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Retail Development in Rural Counties: Evidence from the Upper Midwest

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Abstract. Concerns have been raised that potential retail activity is being lost in rural areas. This study examines the response of retail employment and the number of retail establishments to changes in local employment in isolated rural areas. Since many attempts to strengthen rural retail activity focused on increasing market size by attracting manufacturing activities, special attention is devoted to the empirical analysis of the manufacturing / retail relationship. Using data from the upper Midwest, a statistically significant association between changes in manufacturing employment and resulting changes in retail employment was found. The stimulative impact of manufacturing employment on retail activity was found to be more consistent than other types of job growth. Manufacturing activity also stimulated new retail establishments. Competition from nearby metropolitan areas contributed to the difficulty rural areas have in retail development and the difficulty may be increasing since the start of the analysis.

1. Retail Development in Isolated Rural Counties: Evidence from the Upper Midwest

Retail trade is pivotal to the development of rural economies. The retail sector is a critical medium for the re-spending needed to create an integrated economy. Local merchants are often prominent in civic affairs and among the most important constituencies for economic development. In addition, increased retail shopping outlets can markedly improve the quality of life in isolated rural communities. Attempts to strengthen the retail sector in rural areas have focused largely on increasing market size by attracting manufacturing activities. Some economic development scholars, however, have questioned the potency of manufacturing as a spur to retail development in rural areas (Hunt 1998; Testa 1993; Yanagida et al. 1991)

The purpose of this applied study is to explore the relationship between changes in employment and retail development in isolated rural counties. In

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doing so, the impact of manufacturing employment on the retail industry is isolated to determine if the special attention given to the manufacturing industry in rural retail development efforts is justified. Three issues are examined. The first issue is the extent that manufacturing employment growth contributes to retail employment, and whether this relationship differs from the contribution of employment in other activities. We show that there is a statistically significant relationship between manufacturing employment growth and retail growth. Furthermore, the impact is stronger than for other non-retail employment. While significant discussion has been devoted to the importance of retail employment, no one has considered manufacturing's impact on the number of retail establishments. The relationship between manufacturing employment growth and the number of retail establishments is considered and compared with the relationship between non-manufacturing employment growth and the number of retail establishments. We show that in isolated rural counties, increases in manufacturing employment are likely to result in additional small retail establishments, not just larger stores. Finally, the speed with which changes in employment impact retail employment and the number of stores is also considered. Evidence indicates that the impact of employment changes on retail growth occurs quickly.

In the first section of this study, we review the literature on the relationship between manufacturing growth and rural retail trade. The reasons some observers suggest that the traditional linkage between manufacturing and retail development has weakened are described. Next, a model that will help examine the nature of the manufacturing, retail relationship is presented. The empirical findings and their interpretations are described in the third section. The study closes with a discussion of policy and planning implications.

2. Rural Retail Development and Manufacturing

Retail employment and the number of retail outlets are of particular interest to local development officials. Dehter (1987) in a cross section analysis of rural areas found that the quality of life depends on the availability of shopping facilities in addition to education, healthcare, cultural amenities, and recreational opportunities. Increased shopping opportunities reduce the need for long drives, provide a recreational or social outlet as well as contribute to a sense of place and community. The benefits of local shopping opportunities are likely to be particularly important to less mobile, low-income, and elderly populations.

In addition to augmenting community life, retail development contributes to employment and income. An increase in retail activity reduces monetary leakages, keeping money circulating within the local economy. The relatively large monetary leakages experienced in rural communities are due

partly to lack of retail outlets and helps explain why small rural areas have smaller local multipliers than metropolitan regions. Greater retail activity can also increase the tax base and thus contribute to other community goals.

The importance of manufacturing to economic development in rural areas has been long recognized (Daniels 1999; Holland and Miller 1990; Shonkwiler and Harris 1996). Given the extended decline in agricultural employment, growth in manufacturing activity has been an important source of export oriented jobs.

Manufacturing establishments do not purchase a significant quantity of goods directly from local retailers, but retail activity is supported through the spending and re-spending of earnings that originate in manufacturing. The generally higher wages earned in manufacturing, particularly compared to agricultural employment, add to the potential impact on retail activity. Manufacturing also helps attract and retain population (Klier and Johnson 2000), which supports retail activity.

