Scientific Research Publishing

American Journal of Industrial and Business Management, 2019, 9, 1201-1218
http://www.scirp.org/journal/ajibm
ISSN Online: 2164-5175
ISSN Print: 2164-5167

Analysis of the Role of Commercial Real Estate in the Economic Development of the Northeastern United States

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How to cite this paper: Wasihun, T., Schaeffer, P.V. and Gebremedhin, T.G. (2019) Analysis of the Role of Commercial Real Estate in the Economic Development of the Northeastern United Statese. *American Journal of Industrial and Business Management*, **9**, 1201-1218.
https://doi.org/10.4236/ajibm.2019.95081

Received: March 20, 2019
Accepted: May 24, 2019
Published: May 27, 2019

Abstract

Research on the relationship between real estate investment and economic growth has a long history in the economic development literature. This study adds to the literature by focusing on the largest segment of commercial real estate, retail establishments. Not only quantifying the economic impacts of retail establishments, but also understanding how the economic and socio-demographic characteristics of an area affect investment location decisions, contributes to the understanding of regional growth process. A 3SLS simultaneous equations model derived from is used to analyze the role of "small" and "large" retail establishments in the economic development of the Northeast region of the United States. The study concludes that growth in retail establishments indeed plays a significant role in the economic growth process in the study region. Counties' government expenditure and housing values play a strong role in attracting retail businesses. Population density has different effects on "small" and "large" retail establishments; high population density areas are found to be attractive, particularly to "small" retail establishments, whereas "large establishments" prefer areas with low population densities.

Keywords

Retail Establishments, Economic Growth, Simultaneous Model

1. Introduction

The retail service industry has more than one million stores in the US and accounts for more than four trillion dollars in sales revenue—about 6 percent of US GDP (US Census Bureau, 2012) [1]. The industry employed 15 million workers

in 2012, which is about one out of every 10 workers. The industry is also projected to lead real output growth among all industries by 2020, and to show the second largest employment growth (Bureau of Labor Statistics, 2012) [2].

Traditionally, retail was considered a non-basic industry, meaning that it recycles money within an area and doesn't bring new money from the outside, based on the observation that retailing is largely dependent on local and regional customers and businesses (Ducatel and Blomley, 1990) [3], Lowe, M., and Crewe, L. (1991) [4]. A local economy is assumed to be strong if it relies on industries that primarily depend on external markets and purchases, which are called basic industries.

Today's regional development professionals recognize the dual roles of retail sector, as a basic as well as non-basic industry. As a basic industry, the retail sector contributes to the regional economy by attracting customers from elsewhere. This started a long time ago with the invention of mail order stores and improved transportation and shipping. More recently, the growth of online shopping and selling has increased the geographical reach of retailers and the location of stores is no longer the constraint it used to be. The mail order and online retailer, Lands' End, located in a Wisconsin town of less than 5000 inhabitants, illustrates the possibilities. Additionally, shopping habits have also changed, and customers seem willing to travel farther than in the past. Apart from this, some retailers locate strategically, for example at the intersection of major interstate highways. For example, Tamarack Square ("A Taste of West Virginia") offers high quality crafts, and a restaurant, within a short of its construction, has become a major tourist attraction in Beckley in southern West Virginia. A survey by Price, Kent, Springer, and Al (2008) [5] indicated that some 75 percent of those who stopped at Tamarack were non-West Virginia residents.

In addition to helping attract money from outside their home region, retail businesses contribute directly to the quality of life by offering services and goods. Their presence signals a healthy economy and, to other stakeholders, reduced investment risk. High quality of life and a sound economy promote the growth and development of existing and new businesses, further enhancing employment opportunities and attracting income to a region. The retail sector also plays a major role in reducing expenditures that would otherwise "leak" out of an area (Williams, 1997) [6], (Gibson, Albrecht, and Evans, 2003) [7]; this increases the multiplier effect of all new spending in the region.

Understanding and quantifying the economic impacts of retail businesses and their relationship to other economic factors and demographic characteristics in a region, is crucial information to many stakeholders. Exploring how economic and demographic disparities within a region affect the level of retail business and related economic benefits helps improve policies aimed at attracting investors to an area. To analyze the interdependent relationship between retail businesses and economic and socio-demographic variables, a three-stage least square simultaneous equation model was used. The model consists of a system of inter-

related equations. It is a form of instrumental variable estimation that permits correlations of the observed disturbance across several equations and puts restrictions on coefficients of different equations. The model is known for its consistent estimation and improved efficiency since it estimates coefficients simultaneously by accounting for correlations across equations.

