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Abstract: Pull factors provide a measure of retail trade capture. Pull factors for total and twelve subcategories of retail sales for all West Virginia Counties are analyzed based on 1997 Census of Retail Trade data. A method for estimating missing data points and the use of Rand-McNally trade regions both facilitate estimation of the pull factors. Results indicate that hypothesizes concerning pull factors for central places in West Virginia generally hold. However, other elements influence pull factor estimates. The most important of these is the impact of state sales tax policy, which reduces pull factors for border cities through lessened retail activity in food and drinking establishment and gas stations. Study results imply that state government may wish to rethink its sale tax policy.

Introduction

Many factors influence the ability of local businesses to survive and thrive. The importance of each factor varies between different types of businesses. For retail businesses, a key factor is the ability of the local community to provide a sufficient market for their products. The ability of local demand to support their operation is determined by local population, local income, and the taste and preferences of local consumers. Also important is the degree of competition from other local retailers and retailers in neighboring communities.

The viability of the local retail sector is also important to communities. A viable retail sector makes a community a more attractive place to live. Residents benefit from a broader array of goods and a more competitive retail environment. A viable retail sector also enhances the ability to retain dollars generated in the local economy and attractive customers from elsewhere. Further, all else equal, outside businesses are more likely to make investments in a local economy with growing and diverse shopping opportunities.

Small cities and rural communities in particular have recognized the importance of local retail trade activity. Organizations such as Main Street have led local efforts to enhance the competitiveness of and educate local citizens about the import of the sector in general (Barta and Woods, 2001). Retail development is also often correlated with small business and entrepreneurial development. Development in these areas is currently seen as key elements of local economic growth (Daniels, Keller, and Lapping, 1988) as opposed to traditional smokestack chasing (Deller and Harris, 1993).

Pull factors have been widely used as a way to evaluate local market capture for retail and service activity. Such tools are helpful in identifying business opportunities, the impact of sales tax on retail activity, and the health of the local economy. By comparing local retail to regional retail sales, pull factors indicate how successful the local retail sector is in retaining local dollars and in attracting consumer spending from other communities.

Pull factors for total retail sales and twelve subcategories of retail sales are analyzed here for all 55 West Virginia Counties. Our review of the literature indicates that pull factors have not been calculated for West Virginia or in any detailed fashion for other states belonging to the Appalachian region.

Initially provided is a review of the literature including a summary of the reasons why pull factors are important. The method for estimating the pull factors is discussed. Some possible explanations for the pull factor estimates are then provided. Lastly, policy implications are discussed and areas of future research are highlighted.

Conceptual Base and Literature Review

Central Place theory (Christaller 1966) uses a market hierarchy in explaining why certain types of goods are found in some locations but not in others. The hierarchy is based on the idea that different population (consumer) levels are required to support the provision of different types of goods and services (that is, different commodities have different levels of threshold demand). Central Place theory suggests that as we move from places with smaller populations to areas with greater populations (that is from hamlets, to town, to cities) we will see an increase in the variety of goods and services that are provided.

Inherent in the theory is the concept that central places will provide goods and services to outlying areas (Shaffer et al., 2003). For example, a small community may lack the population and income base to support a shoe store. Consumers residing in that community (and other nearby communities) will travel to the nearest larger community (the central place) to purchase shoes. On the other hand, the community in question has a sufficient number of consumers to support a local gasoline station. So, we would not expect local consumers to travel to the central place for fuel purchases. Central place theory is also consistent with neoclassical economic theory because the fixed cost of providing retail services is spread across a larger customer base as population grows.

Several researchers have used pull factors and similar tools in analyzing local retail activity. Deller and Harris (1993) used a stochastic frontier estimator to analyze the number of retail establishments as a function of population, population density, per capita income, poverty rates, unemployment levels, and adjacency to metropolitan areas for US non-metropolitan counties. Their results implied that retailers in rural areas often accept lower rates of return on their investments as reflected in the overretailing phenomenon (rural areas having a higher concentration of retail activity than would be otherwise expected). Gale (1996) evaluated the factors that can influence pull factors in U.S. rural counties for 1982, 1987, and 1992. He found that higher population density, larger county size, and access to an interstate highway were associated with larger pull factors.

Several researchers have evaluated the interactions between retail business activity in a given location and between businesses in neighboring areas. Shonkwiler and Harris (1996) used a poisson distribution to evaluate the interaction between the number of different types of retail businesses at the local level for US rural counties. Their results indicated that the number of businesses in certain categories were sensitive to the presence of other types of retail activity. Harris and Shonkwiler (1997) also found similar results in their analysis of pull factors for U.S. rural counties. In particular, they found a strong and positive correlation between the pull factors for furniture and home furnishings, building materials and garden supplies stores, and general merchandize stores. Mushinski and Weiler (2002) used a two simultaneous equation Tobit model to evaluate the interaction between retail activity in a place and its neighbors. They indicated that the number of establishments in a given retail category in neighboring areas tended to reduce the number of establishments in a given place in that same category while population in neighboring areas often had little impact.