This study is motivated by concern that the traditional linkage between manufacturing activity and retail development has become weak and by the related idea that non-export activities are as important, or, more important than manufacturing to economic development (Garcia-Mila and McGuire 1997). Testa (1993), in a study of states in the Seventh Federal Reserve District (Michigan, Iowa, Wisconsin, Illinois, Indiana), found that while the traditional agricultural base of rural areas was stagnant or declining, manufacturing employment was filtering down to rural counties in search of cost savings as predicted in the Industrial Filtering Model (Thompson 1968). Yet, in spite of increased manufacturing activity, new retail jobs were not growing in rural areas as would be expected (see Testa 1993):

> *"Manufacturing has become the primary economic base for many non-metropolitan counties in both the Midwest and the rest of the nation. At the same time, services, retail, and other industries are abandoning remote counties and centralizing their operations in urban areas."*

Hart (1998) documented the spread of manufacturing into the rural Midwest and at the same time declared that the traditional retail sector was falling behind. Accordingly, he declared "Main Street" dead. Similar concerns were expressed by Chase and Pulver (1983): "Despite the oft-quoted population turnaround, small rural communities lose their retail customers to nearby, larger cities" (p. 64). Howland and Miller (1990) also considered manufacturing to have weak retail multipliers, but they still considered rural manufacturing important to economic development.

Vias and Mulligan (1999) noted that the traditional export lead growth, of which the manufacturing sector was dominant, has been challenged by the idea that "export services or even non-basic services and trade activities"

drive growth. "In fact it can be argued that for some regions virtually all new growth is due to growth in the non-basic activities…" (p. 510). They found evidence that non-basic employment rather than basic employment was the "real driving force" behind population change in non-metropolitan regions in the Rocky Mountain States.

Two important reasons for concern about the ability of manufacturing employment to stimulate retail growth are suggested in economic development literature. First, the stronger agglomerative pull of metropolitan retail clusters supported by better transportation systems may have placed rural retail stores in a weakened competitive position compared to metropolitan establishments. Second, rural areas may lack the entrepreneurial assets needed to translate increases in local market size into retail jobs.

Concerns that increased spending by residents may fail to generate additional local retail activity and incomes have stimulated several studies examining the determinants of retail trade. Most such studies employed variables derived from the central place paradigm supplemented by demographic variables. In general, the research supports the idea that while local market size and other characteristics are important determinants of rural retail trade, large, competitive shopping clusters in urban areas reduce retail growth in small communities that would otherwise be induced by increases in export activity. Thus the local multiplier in small rural areas may be too small to generate secondary benefits from manufacturing growth or other export activities (Walzer and Stablein 1981; Yanagida et al. 1991).

Frequently, the pull of urban shopping agglomerations is so strong that rural consumers will bypass other, nearby communities in order to make purchases at higher order places (Olfert and Stabler 1994; Mejia, L. C. and Benjamin, J. D. 2002). This tendency places an even greater challenge on rural counties. Even a rural county's highest order place may be bypassed as shopping dollars leave the county attracted by benefits of metropolitan shopping opportunities.

Gruidl and Andrianacos (1994) focused on the ability of local retail establishments to generate sales for other local retail establishments in rural Illinois. They concluded that the presence of large discount stores had a positive effect on retail sales in the area they were located. Of course, the other side of the coin is that communities lacking large discount stores are likely to experience an outflow of retail dollars. Although the presence of discount stores did not outweigh the traditional central place variables, the authors concluded that "structural factors, such as access to neighboring cities, transportation costs, and prevailing shopping patterns, are critical in determining trade capture" (p. 115).

In light of the agglomerative pull of rural retail clusters, Harris and Shonkwiler (1997) discounted the importance of manufacturing to retail development. Their policy prescriptions suggested that communities should directly target retail establishments and should not rely solely on economic

development programs that "have traditionally concentrated attention on the recruitment and retention of export oriented, goods producing industries" (p. 529). A similar proposal to directly develop retail without first developing an internal market was discussed by Pittman and Culp (1995). In an earlier study of rural Wisconsin, Chase and Pulver (1983) presented a cautionary note against developing retail business ahead of increases in the export sector. They found that, "in some categories, shopping centers may help a community realize its potential market growth, but in other groupings, it merely introduces more competition into a declining market" (p. 65). Their analysis suggests a limit to a community's ability to support new retail activity without simultaneously expanding the exports and reinforces to the importance of the manufacturing-retail linkage. Similarly, Leistritz and Ayres (1992) concluded that efforts to recruit export-oriented business were one of the ingredients to successful rural retail expansion.