In summary, the main objective of this study is to empirically analyze the impact of investment in retail establishments, the largest segment of commercial real estate, on the economic development of the Northeast region. The remainder of this article is organized into four sections, starting with a literature review (Section 2), followed by the description and development of the empirical model (Section 3). Section 4 presents the results and discusses their implications for economic development policy. The final section provides a summary if the conclusions and recommendations.

2. Literature Review

There is a growing number of studies examining the economic contributions of retail establishments. Some of the research has shown that retail establishments contribute to economic development by attracting new businesses to a region (Ling and Naranjo, 1997) [8], (Vias, 2004) [9]. They enhance the multiplier effect of household expenditures and create linkages up and down the supply chain (Ling and Naranjo, 1997) [8]; Hongyu, Park, and Siqi, 2002) [10]. Some researchers have examined the role of retail establishments in enhancing the physical environment and its influence on residential location decisions and found positive impacts on housing values. (Seidman, 2006) [11], (Colwell, Gujral, and Coley, 1985) [12], (Porter, 1997) [13]. Retail establishments have also been found to positively contribute to residents' perception of their neighborhood and lower perceived investment risks, which further helps attract new residents and businesses (West and Orr, 2003) [14].

Despite the many positive contributions of retailing to an area, business and household location decisions depend importantly on the quality of the existing infrastructure, general economic conditions, and demographic characteristics of a region (Nair, 2011) [15], (Wincott and Mueller, 1995) [16], (Thilmany, McKenney, Mushinski, and Weiler, 2005) [17], (Lieser and Groh, 2011) [18], (Jackson, 2001) [19], (Alwitt and Donley, 19970) [20], (Boon, 2005) [21], (Colavolpe, 2010) [22], (Malizia, 1991) [23], (Fickes, 2007) [24]. Access to the regional and national transportation network is particularly important for businesses and influences retail business location decisions. In general, more urbanized regions with higher per capita income, industrial diversity, and public transportation, are more likely to attract investors than less urbanized, less affluent, and economically less diversified regions. In line with the results obtained by Miller and Weber's (2014) [25], most rural US counties show persistently slow population growth, a high unemployment rate, a growing poverty rate, and an increasing gap in per capita income compared to their urban counterparts. These trends in rural communi-

ties make attracting investors and retaining existing businesses comparatively more challenging. These challenges also pertain to commercial real-estate investors and retail businesses. Alwitt and Donley (1997) [20] investigated the hypothesis that poor neighborhoods are at the disadvantage in attracting to retail establishments, but they found no statistically significant difference in the number of retail outlets per million dollars of purchasing power. However, they detected a significant difference in retail establishment sizes. Chapple and Jacobus (2009) [26] studied the relationship between growth of chain stores and economic status of neighborhoods in San Francisco. Their analysis revealed a positive relationship of chain stores with "middle class income becoming" neighborhoods as opposed to economically "stratifying" or "gentrifying" areas, indicating that some sector development is closely related to a growing number of middle-income residents, rather than other forms of neighborhood change. Thilmany, McKenney, Mushinski, and Weiler, (2005) [17] hypothesized that population thresholds determine the type of retail stores and found a positive and significant effect of population in the number of establishments. Adjacency to metropolitan areas had a positive effect on the number of Merchandise and Apparel establishments, suggesting that retail establishments depend on local and regional demand conditions, including population size.

To understand the economic contributions of retail establishments in the regional growth process and identify the socio-economic factors that affect investments, this study first differentiates retail establishments from other forms of commercial and non-commercial real-estate and explores the potential economic contributions of the sector.

Second, to consider possible differences in production technologies and economies of scale between retail establishments of different size, this study distinguishes between establishments with 1 - 19 employees to represent relatively small retail establishments, and those with at least 20 employees to represent relatively large ones. Employment between 1 and 19 is used for small retailers because they capture most locally owned stores. A second reason is that a cutoff point of more than 20 employees would eliminate most counties from having even one large retailer, which would cause an imbalance that would make comparisons difficult. It should be noted that the terms "small" and "large" are relative and generally depend on industry type.

Third, this study also examines how socio-economic and demographic disparities within a region affect the growth of establishments. The result will provide information for government officials for developing policies for attracting businesses and stimulating the regional economy.