Researcher efforts have also included the use of pull factors in evaluating tax policies and the influence of Wal-Mart on local retail sales. Stone and Artz (2002) used pull factor analysis to evaluate the impact of a local sales tax option in Iowa. They (1999) also estimated pull factors for towns of various sizes in Iowa from 1976 through 1998. Research results indicated that the share of the state retail market for large cities increased substantially while the market share for towns with less than 5,000 in population suffered a marked decline.

Stone (1991, 1993) also analyzed the impact of Wal-Mart on local retail sales using pull factor analysis. Towns with a Wal-Mart usually experienced an increase in per capita retail sales while neighboring communities without Wal-Marts usually saw a drop in retail sales. For merchants in the towns with Wal-Marts, retailers in direct competition experienced a decline in sales, while merchants with product lines that differed from Wal-Mart usually had a growth in sales. Broomhall and King (1995) estimated total retail sales pull factors for 92 Indiana counties using 1987 and 1992 data. Their study indicated that most counties with pull factors greater than one were serving as central places for outlying areas. A few isolated rural counties also had pull factors that exceeded one, indicating their development as regional trade centers. This study also confirmed the observation of Stone those communities with Wal-Mart's usually experienced growth in retail sales at the expense of smaller, nearby communities.

Research Method

Our research method emphasizes the difference between our approach and that normally used in calculating pull factors. Retail sales are the key variable in pull factor estimations. We also emphasize our approach for dealing with missing estimates for retail sales, a problem faced by many researchers that has not been thoroughly discussed.

Estimating Missing Retail Sales

Some have indicated that data needed to calculate pull factors is readily available (Lloyd, 1995). In fact, this is often not the case for data at any detailed level especially in rural areas. States with local option sales tax have sale tax (and hence retail sales) estimates that are readily available. For states with no local tax option, sales tax data is collected at the company or firm level if at all. Hence, any business located in more than one community or county will report at a single address rather than separately at multiply locations. As a result, reported tax receipts do not usually reflect the level of retail sales for a given community or county.

For regions with no local sales tax levies, researchers have turned to the Census of Retail Trade survey, conducted by the US Census Bureau every five years, as a data source. The Census of Retail Trade provides estimates of number of establishments, retail sales, and annual payroll at the county level for total retail sales and for each of the twelve North American Industry Classification System (NAICS) retail trade subsectors. The latest available Census of Retail Trade was conducted in 1997. Unfortunately, however, estimates of sales and annual payroll are not reported for many subsectors at the county level due to establishment-level disclosure rules.

While a number of researchers (Gale; Harris and Shonkwiler among others) have used the Census in estimating pull factors at the county level, there has been little discussion concerning how missing data was estimated. Outlined here is a procedure for estimating missing data that is consistent with all published information and yields reasonable accurate estimates in our view.

The first step in the missing data procedure was to estimate the total level of missing sales estimates by both county and sales subcategories. These formed two control totals for our estimates of missing values. That is, when summed, our estimates of missing values would have to be simultaneously consistent with a total known value for all missing subsectors in each county and a total known value for all missing county values within each industry subsector.

For all counties with missing values in a given NAICS retail sales category, we established initial sales estimates based on unsuppressed payroll data for 1997 obtained from the West Virginia Department of Employment Security at the four-digit industry level in the Standard Industrial Classification (SIC) System. For example, if two counties had missing sales estimates in motor vehicles and parts dealers (NAICS 441) totaling $1 million, then the relative level of payroll in the matching SIC industry category was used to allocate sales between the two counties. Because the NAICS is a new system, a bridge from the SIC to NAICS provided on the

Census Bureau website was used to allocate the state SIC Code based data to a NAICS retail industry. In cases where a SIC industry was split into more than one NAICS industry, firm level information taken from the Reference USA Business Database (2001) (at the six digit level SIC Code) was used to allocate businesses in the counties of industry to the appropriate NAICS industry. This process was done for all twelve subcategories with missing data at the county level in West Virginia.

A matrix adjustment procedure (termed a RAS) was then used to insure that estimates in each sales category were consistent with both the county level and subsector level missing estimates control totals. The RAS was a procedure originally developed to update input-output tables (Isard et al., 1998). The result was a set of retail trade estimates for all missing values deleted from the Census of Retail Trade. The data was deemed sufficiently accurate for purposes of this study because the original estimates for missing retail sales were based on sound economic (payroll) data and because the final estimates were consistent with published totals.

Pull Factor Estimation

The classic pull factor can be calculated based on the latest available estimates of retail sales (1997 Census of Retail Trade used here) and resident population estimates (1999 used here) or,

(County Retail Sales / County Population) / (Region Retail Sales / Region Population).