Mushinski and Weiler (2002) directly examined retail establishments in rural areas. Employing a simultaneous Tobit equation on detailed retail categories, they found that the number of retail establishments in a place was negatively affected by the number of establishments in nearly rural places for many types of retail activity. In addition to competition from urban retail agglomerations, another possible reason that manufacturing growth may fail to stimulate small area retail development is that the resources needed to start a new enterprise may be lacking.

Entrepreneurship is one of the important supply side variables that determine whether retail employment will respond to changes in the manufacturing base. The literature on entrepreneurship is vast, but plagued by alternative definitions and approaches. Nevertheless, there is ample research suggesting that a lack of entrepreneurship may retard rural development (Worthman, Jr. 1996). Dewitt, et al. (1988), emphasized the need for small rural areas to create an entrepreneurial environment. Improving the ability of rural areas to generate new businesses has also been a focus of federal and local policy.

Additional factors that may limit the ability to develop retail activity, but may be lacking in rural areas include lack of intermediate and related institutions (Johannission 1987), lower average education levels, inadequate capital, networking problems, lack of sub-contractors, and poor infrastructure (Hoy 1996).

While the entrepreneurial response cannot be measured directly, it may at least be inferred by examining the rapidity of the retail trade response to changes in manufacturing employment. The quicker retail employment and the number of retail establishments respond to increases in manufacturing, the stronger the evidence of a responsive entrepreneurial climate.

If the retail response to an increase in manufacturing or other employment is in the form of an increase in the number of retail establishments, as

opposed to larger existing establishments, we can infer that the entrepreneurial response is generating a wider variety of outlets.[2] To the extent that goods which were previously not available locally are offered, the multiplier is likely to increase over time as increased retail activities reduce leakages.

3. The Method

Retail sector development in rural areas is examined using pooled cross section and time series data and a geometric distributed lag model. The principal advantage of using a geometric distributed lag model when examining small rural counties is that the model dampens the effects of random variations in employment or in business establishments. Small random changes in employment or in establishments can be very large in percentage terms in these counties. For example, a grocery store may close because of bad management or the death of the owner. A hiatus may occur that causes a decline in employment having nothing to do with the local economy. In a cross section analysis that uses changes in employment and / or establishments as variables, such a random event would have a major impact on the model's conclusions. Therefore, the geometric distributed lag model, which examines employment totals, and infers changing relationships among the key variables through the lag structure of the equation, will produce estimates that are more efficient.

The geometric distributed lag model assumes that the weights of the lagged explanatory variables are positive and decline geometrically with time. While the weights of the geometric lag model never become zero, they do diminish, and beyond a reasonable time, the effect of the explanatory variable becomes negligible.

The geometric distributed lag model can be expressed as:[3]

$$Y_t = a(1- w) + wY_{t-1} + \beta X_t + u_t \qquad (1)$$

The formula shown in equation (1) is particularly useful in mapping the time path of the impact of a permanent change in the independent variable on the dependent variable. The first period impact of a change in X_t on Y_t is

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[2] The bridge between new establishments and greater variety is suggestive rather than definitive. An existing retail store can expand by selling new product lines and a new establishment may completely replicate existing stores. However, we believe that if retail employment grew while the number of establishments remained the same, a substantial portion of the increase would reflect greater sales volume of existing merchandise lines. Conversely, new establishments are like to differentiate themselves from existing establishments, hence increasing variety.

[3] The geometric distributed lag model can be expressed as $Y_t = a + \beta(X_t + w^2X_{t2} + \ldots) + e_t$ $0<w<1$ We can rewrite it with all observations lagged one period: $Y_{t-1} = a + \beta (X_{t-1} + wX_{t-2} + w^2X_{t-3} + \ldots) + e_{t-1}$ $0 < w < 1$. Then we calculate the expression $Y_t - w Y_{t-1}$ to obtain: $Y_t - wY_{t-1} = a(1- w) + \beta X_t + u_t$ where $u_t = e_t - we_{t-1}$. Rewriting, $Y_t = a(1- w) + wY_{t-1} + \beta X_t + u_t$ (See Pindyck, R. S. and D. L. Rubinfeld 1998.)