3. Method of Analysis

The study uses a three-stage least squares (3SLS) simultaneous equation model based on the work of Carlino and Mills (1987) [27], which in turn is an extension of Steinnes' (1982) [28] model. It applies regional adjustment and economic

base theory to explore the simultaneous relationship between regional population and employment growth. Deller, Tsai, Marcouiller, and English (2001) [29] expanded the model by adding a third equation to simultaneously consider income, population, and employment changes. The Deller, Tsai, Marcouiller, and English model has been used to estimate simultaneous relationships of economic development with entrepreneurship (Mojica, Gebremedhin, and Schaeffer, 2010) [30], (Bashir and Gebremedhin, 2012) [31], amenities (Kahsai, Gebremedhin, and Schaeffer, 2011) [32], environmental regulations (Nondo and Schaeffer, 2012) [33], and small business growth, migration behavior, local public services and median household income (Gebremeriam, Gebremedhin, and Schaeffer, 2012 [34], 2011 [35], 2010 [36]); Gebremeriam, Gebremedhin, Schaeffer, Jackson, and Phipps, 2012 [37]).

The 3SLS simultaneous equation model accounts for simultaneous interactions among interdependent variables. All such models must content with indigeneity, which can only be addressed by applying starting conditions. With this caveat in mind, the model helps overcome inconsistency and bias, and produces efficient estimators. The 3SLS estimation also overcomes the problem of correlation among error terms across equations and helps to accounts all restrictions on parameters in the system of simultaneous equations.

The study area is the Northeast region of the United States. It consists of 299 counties in twelve states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and West Virginia.

3.1. The Model

The model specifies the interaction between population density (*POP*), employment density (*EMP*), per capita income (*PCI*), and investment in commercial real estate (*CRE*), where investment in commercial real estate later will be replaced by small and large retail establishments. The interactions between the four variables are explained as follows:

$$POP^{*} = \alpha_{0POP} + \beta_{1POP} EMP^{*} + \beta_{2POP} PCI^{*} + \beta_{3POP} CRE^{*} + \sum \delta_{1POP} X^{POP} \quad (1.a)$$

$$EMP^{*} = \alpha_{0EMP} + \beta_{1EMP} POP^{*} + \beta_{2EMP} PCI^{*} + \beta_{3EMP} CRE^{*} + \sum \delta_{2EMP} X^{EMP} \quad (1.b)$$

$$PCI^{*} = \alpha_{0PCI} + \beta_{1PCI} POP^{*} + \beta_{2PCI} EMP^{*} + \beta_{3PCI} CRE^{*} + \sum \delta_{3PCI} X^{PCI} \quad (1.c)$$

$$CRE^{*} = \alpha_{0CRE} + \beta_{1CRE} POP^{*} + \beta_{2CRE} EMP^{*} + \beta_{3CRE} PCI^{*} + \sum \delta_{4CRE} X^{CRE} \quad (1.d)$$

$POP^{*}, EMP^{*}, PCI^{*}$, and CRE^{*} are equilibrium levels of population, employment, per capita income, and retail establishments, respectively, in each county. The set of other predetermined variables expected to have direct or indirect effects on population, employment, per capita income, and retail establishments are X^{POP}, X^{EMP}, X^{PCI}, and X^{CRE}, respectively.

The equilibrium values are unobservable. To address this obstacle to empirical estimation, Mills and Price (1984) used the equilibrium adjustment process to

eliminate the unobservable variables. This research uses the same approach. The distributed lag adjustments are specified as follows:

$$POP_t = POP_{t-1} + \lambda_{POP}\left(POP^* - POP_{t-1}\right) \quad (2.a)$$

$$EMP_t = EMP_{t-1} + \lambda_{EMP}\left(EMP^* - EMP_{t-1}\right) \quad (2.b)$$

$$PCI_t = PCI_{t-1} + \lambda_{PCI}\left(PCI^* - PCI_{t-1}\right) \quad (2.c)$$

$$CRE_t = CRE_{t-1} + \lambda_{CRE}\left(CRE^* - CRE_{t-1}\right) \quad (2.d)$$

The speed with which variables move towards equilibrium is given by the parameters λ_{POP}, λ_{EMP}, λ_{PCI}, and λ_{CRE}. POP_{t-1}, EMP_{t-1}, PCI_{t-1}, and CRE_{t-1} are initial conditions.