The classic pull factor is based on the assumption that population drives retail sales. An improvement over the classic pull factor accounts for differences in income levels. Without the income adjustment, the pull factor could have a downward bias if income levels were lower than the regional average. This occurs because the purchasing power of the community in question is assumed to be equivalent to the regional average. On the other hand, the pull factor could have an upward bias if income levels were higher than the regional average. Our approach also has its limitations; if local retail spending is income inelastic, our approach will overestimate the influence of higher incomes on local retail spending. By using the income based approach, we are assuming that the income elasticity for local retail spending is either greater or equal to 1% or at least closer to 1% than to 0% (a reasonable assumption for most products). Others, such as Broomhall and King, have all used this approach in their estimation and analysis of pull factors.

The pull factor estimates the current drawing power of a community's retail sector. The formula for calculating the pull factor used here is as follows:

(County Retail Sales / County Total Income) / (Region Retail Sales / Region Total Income).

The size of the pull factor indicates that relative to the regional average, the county in question is attracting business or losing it to other counties. A pull factor less than one indicates that the county is losing retail business. A pull factor greater than one means the county is gaining retail business from others. At a value of one, retail purchases by local residents occurring outside the county are balanced by local purchased by nonresidents.

Regions of Analysis

With the exception of Gale's analysis (1996), all pull factor analysis has been done by comparing retail sales capture at the local level to retail sales capture at the state level. That is, the state was the region in all studies that we reviewed except Gale's. However, states are usually not retail sales trade regions. For example, it makes little sense to evaluate the ability of the retail sector in Mercer County (on the southern border with Virginia) to capture retail activity based on a comparison to activity that includes West Virginia's northern and eastern panhandles and other distant counties.

Estimating pull factors based on regional central places also providers a way to evaluate the relationship between a given central place and its hinterland. In some cases, it may even indicate that a place presumed to be a central place is in fact not one. For a small state such as West Virginia, it also helps shed light on interactions with areas in other states. Hence, we adopt the approach used by Gale, by employing the Rand-McNally retail trade region as the basic unit of analysis. However, unlike Gale, we also look at retail sales in a detailed fashion, that is, in total and across all twelve retail sales categories in the North American Industry Classification System.

Our presumption is that the consumers in the region will travel to the central place to consume goods and services. The Rand-McNally trade regions are designated based on “physiography, population distribution, newspaper circulation, economic activity, highways, railroads, suburban transportation systems, and field reports of experienced sales analysts” (p. 25, Rand-McNally, 2002). We made minor adjustments to some regions based on our knowledge of the West Virginia economy.

An examination of the Rand-McNally regions implies a strong interaction between many West Virginia counties and neighboring states in terms of retail activity (Figure 1). Five (Bluefield, Huntington, Parkersburg, Wheeling, and Wierton) of the nine regions with the central place in West Virginia draw customers from counties in neighboring states. Two West Virginia centered trading regions (Bluefield and Huntington) have more counties in neighboring states than in West Virginia. Three out of five counties in the Bluefield West Virginia trading region are in Virginia. Four of the eight counties in the Huntington trade region are in Kentucky and two are in Ohio. Fourteen counties in other states (four in Kentucky, seven in Ohio, and three in Virginia) belong to Rand-McNally trade regions that are centered in West Virginia.

Nine West Virginia counties belong to Rand-McNally trading regions that are centered in other states (Figure 1). Grant, Hampshire, and Mineral counties belong to the Cumberland Maryland trade area, Jefferson is part of the Frederick Maryland trade area, and Berkley and Morgan counties are part of the Hagerstown Maryland trade region. Hardy and Pendelton counties are part of the Harrisonburg Virginia trade region and Mingo County is part of the Pikesville Kentucky trade area.

The four remaining West Virginia central places, Beckley, Charleston, Harrison County (Bridgeport and Clarksburg), and Morgantown, are central places for West Virginia counties only. Charleston is the central place for 14 West Virginia counties, Harrison County is the central place for nine counties, Beckley serves in that capacity for five counties, and Morgantown serves as the central place for three West Virginia counties.

Casual Explanation of Pull Factors

In part based on the literature, we examined several variables to explain the behavior of pull factors. These variables include population, per capita income, and population density based on the concepts underlying central place theory. We hypothesize that these variables should be positively correlated with pull factors. Based on Gale, we include county size (square miles) and an indicator variable for the presence of an interstate. The expected sign of both variables is ambiguous; for example, an interstate simultaneously increases the probability of losing local customers to external markets and drawing customer from other areas. All else equal, as county size increases, it is more costly for residents of communities at the center of the county to shop elsewhere, but increased county size also means residents at the county fringe could have increased cost of shopping at a community in the center of the county. We include the percentage of the local population that is elderly particularly because of the expected impact on health and personal care purchases based on our examination of consumer expenditure survey data (U.S. Bureau of Labor Statistics, 2002) collected at the national level.