given by β. The impact of previous changes in X (X_{t-1} - X_{t-n}) on Y_t is reflected by *w*, and the total effect of changes in X (X_t - X_{t-n}) in all periods on Y_t is the coefficient β times the summed lag weights or $\beta/(1-w)$ (Pindyck and Rubinfeld, 1998).[4]

The mean lag is often employed as a measure of how quickly the dependent variable responds to a change in the independent variable. It estimates the number of time periods it takes for half of the cumulative effect of an independent variable to register on the dependent variable. The mean lag is measured by $w/(1-w)$.[5] For example, if "w" is 0.8, the resulting mean lag of four means that half the total impact of changes in X_t - X_{t-n} on Y_t will be felt during the first four time periods.[6]

Now we define the function of retail employment in the form of the geometric distributed lag model:

$$RTEMP_{it} = \alpha + wRTEMP_{it-1} + \beta_1 MEMP_{it} + \beta_2 OTHER_{it} + \beta_3 TRS_{it} + \beta_4 DIR_{it} + \beta_5 G_i + \varepsilon_{it} \quad (2)$$

where:

RTEMP is retail employment; in county i, time period t;
MEMP is manufacturing employment; in county i, time period t;
OTHER is total employment minus retail and manufacturing employment in county i, time period t;
TRS is the amount of transfer payments in county i, time period t;
DIR is income from dividends, interest, and profits in county i, time period t; and
G is a gravity variable that measures the ability of metropolitan areas to capture retail trade from the rural county.

Manufacturing employment is almost exclusively export oriented in small rural counties and retail employment is generally induced. Nevertheless, the principal aim of this study is to examine the response of retail activity to changes in manufacturing employment as well as to changes in non-manufacturing, non-retail employment. The model is not intended to derive

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[4] To prove Σw^s (the summed lag weights) = $1/(1-w)$, let $\Sigma^{\infty}_{s=0} w^s = k$. Multiplying by w implies that $\Sigma^{\infty}_{s=1} w^s = kw$. Subtracting, we get $1=k(1-w)$ or $k=1/(1-w)$. (See Pindyck, R. S. and D. L. Rubinfeld 1998.)

[5] Mean lag = $\Sigma s\beta_s / \Sigma \beta_s$ where $s=0\rightarrow\infty$, and $\beta_s = \beta w^s$. In the geometric lag model the mean lag is $w/(1-w)$, since $\Sigma s\beta_s / \Sigma \beta_s = \beta\Sigma s w^s / \beta\Sigma w^s = [w/(1-w)^2]/[1/(1-w)] = w/(1-w)$. (See Pindyck, R. S. and D. L. Rubinfeld 1998.)

[6] Geometric distributed lag model can be alternatively defined as $Y_t = (1-\lambda)Y_{t-1} + \lambda b X_t + \varepsilon_t$
Where: total impact = "b", first time period impact = "λb", mean lag = "$(1-\lambda)/\lambda$". This equation is homogenous with equation (4), adopted in the paper. This variant of the distributed lag model was used by Gerking and Isserman, (1980).

a traditional export base multiplier. Therefore, manufacturing employment was separated from other employment sources.

All employment in other non-retail activities was aggregated into the variable OTHER, allowing for a single measure of the impact of all non-manufacturing industries on retail employment. By lumping all other employment except retail and manufacturing into one category we will be able to compare the impact of manufacturing employment with the average of other employment whether it expands exports or decreases imports. Individual sectors within OTHER, however, may have unique impacts not captured by our models.

Transfer payments (TRS) and dividends, interest, and rents (DIR) were also included in the model because they are an important determinant of buying power. Bain (1984) showed that in rural areas, income from transfer payments have nearly three times the impact on retail sales as income from other sources. A likely reason for the differential impact of transfer payments on retail sales is that elderly citizens, who receive a large share of transfer payments, may have a higher propensity to consume locally.

The gravity variable, G, was defined as $PC_i / (P_m / D^2_{im})$ where PC_i is the population of rural county i, Pm is the population of the nearest metropolitan area and D_{im} is the distance between the largest city in the county and the metropolitan area. A positive coefficient for the gravity variable indicates that the larger and closer metropolitan areas compared to the size of the county (hence the smaller G) the greater the impediment to retail development.