With the help of the lag adjustment, and by specifying the model in terms of changes in the dependent variables, we can eliminate the unobserved equilibrium values. The resulting empirical model explains changes in population, employment, per capita income, and retail establishments respectively, as follows:

$$\begin{aligned}\Delta POP = {} & \alpha_{0POP} + \beta_{1POP}\Delta EMP + \beta_{2POP}\Delta PCI + \beta_{3POP}\Delta CRE + \beta_{4POP}POP_{2000} \\ & + \beta_{5POP}EMP_{2000} + \beta_{6POP}PCI_{2000} + \beta_{7POP}CRE_{2000} + \sum \delta_{1POP}X^{POP} + u_1\end{aligned}$$

$$\begin{aligned}\Delta EMP = {} & \alpha_{0EMP} + \beta_{1EMP}\Delta POP + \beta_{2EMP}\Delta PCI + \beta_{3EMP}\Delta CRE + \beta_{4EMP}POP_{2000} \\ & + \beta_{5EMP}EMP_{2000} + \beta_{6EMP}PCI_{2000} + \beta_{7EMP}CRE_{2000} + \sum \delta_{2EMP}X^{EMP} + u_2\end{aligned}$$

$$\begin{aligned}\Delta PCI = {} & \alpha_{0PCI} + \beta_{1PCI}\Delta POP + \beta_{2PCI}\Delta EMP + \beta_{3PCI}\Delta CRE + \beta_{4PCI}POP_{2000} \\ & + \beta_{5PCI}EMP_{2000} + \beta_{6PCI}PCI_{2000} + \beta_{7PCI}CRE_{2000} + \sum \delta_{3PCI}X^{PCI} + u_3\end{aligned}$$

$$\begin{aligned}\Delta CRE = {} & \alpha_{0CRE} + \beta_{1CRE}\Delta POP + \beta_{2CRE}\Delta EMP + \beta_{3CRE}\Delta PCI + \beta_{4CRE}POP_{2000} \\ & + \beta_{5CRE}EMP_{2000} + \beta_{6CRE}PCI_{2000} + \beta_{7CRE}CRE_{2000} + \sum \delta_{4CRE}X^{CRE} + u_4\end{aligned}$$

The endogenous variables ΔPOP, ΔEMP, ΔPCI, and ΔCRE, indicate changes in a county's population density, employment density, per capita income, and retail establishment density, respectively. X is the exogenous variable vector, while u_1, u_2, u_3, and u_4 are error terms. The year 2000 is the initial period (T_{2000}). The structural model of Deller and Lledo (2007) [38] and Deller, Tsai, Marcouiller, and English (2001) [29] explained that the speed of adjustment coefficients λ_{POP}, λ_{EMP}, λ_{PCI}, and λ_{CRE} are embedded in α, β, and δ.

The model allows the estimation of the structural relationships in the short-term adjustments in population density, employment density, per capita income, and retail establishment density, and the long-term equilibria POP^*, EMP^*, PCI^*, and CRE^*, while simultaneously separating the effects of growth in retail establishments on regional economic growth.

3.2. Data

The empirical model is used to analyze the effects of retail establishments on regional economic growth. The study uses change of population density (*GPOP*),

employment density (*GEMP*), per capita income (*GPCI*), and density of retail establishments (*GRE*), from year 2000 to 2010 as endogenous variables.

In Table 1, all density calculations are relative to county population, except in the case of population density, where people per square mile is used. Serious crimes include any violent and felony charges. Violent crimes are defined as offenses that involve face-to-face confrontation between the victim and the perpetrator, including homicide, rape, robbery, aggravated assaults, etc.

Table 1. Variables and their sources.

Variable	Definition	Source
Endogenous variables		
GPOP	Growth in population density by county	EBA
GEMP	Growth in employment density by county	EBA
GPCI	Growth in per capita income by county	C&CDB
GRE	Growth in number of retail establishments (density) by county	SUSB
Initial conditions		
POPBASE	County population density in 2000	USCB
EMPBASE	County employment density in 2000	EBA
PCIBASE	County per capita income in 2000	C&CDB
REBASE	County retail establishment density in 2000	USBS
Accessibility variables		
METRO	Metropolitan counties, dummy variable = 1, 0 otherwise	ERS
METROADJ	Counties adjacent to metro areas, dummy variable 0, 1 otherwise	ERS
ROADDEN	Interstate road density	NRAC
Economic variables		
NFIRMS	Density of number of firms by county	USBS
PCITAX	Per capita income tax	C&CDB
PTAX	Property tax on business	USCB
POVERTY	Percent of families below poverty line	USCB
CMHV	County's median housing value	C&CDB
EGOV	Per capita government expenditure	C&CDB
PHP	Density of housing permits	C&CDB
CBSI	Density of banking and saving institutions	C&CDB
Socio-demographic variables		
RETIRE	Percent of population above 65	C&CDB
NONWTE	Percent non-white population	C&CDB
OPERATIVE	Percentage of population between 16 and 64	C&CDB
COLLD	Percentage of population 25 years and older with college degree	C&CDB
CRIME	Serious crime rate (felony, violent crimes, etc.)	C&CD