Based on the multitrip phenomena (Thill and Thomas, 1987), we also included the level of net-commuting earnings (commuting in-flow dollars less commuter outflow dollars) divided by earnings by place of residence. Central places would be expected to have a negative value for this variable, because more people usually commute into a central place (greater dollar outflows) than would commute from the central place to elsewhere. A positive value indicates net-commuting inflows (the usual case for smaller, non central place communities). We expect this variable to have an inverse influence on the pull factor. A relatively large negative value means a large level of net in-commuters. These in-commuters would be expected to be more likely to make purchases in the central place. Due to their own population and wealth, central places with large amounts of in-commuting would also be expected to also have well-developed retail sectors that serve out-lying areas.

Study Results

Based on the literature and our knowledge of the West Virginia economy, we formulated several hypotheses concerning our pull factor estimates. First, we expected pull factors to reflect the central place heirachy. That is, we expected counties with central place cities to have larger pull factors than their hinterland counterparts. If this hypothesis is rejected, we expect that the central place cities would at least have pull factors that exceed one. In cases where this does not hold, we question the designation of the city as a central place.[1]

Based on our knowledge of the West Virginia economy and the literature, we also advanced several hypotheses concerning the twelve subcategories of retail sales. Nonstore retailers in West Virginia are concentrated in electronic shopping and mail-order houses (29.4% of all nonstore retail sales), fuel dealers (44.9% of all nonstore retail sales), and vending machine operators (11.5% of all nonstore retail sales). While the electronic divide implies that electronic shopping activity may be concentrated in urban areas, such establishments may prefer rural areas with adequate telecommunication infrastructure. Based on our own knowledge and the analysis of others for gas stations, we would expect fuel dealers to be more oriented to local markets and hence less reflective of central place theory than other commodities. As a result, we also expected nonstore retail to less strongly reflective central place theory than other sectors. Nonstore retail pull factors should be smaller for central place counties and larger for other areas as compared to other retail trade. Further, we expect a positive but weaker relationship between nonstore retail trade versus income, population, population density, and net-commuting as compared to other retail trade.

[1] Because this analysis is limited to retail trade, the city may still serve as a central place for so-called higher ordered services, such as medical services.

Another subcategory that we expect to reflect different behavior is health and personal care (primarily pharmacies). Based on our analysis of consumer expenditure survey data, we expect that the percent of the local population that is elderly will have a relatively strong influence on sales in this category. This expectation also carries the implication that population, population density, net-commuting, and the interstate dummy variable, would all have less influence on the pull factor for this subcategory as compared to other retail trade.

Further, based on the literature (Harris and Shonkwiler), we expect the pull factor for furniture and home furnishings, building material and garden supplies stores, and general merchandize stores to all show positive and strong correlations.

Because our data was for one state, we also examine the influence of tax policy on pull factors, which has not been done in most studies. West Virginia has unique elements of tax policy that influence pull factors. Over 52% of West Virginia's population currently resides in border counties. Further, analysis of the most recent county level population estimates by the Census (2001) indicates that the share of state population in border counties is increasing. Urban border counties with large population include the Metropolitan cities of Huntington (Cabell County), Parkersburg (Wood County), Wheeling (Ohio County), Martinsburg (Berkeley County), and Morgantown (Monongalia County). Nonmetropolitan counties with larger towns include Mercer County (Bluefield), Greenbrier County (Lewisburg), and Hancock and Brooke (Weirton) Counties.

State sales tax policy has a strong influence because West Virginia does not exempt food purchases from sales taxes unlike all neighboring states save Virginia (where food sales are still taxed at a lower rate). The state also has a higher tax on gasoline than neighboring states with the exception of Pennsylvania (Federal of Tax Administrators, 2002). Based on economic theory and previous research (Walsh and Jones 1988), we expect border counties to have higher sale leakages and lower pull factors than would be otherwise because of state tax policy. Because a number of urban centers border other states, we expect pull factors to be less reflective of central place theory than would be otherwise, as consumers would be more likely to shop in other states to avoid such taxes. Because central place theory is based on population and income levels (threshold demand), we would expect the effect of factors such as per capita income and population to be smaller for gas stations and food and beverage retail establishments (over 90% grocery stores in value of sales) than for other retail trade (with the possible exception of nonstore retail). Further, based on the literature, we expect both categories to lower pull factors even for central places that are not in border counties, because of the predominant local market nature of both products.

To further evaluate the impact of state tax policy, we calculate the total retail sales pull factor net of retail sales for gas stations and for food and drinking establishments (the net pull factor variable). We expect that, in general, central place counties will have higher net pull factors than pull factors. We expect this effect to be especially pronounced for central place counties that are border counties. Furthermore, we expect the influence of central place theory based variables (population density, per capita income, population, and net-commuting) to be stronger on the net pull factor as opposed to the pull factor.