In equation (2), the estimate of β_1 reflects the multiplier effect of manufacturing employment upon retail employment in the first time period only, while β_2 is the estimate of the effect of other employment upon retail employment for the first time period, and so forth. Finally, α is the constant term, and ε is the random disturbance and is assumed to be well behaved. Over time, the total multiplier effect of manufacturing employment on retail employment is $\beta_1 / (1- w)$, while the total multiplier effect of other employment on retail employment is $\beta_2 / (1- w)$. Half of the total multiplier effect will be felt within the time period of $w / (1- w)$.

A modification to equation (2) was necessitated because the panel data set prevents the constant term, α, from being assumed to actually hold constant for two reasons. First, the multiplier effect of manufacturing employment on retail employment may change over time due to improved transportation, higher incomes, changed consumer preferences, and new technology that may have altered shopping patterns (such as the use of the Internet). Second, characteristics of individual counties may impact on the multiplier effect of manufacturing employment on retail employment. For example, a small county may lose retail business to its larger neighbor because of a unique transportation system that encourages consumers to purchase out-of-county. This circumstance is best controlled by rewriting equation (2) as a

fixed effects model. In order to measure the time and county effect, time dummies and county dummies are added to the equation (2). Now we obtain:

$$RTEMP_{it} = aDI + bDT + wRTEMP_{it-1} + \beta_1 MEMP_{it} + \beta_2 OTHER_{it} + \beta_3 TRS_{it} + \beta_4 DIR_{it} + B_5 G_i + \varepsilon_{it} \quad (3)$$

where DI and DT indicate vectors of county dummies and time dummies respectively, while a and b represent vectors of the associated coefficients.

Changes in retail establishments may not mirror employment changes because an increase in market size may produce larger retail stores rather than more retail establishments or because some areas may have a demographic profile that encourages (discourages) business formation. To distinguish between these two effects, the dependent variable in equation (3) was changed to the number of retail establishments to yield equation (4):

$$RTEST_{it} = a'DI + b'DT + w'RTEST_{t-1} + \beta_1' MEMP_t + \beta_2' OTHER_t + \beta_3' TRS_t + \beta_5' DIR_{it} + \beta_5' G_i + \varepsilon_t \quad (4)$$

where RTEST is the number of retail establishments in county i at time period t.

Equation (4) facilitates a comparison of the response patterns of retail employment and retail establishments to identical changes in the explanatory variables. A quick response of retail employment along with a slow response of retail establishments implies existing stores capture the added purchasing power before new competitors arise. Such a response is consistent with growth without an increase in variety and suggests a temporary profit boost to existing retail establishments. A quick response of retail employment along with a quick increase of retail establishments indicates ease of entry, with new stores established in response to the increased demand.

The estimates were derived from a data set covering 132 nonmetropolitan counties from 1990 to 1997.[7] The 132 counties were selected from Illinois, Iowa, Michigan, Minnesota, and Wisconsin. Selection criteria included counties that are not adjacent to metropolitan areas. Selecting counties that are not adjacent to MSAs reduces the likelihood that the rural county has been engulfed by an MSA since the 1990 census and reduces the pull of metropolitan retail agglomerations. The source of the employment

[7] The use of counties is not ideal as a unit of analysis because they are political rather than economic regions. Nevertheless, they are important for many economic development purposes. A copy of the data set is available through the authors.

data is County Business Patterns. Income data is from the Bureau of Economic Analysis, Regional Accounts Data. The gravity variable is derived from U.S. Census of Population for 1994, a mid-point year in the study. The distance between the largest city in the county and the closest metropolitan areas is calibrated in minutes of roadway travel time as measured by Map Quest.

4. Findings

Presented in Table 1 are the empirical results for two dependent variables, the change in retail employment and the change in the number of retail establishments.

Table 1. Geometric Distributed Lag Approach

	Dependent Variable	
	Retail Employment	Retail Establishment
Intercept	-164.43	56.71
	(-1.57)	(9.39)
$RT.EMP_{t-1}$	0.37*	-
	(10.02)	-
$RT.EST_{t-1}$	-	0.51*
	-	(14.556)
M.EMP	0.10*	0.0034*
	(3.36)	(2.26)
OTHER	0.002	0.004*
	(.14)	(4.55)
TRS	0.0073*	-0.0002*
	(3.53)	(-2.29)
DIR	0.0032*	0.00002
	(3.34)	(0.34)
G	0.13*	.016*
	(3.00)	(7.15)
TIME**	(-)	(-)
	(-)	(-)
COUNTRY***	(-)	(-)
	(-)	(-)
Adj. R-Square	.992	.995
F-Value	586.01	1262.89

T-values are in Parentheses.
*Coefficient is statistically significant at 5% level.
**Two of five coefficients were negative and significant at the .01 level.
***Four of five were negative and statistically significant.
****The complete model including the result of each county's dummy variable is available from the author upon request.