Endogenous and exogenous variables included in the empirical model are collected from the US Census Bureau (USCB), County and City Data Book (C&CDB), Bureau of Economic Analysis (BEA), US Department of Agriculture's Economic Research Services (ERS), West Virginia University's Natural Resource Analysis Center (NRAC), and the US Census Bureau's Statistics of US Businesses (SUSB), and County Business Patterns (CBP). Table 1 provides a summary of the variables and Table A1 (**Appendix**) lists descriptive statistics for all variable.

The Northeast region of the US is large enough for underlying processes to vary systematically across space. Data availability dictates the county as the spatial units of analysis as several variables are unavailable at a smaller geographical scale. The study region contains a sufficient number of observational units for statistical inference, but the county-level analysis might mask some within-region variation.

4. Results and Discussion

4.1. Population Density Growth Equation

The results of the population density growth equations are presented in Table 2. This equation is estimated using endogenous variables of growth in employment density (*GEMP*), per capita income (*GPCI*), and density of retail establishments (*GRE*). The initial conditions of population density (POPBASE) and employment density (EMPBASE), and control variables are included to measure economic effects. The empirical model assumes that growth depends on initial conditions. The regression explains 60 and 43 percent in the small and large retail establishment models, respectively.

The empirical results show that growth in population density (*GPOP*) is positively and significantly related to growth in employment (*GEMP*) in both models. This explains that an increase in the number of jobs also increases population growth—people follow jobs. There is a positive and significant relationship between population growth (*GPOP*) and small retail establishments (*SRE*). This suggests that growth in small retail establishments enhances the attractiveness of an area by increasing access to goods, services, and job opportunities. However, growth in the density of large retail establishments (*LRE*) shows an unexpected negative relationship with growth in population density (*GPOP*). This could mean that LRE investments prefer locating in areas with lower population densities, such as suburbs, because of their large land requirements. This applies particularly to shopping malls, which might have a difficult time finding a sufficiently large lot in a densely developed area, regardless of price. Locating in low-population density areas does not mean restricted market access, since large establishments tend to have integrated supply schemes, including online marketing, and many suburban locations are easily accessible via county and Interstate highways. Online retailing created opportunities for retail stores even in relatively isolated areas. This statement is supported by Kim and Orazem (2012) [39] who report that broadband availability has a significant positive effect on

Table 2. Results of growth and population density (GPOP).

Variables	Small Retail Establishments (SRE)		Large Retail Establishments (LRE)	
	Coefficient	z	Coefficient	z
GEMP	0.492***	5.51	0.519***	6.94
GRE	0.221***	3.26	−0.384***	−8.12
GPCI	−0.344***	−3.72	−0.180**	−2
EMPBASE	0.015	1.18	0.014	1.31
POPBASE	−0.028**	−1.9	−0.029**	−2.25
POVERTY	−0.007	−1.07	−0.002	−0.32
PHP	0.003	1.04	0.000	0.02
CMHV	0.024***	7.81	0.019***	6.39
NONWTE	0.001***	2.45	0.001**	1.89
CRIME	0.002	0.82	0.002	1.18
METRO	−0.002	−0.31	0.003	0.41
METROADJ	−0.006	−0.79	−0.007	−0.91
R^2	0.604		0.425	
N	299		299	

Note: ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

firm entries in rural areas.

Growth in per capita income (*GPCI*) and growth in population density (*GPOP*) has a negative and significant relationship. This could mean that income growth is not keeping up with population growth maybe because the labor supply is increasing faster than the number of jobs.

The initial county population density (POPBASE) in 2000 is negatively and significantly related to population growth (*GPOP*). This finding is compatible with the convergence of population density hypothesis. A county's non-white population size (*NONWTE*) and growth in population (*GPOP*) are significantly and positively related to each other. A larger non-white population may indicate economic opportunities that attract immigrants from many backgrounds. Higher birth rates among some non-white populations may also contribute to the positive relationship.