Study results provided in Table 1 both confirmed preconceived ideas and also provided some surprises. Counties with large pull factors included a combination of larger central places and often isolated, interior, rural counties. The relatively large pull factors for some rural counties implies that these counties were smaller regional trade centers, especially for more locally oriented commodities. An outlet mall probably explains the ranking for Braxton County. Jackson county's relatively high ranking is primarily due to large out of county sales of motor vehicles, where it had a pull factor of 2.2181, the largest in the state and 51.7% larger than Raleigh County (ranked second in that category). These results are also consistent with the over retailing phenomena observed by Harris and Deller in rural areas. (That is, rural areas may appear to have overdeveloped retail sectors because merchants are willing to accept a lower return on their investments.)

Yet, our analysis generally supported the central place based concepts. Five out of the nine cities (exceptions were Harrison, Kanawha, Monongalia, and Ohio) containing a central place has the largest pull factors in their region (Table 1). Seven out of the nine (except for Kanawha and Ohio) had the largest net pull factors. Even in areas where the central place did not have the largest pull factor, it still was a relatively large value. For example, Kanwaha County (Charleston) ranked fifth in pull factor size and second in net pull factor size among the 14 counties in its region. Further, all but one (Logan) of the more rural, more isolated and often interior counties fell out of the top ten ranking when the net pull factor rather than the pull factor was calculated.

We also tested the weaker proposition that all central places should have pull factors that exceed one. This test held for all the central place counties with the exception of the two northern panhandle cities of Weirton (Hancock and Brooke Counties) and Wheeling (Ohio County) (Table 1). For both Wheeling and Weirton, it is questionable that such cities should be designated as retail trade central places.

We examined the relationship between the pull factors and several variables (the presence of an interstate, county size, and net-commuting) as shown in Table 2. The presence of an interstate in a county had a strong and positive influence on the pull factor with a correlation coefficient of 0.4691 (the largest among the seven casual variables that we examined). The positive influence is consistent with the finding of Gale for all US Nonmetropolitan Counties.

County size also had a generally positive influence on the pull factor for West Virginia retail sales as evidenced by a correlation coefficient of 0.2822 (fifth largest among the seven casual variables), which was also consistent with Gale's earlier findings (Table 2). In a particular, we would expect individuals residing in larger rural counties to find it to be more difficult to shop in venues that were located elsewhere.

The level of net-commuting in a county had a very strong and negative influence on the pull factor as shown in Table 2. (Recalling that as the size of the variables increased, a greater percentage of local earnings will come from local residents traveling to jobs outside the county). Because they serve as job magnates, more developed areas serving as central places would be expected to have a generally negative value for this variable (i.e., people in-commuting who outweigh local residents out-commuting). Central place theory would in turn suggest a negative or inverse relationship between this variable and the size of the pull factor. This hypothesis was confirmed as the correlation coefficient between the pull factor and the net-commuting variable was negative 0.4148, the only negative relationship we found between the pull factor and the seven possible casual variables that we examined.

As expected, the influence of population density, per capita income, population, and net-commuting was markedly higher on the net pull factor as opposed to the pull factor (Table 2). For example, the correlation coefficient between the pull factor and population density was 0.2687 while the correlation coefficient between the net pull factor and population density was 0.4132 (53.9% larger). The correlation coefficient between the pull factor and per capita income was 0.4289 while the correlation coefficient between the net pull factor and per capita income was 0.5764 (34.4% larger). Likewise, the correlation coefficient between population and the pull factor was 0.4410 versus a correlation coefficient of 0.5846 (32.6% larger) between population and the net pull factor.

Comparing the net pull factor to the pull factor also confirmed the impact of state tax policy on border counties (Table 1). The impact was especially pronounced on border counties that are central places. For example, the net pull factor for Cabell County (Huntington) was 1.3876 (ranking second among all West Virginia counties) while its pull factor was 1.2799 (ranked fourth). The pull factor for Wood County (Parkersburg) increased from 1.2170 (ranked sixth) to a net pull factor of 1.3144 (ranked third). As a result, we conjecture that consumers in border counties experience less of an impact from sale taxes on food and petroleum than consumers in interior counties. On the other hand, merchants in border counties experience a larger detrimental impact from such taxes than their counterparts in the interior.

While the impact on border county cities was larger, the net pull factor was also larger than the pull factor for central places in the interior. For example, the pull factor for Kanawha County (Charleston) increased from 1.1229 to 1.2187 but declined for twelve of the thirteen other counties in that retail trade region (Table 1). This research result confirms the observation by Mushinski and Weiler (2002) that food and beverage retail establishments are primarily devoted to local markets.

We also examined the relationship between pull factors for selected retail trade subcategories and our causal variables. We particularly focused on two subcategories, nonstore retail trade and health and personal care retail trade.

Study results supported the hypothesis that nonstore retail would have a weak relationship with the pull factor (Table 3). The correlation coefficient between the nonstore retail pull factor and the pull factor was 0.2097 (markedly the lowest among the twelve retail trade subcategories). This result indicates that the distribution of nonstore retail tended to be less reflective of the central place hierarchy than other types of retail trade. The weaker central place orientation of nonstore retail was also reflected in the correlation of its pull factor with both population and population density as compared to the twelve retail sales subcategories. The correlation coefficient between the nonstore retail pull factor and population was 0.1324, which was much smaller than that found for categories such as electronics and applications (0.6385), but markedly larger than for gas (negative 0.1545) and food. Very similar results also held for the relationship between nonstore retail trade and population density.