Retail employment: The parameter estimate of .10 for manufacturing employment in the second column suggests that an increase of manufacturing employment by 100 would result in an increase of retail employment by 10

in the current year. The total multiplier effect of manufacturing employment upon retail employment is 15.87 per one hundred increase in manufacturing employment (10/(1-0.37)). The manufacturing retail employment relationship appears reasonable in light of export base multipliers derived for other rural communities. For instance, Olfert and Stabler (1994) found export base multipliers between 1.09 and 1.26 for small rural communities in Saskatchewan. This study examined only the induced change in retail employment to manufacturing changes. Since retail trade generally accounts for less than half the total induced employment, the relationships seem consistent despite the different methods and geographic places. For instance, if retail accounts for half of all induced employment, our numbers would suggest a total export base multiplier of 1.31.

As shown in Table 1, OTHER employment has a smaller multiplier effect than manufacturing employment, and the coefficient was not statistically significant.[8] One possible reason for the difference in multipliers may be attributed to manufacturing compensation. In rural areas, other employment beyond retail and manufacturing usually concentrates on agriculture, mining, tourism, and some low-paying service industries. Take home pay from manufacturing industries is about $7000 per year higher than income from other industries, among our sample, is less seasonal, and provides better benefits (County Business Patterns 2000). Another explanation is that manufacturing employment increases may have higher visibility. Many manufacturing employment changes occur in discreet lumps large enough to warrant local notice. The opening or closing of a manufacturing facility is almost certain to draw attention, but a change of ten or so employees is likely to draw attention in a small community. Increases of one or two workers, more typical of the service sector, are less likely to do so. Thus, retail businesses may be induced to expand their employment due to the greater notoriety of manufacturing employment changes.

Transfer payments have been shown to be a factor in determining the level of retail employment in rural counties. The estimate of 0.0073 in the second column of Table 1 indicates that increased transfer payments of one million dollars would lead to an increase of retail employment by 7.3 in the current year. Local residents' earnings from dividends, interest, and rents (DIR) was also statistically significant with the expected sign. This result is consistent with Bain's finding in rural Wisconsin (1984).

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[8] It should be noted that the coefficient estimate for OTHER was not robust to changes in the counties excluded for the fixed effects portion of the model. While always positive, the magnitude and statistical significance varied substantially for this coefficient. This characteristic did not exist in the coefficient estimates for the other variables in the model.

The measure of gravity also showed that the larger and closer a major metropolitan area, the less likely that retail employment would increase.[9] This finding is consistent with those studies cited in the literature review.

The time dummy variables had differing results. In the earliest years of our study, the results were not statistically significant. Both of the statistically significant coefficients were in the last two years and had negative signs. This result suggests that retail employment is falling over time, ceteris paribus, in the small rural areas. Also, many of the county dummies were significant, suggesting that there are unique county specific factors, not captured in our model that account for employment growth.

In addition to the size of the impact of manufacturing employment changes on retail employment, the speed of response is also of concern. The model implies that a permanent increase in the explanatory variables stays in effect with diminishing weights over time. The weight in equation (3) with retail employment as the dependent variable is the parameter estimate for $RTEMP_{t-1}$ in the second column of Table 1. As described earlier this coefficient estimate can be used to calculate the mean lag of .37 / [1-.37] = .58. Accordingly, half of the total impact of a change in retail employment due to a change in manufacturing employment would be felt in the first .58 of one year (approximately 7 months).