County median housing value (*CMHV*) has a positive and significant relationship with population growth (*GPOP*) in both models. One possible explanation is that economic opportunities and local amenities, which attract immigrants, are capitalized in housing values. If this explanation is correct, the added demand for housing by immigrants may also drive up housing values. In other words, the relationship between housing values and population is likely to be a simultaneous process.

4.2. Employment Growth Equation

The results of the employment growth estimation are presented in Table 3. The endogenous variables are growth in population density (*GPOP*), growth in per capita income (*GPCI*), and growth in retail establishment density (*GRE*). The initial county population density (POPBASE), retail establishments (REBASE), per capita income (PCIBASE), and control variables are included to measure economic effects. The implicit assumption, standard in the literature, is that growth depends on initial conditions. The overall fit (R^2) of the empirical results for employment density equations is 0.42 and 0.33 in the small and large RE models, respectively.

Growth in employment density (*GEMP*) is positively and significantly related to growth in population density (*GPOP*) in both models, indicating that jobs follow people. The initial county population density (POPBASE) also has a positive and significant relationship with growth in employment density (*GEMP*) only in the SRE model. As expected, there is a positive and significant relationship between per capita income growth (*GPCI*) and employment growth (*GEMP*) in both models. This implies that per capita income increases induce job expansion.

Table 3. Results of employment growth (GEMP).

Variables	Small Retail Establishments (SRE)		Large Retail Establishments (LRE)	
	Coefficient	z	Coefficient	z
GPOP	0.830***	4.86	1.071***	6.67
GPCI	0.618***	4.61	0.626***	4.82
GRE	0.150	1.33	0.305***	3.18
POPBASE	0.019***	2.39	0.036	1.58
PCIBASE	0.000*	−1.77	0.010	0.54
REBASE	0.003	0.55	0.010*	1.68
PHP	−0.002	−0.19	0.013	0.81
CBSI	−0.011	−0.73	−0.015	−0.98
ROADDEN	−0.019	−1.53	−0.040**	−2.32
OPERATIVE	−0.019***	−3.33	−0.019***	−3.31
PCITAX	0.000	0.3	0.001	1.3
COLLD	0.009	0.72	0.007	0.55
METRO	−0.012	−1.02	−0.004	−0.3
METROADJ	0.830	4.86	1.071	6.67
R^2	0.424		0.330	
N	299		299	

Note: ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

Growth in the density of large retail establishments (*GRE*) has the expected positive and significant relationship with growth in employment density (*GEMP*), indicating a positive economic role of retail establishments in stimulating and creating businesses and jobs. The initial level of large retail establishments also has a positive and significant relationship with growth in employment density (*GEMP*). Although growth in the density of SRE establishments and its initial condition also was positively related to growth in employment density (*GEMP*), this result is not significant. This may be because small businesses suffered more during the great recession and lost more employment share than larger business.

The percentage of the population between 16 and 64 years of age (*OPERATIVE*) represents the working-age population. The estimated coefficient of the relationship of this variable and employment density growth (*GEMP*) is negative and significant, which is unexpected. The negative relationship of road density variable (*ROADDEN*) with growth in employment density in the large retail establishment model can be explained by job loss during the great recession.

4.3. Per Capita Income Growth Equation

The results of the per capita income growth equations are presented in Table 4. The per capita income growth equation is estimated against endogenous variables of growth in population density (*GPOP*), growth in employment density (*GEMP*) and growth in retail establishments density (*GRE*); the initial conditions of population (POPBASE), per capita income (PCIBASE) and retail establishments (REBASE); and control variables are included to measure economic effects. The overall fit (R^2) of the empirical results for the per capita equations are 97 and 96 percent in the small and large retail establishment models, respectively.

Growth in employment density has the expected positive and significant relationship with growth in per capita income in both models, implying more jobs mean more earnings to a county. Growth in population (*GPOP*) has a negative and significant relationship with growth in per capita income (*GPCI*) in both models. This observed negative relationship could be because average county income is not keeping up with growth in population density. Alternatively, or additionally, it could signal a surplus of labor. The initial population density (POPBASE) has also a positive and significant relationship with growth in per capita income (*GPCI*) in the large retail establishment model. This confirms the theory that supports population as an economic stimulant, by providing the consumer demand to generate economies of scale in the production.

The initial condition of per capita income (PCIBASE) is positively related to growth in per capita income (*GPCI*) in the LRE model. This positive and significant relationship shows that counties with higher initial average income experienced greater income growth than other counties.

Growth in the density of large retail establishments (*GLRE*) has a positive and

Table 4. Results of growth in per capita income (G*PCI*).