An interesting result held with regards to the relationship between nonstore retail and the net-commuting variable. Recall that as the size of the variable increase, a greater percentage of local earnings will come from local residents traveling elsewhere to work. Hence, more rural areas with less developed local economies would be expected to have a larger value for this variable. Model results indicated that as the contribution of out-commuting to an economy increased the pull factor for nonstore retail also tended to increase (the correlation coefficient between the two variables was 0.1588 as shown in Table 3). This positive relationship was unique among the retail trade subcategories (recalling that the correlation coefficient between the pull factor and the net-commuting variable was also strongly negative). This positive relationship reinforces our point concerning the especially local market orientation of nonstore retail trade in West Virginia.

Study results also supported the hypothesis that health and personal care retail sales would have a weak relationship with the retail trade pull factor. Similar to nonstore retail, the correlation coefficient between the health and personal care retail pull factor and the pull factor was 0.3302 (second lowest among the retail trade subcategories) (Table 3). This result indicates that the distribution of health and personal care retail also tended to be less reflective of the central place hierarchy than most other types of retail trade.

The weaker central place orientation of health and personal care retail was also reflected in the correlation of its pull factor with both population and population density as compared to the other retail sales categories. The correlation coefficient between the health and personal care retail pull factor and population was 0.0555, which was much smaller than that found for most other categories (Table 3). Population density had no influence of the size of the health and personal care pull factor (the correlation coefficient between the two variables was .0048, the third lowest among the retail trade subcategories). The correlation coefficient between the health and personal care retail pull factor and per capita income showed a similar result. Likewise, the correlation coefficient between the health and personal care pull factor and the presence of an interstate in the county was 0.0825, the second lowest value among the twelve retail sales subcategories for the interstate variable. We expected a positive correlation (or at least a weak negative correlation) between the net commuting variable and the health and personal care pull factor. However, result research indicated a fairly strong negative correlation between the two variables.

On the other hand, the correlation coefficient between the pull factor for health and personal care retail and percent of elderly population at the county level was 0.2336 second largest among the retail trade subcategories (Table 3). The result confirmed our hypothesis that the percentage of elderly population is an important determinant in the location decision of pharmacies and similar retail stores.

Study results also confirmed Harris and Shonkwiler's observation of a strong and positive correlation between furniture and home furnishings, building materials and garden supplies stores, and general merchandize stores (Table 4). The correlation coefficient between furniture and home furnishings and general merchandize stores was 0.5742 (the largest correlation coefficient between furniture and home furnishings and all other retail trade subcategories). The correlation coefficient between furniture and home furnishings and building materials and garden supplies stores was 0.5478 (the second largest correlation coefficient between furniture and home furnishings and all other retail trade subcategories).

Summary, Policy Implications, and Future Work

We analyzed pull factors for total retail sales and twelve subcategories of retail sales for all West Virginia Counties, which has not been previously done for West Virginia. Presented is a method used in estimating missing data points and our approach based on Rand-McNally trade regions. Results indicate that hypothesizes concerning central places in West Virginia generally hold. However, other elements, such as state tax policy, a disproportionately high level of elderly population, and other factors either influence the retail pull factor or pull factors for specific retail trade subcategories.

An important element of this research is the implication for state tax policy. One major finding in this regard is that central place propositions in general hold, despite the distortions introduced by state sale tax policy. However, the research does indicate that sales taxes are borne more by businesses and less by consumers in border cities as opposed to communities located in the interior areas of the state. This result holds of course because consumers in border counties have the option of shopping for food and gasoline and other affected products in neighboring states where such items are taxed at a lower rate. Given the percentage of state population in border counties and cities and given that the percentage is growing, it may be time to rethink state tax policy. In particular, a local option sales tax, in lieu of state sales taxes, should give greater local flexibility in setting sales tax rates in response to local conditions. Current state tax policy may be also impacting other tax revenue levels. For example, reduction in economic activity in border areas may impact other governmental revenue sources in a negative way (such as reduced business and occupation tax receipts).

This research also points the way for the need for future work. In particular, regression-based analysis provides a means for formally testing the relationship between pull factors and the group of causal variables identified here. However, unlike previous studies, this effort should test and if necessary correct for the existence of spatial autocorrelation, which can bias econometric model coefficients and tests of significance, thus causing the researcher to draw erroneous conclusions.

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Table 1. Pull Factor and Net Pull Factor Estimates for West Virginia Counties, 1997.