Retail establishments: With respect to the number of retail establishments, the estimated coefficient of 0.0034 in the third column of Table 1 indicates that an increase of manufacturing employment by 100 would lead to an increase of retail establishment by 0.34 in current year. The total effect of manufacturing employment upon retail establishment is .69 per hundred increase in manufacturing employment (.34 / [1-.51]). Retail establishments were also influenced by increase in other employment to a comparable extent. Income from transfer payments (TRS) has a negative impact on the number of retail establishments, a result that is counterintuitive and unexpected. When taken together with the significant positive impact that TRS has on retail employment (see column 2 in Table 1), transfer payments seem to encourage fewer but markedly larger (in terms of employment) retail establishments. A possible explanation may be that since transfer income is primarily social security payments, a high TRS may reflect an aging population that in turn, discourages establishment growth. The coefficient relating dividends, interest and rents (DIR) to changes in the number of establishments had the expected sign, but was statistically insignificant.

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[9] There is no theoretically best definition of the gravity model. Dividing a measure of attraction such as population by the square of distance is most commonly used and has proven predictive for general retail merchandise. In constructing G, several variations were considered including using of the population of the largest city in the county as the attraction measure and employing multiple metropolitan areas as the pull factors. The alternative specifications showed similar results. Accordingly, the simplest definition was used in the empirical specification.

Taken together, the TRS and DIR values suggest that the changes in the number of establishments are more responsive to employment than to income changes. Perhaps employment changes have a stronger effect on the number of establishments because they are more directly related to population change.

The gravity coefficient was significant indicating that competition from nearby metropolitan areas deters creation of retail establishments as well as employment. The coefficients on the time dummy variables were negative and all but one was statistically significant, suggesting the small rural counties are having a more difficult time establishing new establishment since the beginning period of the analysis. There were also numerous statistically significant county dummy variables.

The response pattern for the impact of manufacturing employment change in changes in the number of retail establishments is larger than the impact on retail employment, as would be expected. The estimated coefficient was .5, and the resulting estimated mean lag is (.51 / 1-.51 = 1.04), which indicates that half of the total impact of a change in the independent variable on retail establishments would occur in the first year.

5. Conclusions and Discussion

The findings suggest that manufacturing growth can encourage a statistically significant level of retail development in isolated rural counties. This impact differs from that of other non-retail industries on retail activity. Our findings support the importance of attracting manufacturing employment as a key to retail development. The manufacturing coefficient indicated that 100 manufacturing jobs induce about 15.87 retail jobs in the long-run.

Two considerations temper the importance of manufacturing employment to retail growth. First, the size of the manufacturing coefficient suggests that a moderate increase in manufacturing of the size most counties can reasonably anticipate will not by itself generate a retail boom. Second, the significance of the gravity coefficient indicates that shopping opportunities from nearby retail agglomerations in urban areas can be a major impediment to retail development in many areas.

The relationship between manufacturing growth and the number of retail establishments has important policy implications. Increased employment is associated with an increase in the number of retail establishments, as opposed to increases in retail employment while the number of establishments remains the same. This finding suggests that manufacturing growth can bring retail variety to an area. As the variety of goods available locally expands the export base multiplier should increase.

The quick response of both employment and establishments to increased manufacturing employment changes also indicates that the communities

have the entrepreneurial resources to generate new retail employment, and small-scale establishments. Half of the induced employment change occurred within the first seven months and half of the new establishments were formed during the first year. This finding regarding the ability of rural areas to quickly create new businesses in response to increases in the export base, does not necessarily contradict the conclusions of numerous observers that rural areas need to strengthen entrepreneurial resources. But they suggest that entrepreneurial development programs need not be further directed towards small-scale retail development. Perhaps entrepreneurial development programs could be better directed towards encouraging large-scale retail activities. For instance, development of retail specialty clusters, large department or box stores, discount malls and other activities might be stymied by lack of entrepreneurial resources even though small establishments are not deterred. Encouragement of higher order retail activity will enhance the community's position in the central place hierarchy, and bringing dollars into the region may still require public encouragement of retail entrepreneurship.

The finding regarding time trends, while not definitive, is strongly suggestive. In the retail employment model, the only statistically significant time coefficients were negative. In the case of the retail establishment model, all of the time dummy variables had negative coefficients and all but one was statistically significant. Taken as a whole, the models suggest that rural retail development has become more difficult since the early 1990s, the start of the analysis.

The significance of many of the county dummy variables indicates that treating all rural counties alike with regard to a retail development strategy is not advisable. Individual counties will have to consider their unique circumstances in developing and implementing retail development strategies. Some counties may find manufacturing led retail development more difficult in some counties than in others. The generalization that manufacturing growth will stimulate rural retailing will not be applicable to all areas.

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