Variable	Small Retail Establishments (SRE)		Large Retail Establishments (LRE)	
	Coefficient	z	Coefficient	z
GEMP	0.571***	5.44	0.320***	3.13
GPOP	−1.151***	−8.24	−0.576***	−3.71
GRE	−0.130	−0.93	0.510***	4.57
POPBASE	−0.010	−1.87	0.072***	5.07
PCIBASE	−0.047	−1.26	0.061***	4.3
REBASE	0.000	−0.09	−0.122***	−3.38
NFIRM	0.002	0.2	0.016**	2.15
CMHV	0.080***	2.57	0.094***	3.38
PCITAX	0.008	1.54	0.017***	3.02
RETIRE	−0.004**	−2.14	−0.004**	−2.09
METRO	−0.017*	−1.65	−0.032***	2.89
METROADJ	0.005	0.52	0.010	0.95
R^2	0.965		0.957	
N	299		299	

Note: ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

significant relationship with growth in per capita income (*GPCI*), while growth in the density of *SRE* investment has an insignificant relationship. The positive relationship of *LRE* implies that the investment is contributing to earnings in the economy. This result is reinforced by the positive relationship of investment with growth in employment density (*GEMP*). The initial condition of *LRE* investment is negatively related to per capita income growth. This could be related to the negative relationship between initial RE investment and growth in retail establishments (*GRE*) in the retail establishment equation in Table 4. The initial condition of *LRE* investment is negatively related to per capita income growth. This could be related to the negative relationship between initial retail establishment investment and growth in retail establishments (*GRE*) in the retail establishment equation in Table 4.

Density (number) of firms (*NFIRM*) in a county has a positive and significant relationship with per capita income growth (*GPCI*) in the LRE model. This implies that the number of firms and the demand for labor in a county increase together, and the additional jobs contribute to an increase in per capita income. However, this relationship is insignificant in the SRE model. A county's median housing value (*CMHV*) has the expected positive sign. CMHV represent not only capitalized quality of life aspects and the purchasing power, but also, overall economic opportunities.

The income tax is a major source of state government revenue. The positive

relationship between per capita income growth and the per capita income tax implies that an increase in per capita income tax revenue funds government services such as education, healthcare, highways, railroads, crime prevention etc., that stimulate the economy.

The percentage of retired population showed a negative and significant relationship with per capita income growth in both models. Since the main sources of income for most retired people are pensions and government benefits, this result was expected.

The dummy variable for metro (*METRO*) is significant with an unexpected negative sign in relation to growth in per capita income in both models; however, the magnitude is small.

4.4. Retail Establishment Equation

The results of the retail establishment growth equation for the Northeast region using 3SLS are presented in Table 5. The retail establishment equation is estimated against endogenous variables of growth in population density (*GPOP*), per capita income (*GPCI*), and employment density (*GEMP*); the initial condition of retail establishment density (REBASE) and population density (POPBASE); and control variables are included to measure economic effects. The overall fit (R^2) of the empirical results for RE equations are 0.47 and 0.37 for the small and large RE models, respectively.

Growth in population density (*GPOP*) has a positive and significant relationship with growth in the density of SRE. This implies that population is an important pull factor that represents the aggregate demand for goods and services. Growth in population density unexpectedly has a negative and significant relationship with growth in the density of large retail establishments, which implies, counter-intuitively, that large retail establishments are more likely to locate where population density is lower. One possible explanation for this result could be that the large space and land requirements of large retailers are more easily met in less densely populated areas. In addition, such a location need not be disadvantageous if the transportation infrastructure makes it readily accessible. The boost in online retailing may also make retailers less location dependent than in the past. This assumption finds some supported by the work of Kim and Orazem (2012), who show that broadband availability has a significant positive firm entry effect in rural areas. The initial population density also showed a negative relationship with growth of large retail establishments. Growth in employment density (*GEMP*) showed the expected positive and significant relationship with large retail establishments (*GLRE*). The initial condition of retail establishments showed a negative and significant relationship with growth in retail establishments. This result implies that counties that had low level of retail establishments in 2000 had higher retail establishment growth rate compared to counties that had a higher level. This could indicate the existence of previously untapped market opportunities.

Table 5. Results of growth in retail establishments.