County	County Region	Pull Factor Estimates			
		Pull	Rank	Net	Rank
Barbour	Harrison County	0.7170	32	0.5747	34
Berkeley	Hagerstown, MD	0.9601	20	0.9772	19
Boone	Charleston	0.7053	33	0.6034	31
Braxton	Charleston	1.2894	3	0.9990	15
Brooke	**Weirton**	0.6021	43	0.5482	37
Cabell	**Huntington**	1.2799	4	1.3876	2
Calhoun	Parkersburg	0.4676	48	0.2569	52
Clay	Charleston	0.6413	36	0.3476	47
Doddridge	Harrison County	0.1460	55	0.1141	55
Fayette	Charleston	0.9873	19	0.9484	20
Gilmer	Harrison County	0.4746	47	0.2784	50
Grant	Cumberland, MD	0.7203	31	0.7479	26
Greenbrier	Beckley	1.1369	12	1.1350	7
Hampshire	Cumberland, MD	0.6043	42	0.5006	39
Hancock	**Weirton**	0.9262	22	0.8455	24
Hardy	Harrisonburg, VA	1.3730	2	1.0128	13
Harrison	**Harrison County**	1.1844	9	1.1784	6
Jackson	Charleston	1.3930	1	1.5253	1
Jefferson	Fredrick, MD	0.5402	46	0.4904	40
Kanawha	**Charleston**	1.1229	14	1.2187	5
Lewis	Harrison County	1.2472	5	1.0011	14
Lincoln	Charleston	0.4117	52	0.2218	53
Logan	Charleston	1.1753	10	1.1015	8
McDowell	Bluefield	0.6072	41	0.4436	43
Marion	Morgantown	1.0267	16	0.9932	17
Marshall	Wheeling	0.8548	25	0.7381	28
Mason	Charleston	0.4415	50	0.3530	46
Mercer	**Bluefield**	1.0196	18	1.0809	9
Mineral	Cumberland, MD	0.7890	27	0.8503	23
Mingo	Pikesville, KY	0.7777	28	0.7397	27
Monongalia	**Morgantown**	1.0202	17	1.0450	10
Monroe	Beckley	0.3195	53	0.2854	48
Morgan	Hagerstown, MD	0.6342	37	0.5390	38
Nicholas	Charleston	1.2028	7	1.0322	11
Ohio	**Wheeling**	0.8730	23	0.9857	18
Pendleton	Harrisonburg, VA	1.1304	13	0.9937	16
Pleasants	Parkersburg	0.6691	34	0.5827	32
Pocahontas	Charleston	0.6523	35	0.5535	36
Preston	Morgantown	0.8577	24	0.8421	25
Putnam	Charleston	0.7410	30	0.6674	29
Raleigh	**Beckley**	1.1952	8	1.2636	4
Randolph	Harrison County	0.9511	21	0.8505	22
Ritchie	Parkersburg	0.6201	40	0.4432	44
Roane	Charleston	0.7547	29	0.6412	30
Summers	Beckley	0.4161	51	0.2658	51
Taylor	Harrison County	0.5948	44	0.4896	41
Tucker	Harrison County	0.8135	26	0.5752	33
Tyler	Wheeling	0.4637	49	0.2794	49
Upshur	Harrison County	1.0275	15	0.8778	21
Wayne	Huntington	0.6337	38	0.5726	35
Webster	Charleston	0.5946	45	0.3561	45
Wetzel	Wheeling	1.1521	11	1.0162	12
Wirt	Parkersburg	0.2991	54	0.1444	54
Wood	**Parkersburg**	1.2170	6	1.3144	3
Wyoming	Beckley	0.6249	39	0.4477	42

Central place counties and cities are in bold.

Table 2. Correlation Coefficients Between the Pull Factor and Net Pull Factor Estimates for West Virginia Retail Sales, 1997 and Explanatory Variables.							
	Size	Population Density	Interstate	Per Capita Income	Population	Percent Elderly	Net-Commuting
Pull	0.2822	0.2687	0.4691	0.4289	0.4410	0.1269	-0.4148
Net Pull	0.2464	0.4132	0.5442	0.5764	0.5846	0.1160	-0.4471

Table 3. Correlation Coefficient Between Pull Factors for Retail Trade Subcategories and Explanatory Variables, West Virginia Retail Trade, 1997.

