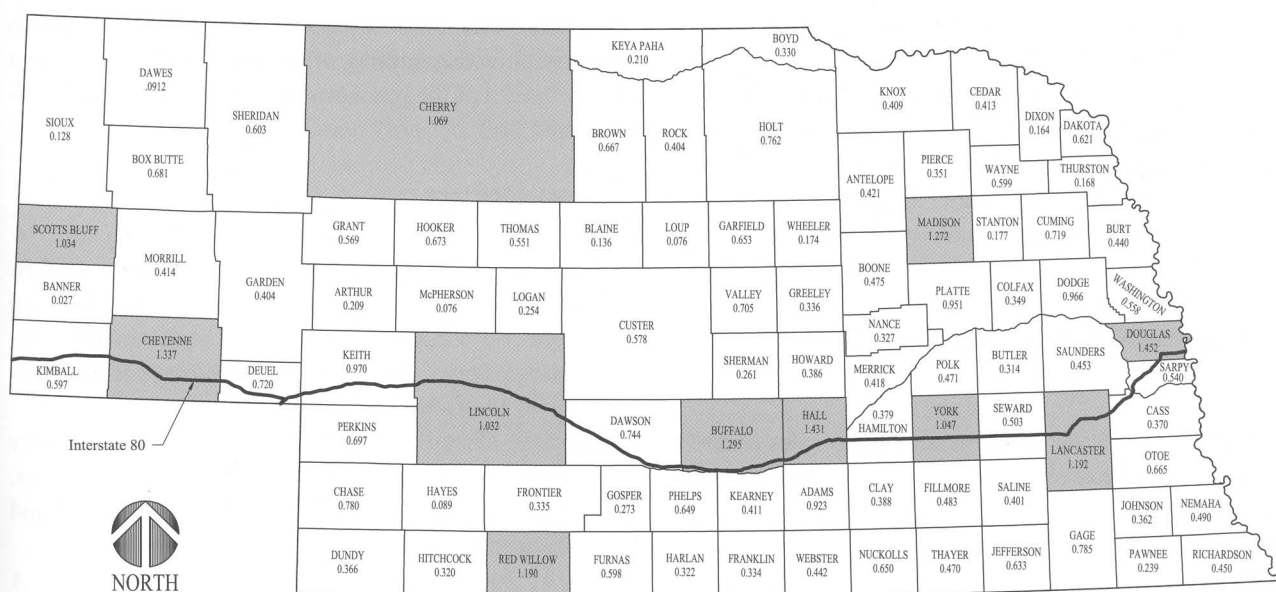


Figure 3. Retail pull factors for Nebraska counties, 2002. Shaded counties have pull factors over 1.0.

INCOME was significant and positive in the model. However, the coefficient was relatively small, suggesting that income alone is not enough to assure strong retail trade, and conversely, that lower-income communities may still have strong retail performance if they possess strengths in other areas. Commuter income, as represented by CIIV, was also significant and additive to CTPF for job-center communities.

The quality of the retail environment was represented in the model by the variables VALUE and POPROOT. Both were highly significant and confirm that the per capita dollar value of commercial property and the population of a county trade center give some measure of a retail district's ability to draw customers. This indicates that larger, more complete shopping districts are more effective at pulling trade in from surrounding areas and suggests that new retail investments such as a Wal-Mart can draw increased trade into a community. The results further indicate that population is a key to establishing that retail base.

The VALUE variable is intended to give a window into the important dynamic whereby communities can change their fortunes by encouraging or preventing investment in new shopping alternatives. The increasingly politicized question of whether to welcome a new Wal-Mart into a community hinges on how such an investment impacts the larger retail community.

CONCLUSIONS

Retail-trade pull factors have been in use for years as a way to measure the relative strength of retail activities in counties and towns across the country. What is often lacking is an empirical understanding of the major forces that cause the differences observed in pull factors across places. This model demonstrates strong explanatory power. The analysis suggests that retail trade is a function of the size of customer base, their buying power, and the quality of the retail environment. Furthermore, the customer base can be seen as a composite of the following: interstate highway access, which facilitates customer access to trade centers and attracts greater numbers of shoppers, and distance to major trade centers for communities over 2,500 population, or distance to either intermediate or major trade centers for those under 2,500. Increasing distance to large cities will tend to increase trade in remote intermediate trade centers. Income, representing buying power in the model, was significant and indicates that it is a component of a strong retail base. Property values served as a strong proxy for the quality of the retail environment. Population was also a component of the retail environment, because larger cities will tend to possess larger, more attractive retail districts. These results suggest that large, attractive retail centers will lead to increased trade from surrounding areas and that new

retail-store developments are a viable way to positively impact the level of trade in a county. The fact that these results were achieved without inclusion of a number of lesser variables suggests that the larger "critical mass" issues may overshadow many other factors influencing retail trade. Taken together, these variables give us an improved understanding of the factors underlying geographic retail patterns.

Implications and Suggestions for Further Research

Our retail analysis using taxable retail sales is not a complete measure of retail activity because a host of goods and services are exempt from sales taxes. These include some health-care items, grocery products, and farm implements, which ideally would have been incorporated into this analysis for greater reliability of our findings. In the interest of focusing on the primary factors, other demographic and socioeconomic factors have been excluded from the model such as age, education level, and poverty level.

An improved measure of retail activity may yield new insights. Studies of communities that have made targeted investments for improving factors measured in this model, such as retailing infrastructure or transportation, may identify opportunities for other communities. As an example, non-interstate four-lane expressway highways were not considered in this model but represent a policy-driven investment that is being made in some locations throughout the Plains states. Longitudinal analysis of the impact that these investments may have on retail activity and on population growth could yield helpful information for policymakers.

Finally, large discount retailers are a growing force that is reshaping retailing in our nation. The impact of these chains appears to be particularly profound on rural communities. While several dynamics of this trend are imbedded in this model, continued research is in order to fully understand the effects of big-box retailers, not only on the ever-changing retail sector but also on the health of both rural and urban cities and economies.

Retailing, which was once a core function of rural communities, now is often being lost to larger cities. More than just an inconvenience and a lamentable sign of change, this loss of retail activity in many cases represents, at least in part, the loss of whole and healthy community life and diminished access to basic services for residents. If left unchecked, it can mean the loss of any opportunity a community has for recovery or reinventing itself for a new age and a new economy. Economic development and community viability in the future may depend heavily on

the retail sector. These realities call concerned citizens to a thorough understanding of, and proactive involvement in, the health of the retail business districts in rural communities.

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- Manuscript received for review, September 2005; accepted for publication, February 2006.
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