Variable	Small Retail Establishments (SRE)		Large Retail Establishments (LRE)	
	Coefficient	z	Coefficient	z
GPOP	0.814***	3.03	−1.516***	−7.66
GEMP	0.273	1.39	0.644***	4.42
GPCI	0.462	1.53	0.025	0.12
REBASE	0.000	0.43	−0.060***	−3.02
POPBASE	−0.011	−0.7	−0.080***	3.46
EGOV	−0.007	−0.88	0.011**	2.06
CMHV	0.064***	−2.83	0.054***	2.97
PCITAX	0.005	0.5	−0.007	−0.99
PTAX	−0.001	−0.07	−0.010	−0.91
ROADDEN	0.042	1.27	0.001	0.03
NFIRM	0.069***	2.39	−0.035*	−1.68
POVERTY	−0.036	−1.23	0.020	0.97
METRO	0.010	0.55	0.018	1.1
METROADJ	0.028	1.58	−0.017	−1.06
R^2	0.467		0.366	
N	299		299	

Note: ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

The relationship between county median housing value (*CMHV*) and density of large retail establishments (*GRE*) is positive and significant. This result is expected because the median housing value is an indicator of the economic health of a county.

Density of number of firms (*NFIRM*) has a positive and significant relationship with growth in SRE investment and a negative and significant relationship with LRE investments. It is plausible that large retail establishments are less dependent on local and regional suppliers than small retail establishments because they are more likely to obtain most of their supplies from a regional warehouse, while small retailers may reap greater benefits from the agglomeration economies.

Government expenditures (*EGOV*) showed a positive and significant relationship with large retail establishments. This result indicates that government expenditures on education, healthcare, transportation, public safety, etc., creates jobs and income, and contributes itself to the demand from retailing services. By contrast, both the property tax (*PTAX*) and per capita income tax (*PCITAX*) showed an insignificant relationship with growth of retail establishments.

5. Conclusions and Recommendations

The empirical analysis indicated that growth in retail establishments played a measurable role in the economic growth process in the Northeast region of the United States from 2000 to 2010. This implies that local governments should include retail development as part of their economic development strategies. Though small local governments generally have limited abilities to encourage business development, they can support retail development when by locating or relocating government offices that frequently interact with members of the public proximate to retail businesses. They could also lobby county, state, and federal officials to give preference to co-locating services with retail businesses. In this respect, the relocation of many US Post Offices from in rural counties from downtown to outside of town is an unwelcome trend. Incentives such as using revenue bonds, tax increment financing (TIF), reduced tax rates, subsidies, and one-stop shopping for construction and other permits, help reduce the cost of making an investment.

The empirical results also showed a strong positive relationship between county median house values (CMHV) and growth in the density of retail establishments. Therefore, local governments should try strategies to maintain and improve neighborhoods and downtown areas, for example through consistent code enforcement and maintaining public infrastructure to avoid deterioration leading to blight. Such a strategy would benefit established retailers as well as newcomers. A periodical reassessment of parking policies may also be called for.

Acknowledgements

We acknowledge the financial support from the West Virginia University Agriculture and Forestry Experiment Station.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix

Table A1. Descriptive Statistics for all variables, 2000-2010.

Variable	Unit	Mean	Min	Max	Std. Dev.
EMPBASE	Log	4.198298	0.021626	11.60433	1.72415
POPBASE	Log	5.134251	1.139951	11.11183	1.576341
SREBASE	Log	−0.34118	−3.78675	6.214782	1.551032
LREBASE	Log	−3.94782	−8.28557	1.764086	1.897176
METRO	Level	0.548495	0	1	0.498477
METROADJ	Level	0.314381	0	1	0.465047
RETIRE	Percent	14.61164	7.451522	23.06844	2.68193
COLLD	Percent	20.58963	5.6	54.6	9.360455
NONWTE	Percent	9.624415	0.6	73	12.03228
CBSI	Log	3.429119	0	6.137727	1.245616
MHI	Log	10.58013	9.795178	11.29513	0.260887
POVERTY	Percent	9.042295	6.2186	13.17816	1.200554
CMHV	Log	11.49728	10.02571	13.81551	0.444443
EGOV	Log	12.80363	0	17.67069	2.005463
OPERATIVE	Log	10.87592	7.951559	14.23433	1.324862
ROADDEN	Log	6.793939	4.607495	9.318369	0.683881
NFIRM	Log	8.840978	5.666427	12.55093	1.361568
PHP	Log	5.396302	0	8.636397	1.884082
CRIME	Log	7.28688	0	12.62136	1.835308
PTAX	Log	6.683851	0	8.445268	0.965015
PCITAX	Log	2.579631	0.992366	5.727921	0.937184