Retail Trade Subcategory	Size	Population Density	Interstate	Per Capita Income	Population	Percent Elderly	Net-Commuting	Pull	Net Pull
Food	0.1516	-0.1233	0.0064	-0.1208	-0.0501	0.0259	-0.0672	0.5165	0.2763
Gas	0.2894	-0.2732	0.1430	-0.1166	-0.1545	0.1029	-0.1488	0.5829	0.3782
Motor Vehicles	0.0543	0.3634	0.4884	0.4438	0.4257	0.0776	-0.3914	0.6918	0.7869
Furniture and Furnishings	0.1414	0.2366	0.1814	0.3664	0.3541	-0.0965	-0.2804	0.4773	0.4539
Electronics and Appliances	0.0734	0.4226	0.4959	0.4989	0.6385	0.0585	-0.3912	0.6645	0.7553
Building and Garden Supplies	0.2172	0.3229	0.2725	0.4095	0.4430	0.0598	-0.3851	0.7141	0.7169
Health and Personal Care	0.0918	0.0048	0.0825	0.0843	0.0555	0.2336	-0.3095	0.3302	0.3194
Clothing and Accessories	0.2406	0.2532	0.2842	0.4365	0.3791	0.0929	-0.2176	0.6699	0.6290
Sporting Goods, Hobby, Books, Music	0.2053	0.3999	0.3739	0.5636	0.6197	0.0855	-0.3900	0.5858	0.6711
General Merchandize	0.2622	0.2136	0.2988	0.3726	0.3881	0.0687	-0.2070	0.7896	0.7431
Miscellaneous Merchandize	0.2726	0.1076	0.2669	0.2568	0.1778	0.3472	-0.2128	0.4997	0.4394
Nonstore Retail	0.3381	0.0317	0.3019	0.1816	0.1324	0.0361	0.1588	0.2097	0.2659

Table 4. Correlation Coefficients Between the Pull Factor Estimates for the Twelve West Virginia Retail Sales Subcategories, 1997.

	Pull	Food	Gas	Motor Vehicles	Furniture and Furnishings	Electronics and Appliances	Building and Garden Supplies	Health and Personal Care	Clothing and Accessories	Sporting Goods, Hobby, Books, Music	General Merchandize	Miscellaneous Merchandize
Pull	1.0000											
Food	0.5165	1.0000										
Gas	0.5829	0.4634	1.0000									
Motor Vehicles	0.6918	0.0390	0.1725	1.0000								
Furniture and Furnishings	0.4773	0.3058	0.1963	0.1393	1.0000							
Electronics and Appliances	0.6645	0.0379	0.1012	0.5970	0.2872	1.0000						
Building and Garden Supplies	0.7141	0.3191	0.2631	0.4221	0.5478	0.5360	1.0000					
Health and Personal Care	0.3302	0.0616	0.3604	0.2047	0.0249	0.1257	0.2177	1.0000				
Clothing and Accessories	0.6699	0.3823	0.4261	0.1761	0.3953	0.3454	0.5070	0.1375	1.0000			
Sporting Goods, Hobby, Books, Music	0.5858	0.0528	0.1001	0.5223	0.2388	0.5957	0.5283	0.0701	0.5848	1.0000		
General Merchandize	0.7896	0.4946	0.3879	0.2753	0.5742	0.5978	0.5576	0.0779	0.6994	0.3912	1.0000	
Miscellaneous Merchandize	0.4997	0.2644	0.3743	0.2509	0.1676	0.3086	0.2440	0.2766	0.3909	0.2984	0.3541	1.0000
Nonstore Retail	0.2097	-0.1692	0.2015	0.1504	-0.0489	0.0333	-0.0171	0.1351	0.3308	0.2731	0.2262	0.0571

Figure 1. Rand-McNally Regions Employed in Pull Factor Calculations (Source: Rand-McNally 2002).

Rand-McNally Region Counties	Rand-McNally Counties	Rand-McNally Counties	Rand-McNally Counties
Beckley (35):	**Bluefield (48)**:	**Clarksburg (82)**:	**Charleston (73)**:
Greenbrier	Mercer	Barbour	Boone
Monroe	McDowell	Doodridge	Braxton
Summers	Bland, VA	Gilmer	Clay
Raleigh	Buchanan, VA	Harrison	Fayette
	Tazwell, VA	Lewis	Jackson
		Randolph	Kanawha
		Taylor	Lincoln
		Tucker	Logan[1]
		Upshur	Mason
			Nicholas
			Pocahontas
			Putnam
			Roane
			Webster
Huntington (197):	**Morgantown (306)**:	**Parkersburg (342)**:	**Wheeling (471)**:
Cabell	Marion[2]	Calhoun	Marshall
Wayne	Monogahlia	Ritchie	Ohio
Boyd, KY	Preston	Wirt	Tyler
Carter, KY		Wood	Wetzel
Greenup, KY		Washington, OH	Bellmont, OH
Lawrence, KY			Harrison, OH
Galia, OH			Monroe, OH
Lawrence, OH			
Weirton (431):	**Cumberland, MD (100):**	**Frederick, MD**[3]	**Hagerstown (179):**
Brook	Grant	Jefferson	Berkley
Handcock	Hampshire	Clarke, VA	Morgan
Jefferson, OH	Mineral	Frederick, VA	Washington, MD
	Allegany, MD	Frederick, MD	Franklin, PA
	Garrett, MD		Fulton, PA
Harrisonburg, VA (183):	**Pikesville, KY (474)**:		
Hardy	Mingo		
Pendelton	Floyd, KY		
Page, VA	Johnson, KY		
Rockingham, VA	Martin, KY		
	Pike, KY		

Notes: [1]Logan reassigned to Charleston; [2]Fairmont reassigned to Morgantown; [3]Frederick, MD created from Washington DC region.