THE ECONOMIC CONTRIBUTION OF RURAL GROCERY STORES IN KANSAS

by

HANNAH MILLER

B.S., Kansas State University, 2013

A THESIS

submitted in partial fulfillment of the requirements for the degree

MASTER OF SCIENCE

Department of Agricultural Economics
College of Agriculture

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2015

Approved by:

Major Professor
Hikaru Hanawa Peterson

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Abstract

The purpose of this study was to examine the economic contribution of rural grocery stores to the communities they serve. In addition, this study looked at the community characteristics that influence the level of economic contribution of a rural grocery store. The analysis was conducted for 163 Kansas rural grocery stores that were selected from cities with populations of fewer than 2,500 people.

Regarding the first objective, household income changes and loss of business activity associated with each grocery store were estimated using the IMPLAN economic modeling system. To do so, changes in employment at each grocery store and household income in the community were measured assuming the loss of income that affected households in a city would face if they had to travel a greater distance to buy groceries. The economic contribution of rural grocery stores in Kansas averaged $644,413, ranging from $38,441 and $3,921,027. The results showed that population and location within the state had direct effects on the economic impact of a grocery store. With more complex economies in the eastern and south central parts of Kansas, these stores had a greater economic contribution than stores in the Southwest and Northwest. Communities in the western parts of Kansas would be the worst off from losing their grocery store because of increased travel costs they would incur by traveling the next alternative store.

For the second objective, city and county characteristics that were thought to influence the level of the economic contribution of a store were tested. Two regression models were considered specifying the natural log of the economic contribution of the grocery store and the percentage of total value added the grocery store contributed to the county economy as the respective dependent variables. It was observed that population was one of the biggest drivers of the economic contribution of a grocery store. Other variables that were statistically significant in

both models were the number of city households that had children, relative remoteness of the county, the number of convenience stores per 1,000 people, and the county wealth.

In conclusion, this study showed that grocery stores have a significant impact on the communities that they serve. Both employment and travel costs had direct implications on the economic impact of a store. Additionally, demographic factors and other community characteristics influenced the level of impact that these grocery stores can have on their communities.

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Acknowledgements

I would first like to thank my parents Joe and Anita Miller for everything they have done for me. There guidance throughout my life and their support for me to continue my education has been unmatched by anyone else. I would also like to thank Dr. Peterson for her support throughout graduate school. Her understanding, pushing me to think deeper and her ability harness my true economist skills have been a blessing and I couldn't have asked for a better major professor. To Dr. Leatherman, I can't thank you enough for willingness to work with me on my thesis. Your IMPLAN knowledge and economic guidance have helped make this thesis what it is. You also pushed me to think beyond the numbers and analyze the economic landscape of Kansas. I would also like to thanks Dr. Procter for helping me better understand the rural grocery market and the challenges that these businesses owners face on a regular basis.

I would also like to acknowledge the Agricultural Economics department and the many faculty and staff who helped me throughout my time as a graduate student. In every class I was challenged and pushed to do my best. These professors helped through the tough classes and deepen my knowledge of economics. Lastly, I would I like thank my fellow graduate students. Without the constant laughter and help from all of you, my graduate school experience would have not been the same.

Chapter 1 - Introduction

Rural grocery stores exist all across Kansas. These stores vary in the size and scope of their operation, but they provide an avenue for community members to obtain food and other grocery items. These stores provide jobs and economic benefits including labor income and taxes to the communities where they are located. While these stores provide a service to their communities, they can struggle to remain economically viable. Since 2006, nearly one out of every five rural grocery stores in Kansas went out of business (Procter, 2010).

With this economic reality, why should a rural community care about their grocery store? The biggest benefit of having a grocery store is the ability to purchase food close to home and not driving long distances to do so. As defined by the U.S. Department of Agriculture (USDA) Economic Research Service (ERS), food insecurity is the limited or uncertain availability of nutritionally adequate and safe food, or limited or uncertain ability to acquire acceptable foods in socially acceptable ways. In Kansas, 15.1 percent of rural residents are at or below the poverty level. In addition, 15.2 percent of Kansans overall are considered food insecure (Parker, 2015). The lack of money, coupled with food insecurity, suggests that some families in rural Kansas are both food insecure and live in poverty.

In the United States, annual health care costs are 36 percent higher and prescription costs are 105 percent higher for those coping with a diet related disease due to obesity than the average citizen. Diet-induced obesity can also cause decreased worker productivity, increased disability payments and increased transportation cost (Hammond and Levine, 2010). Without some of these stores located in the communities, there is potential for a larger percentage of unhealthy individuals within the rural population. Studies done in two counties of North Carolina and Mississippi found that there was a negative relationship between the density of supermarkets and

adult obesity rates (Morland and Evenson, 2009). This meant that the fewer stores in an area, the higher incidence of the population that were obese and overweight.

The term "food desert" also has been associated with lack of access and food insecurity. In the 2008 Farm Act, Congress directed the USDA to assess the extent of areas within the United States where people have limited access to a variety of healthy and affordable foods. These regions, known as food deserts, are characterized by low income, low access to transportation and a limited number of food retailers. The USDA found that 23.5 million people live in low-income areas that are further than 1 mile from a grocery store. Areas with higher poverty rates were more likely to be food deserts regardless of whether they were in a rural or an urban area (Dutko, Ver Ploeg, and Farrigan, 2012).

Food deserts are a concern in rural Kansas and locally-owned stores can help provide an avenue for getting food, but they compete with large merchandisers. When rural grocery store owners in Kansas were surveyed, 80 percent of them indicated that competing with "big box stores" was the biggest challenge they faced (Procter, 2010). Large merchandisers can help lessen the issue of food deserts, but it comes at a cost to small town grocery stores. According to the U.S Census Bureau, 50 to 60 percent of small businesses closed five years after a Walmart opened in a small town (Klimek, Jarmin, and Miranda, 2008).

In general, small business creates more jobs than their larger counterparts. Neumark, Wall, and Zhang (2011) found a negative relationship between establishment size and net job creation, suggesting that the larger the firm, the fewer jobs it created. According to the Small Business Administration, in Kansas' private sector, small business employed over half of the workforce, or 595,048 employees, in 2012. Also in 2012, Kansas small businesses created over 14,000 net new jobs (U.S. Small Business Administration, 2015). Goldschmidt (1947), in his

early work, showed that communities with small-scale, local ownership, as opposed to large firms, tended to exhibit multiple positive economic and social characteristics, such as more schools, parks, civic and social organizations, better infrastructure, more local decision making, and a more stable population.

In summary, when an area is food insecure or within a food desert, there are negative health outcomes. Large merchandisers can help lessen the burden of food insecurity, but it comes at a cost of other small stores going out of business and decreasing overall community's economic viability. This study considers the value these grocery stores contribute to their local economies, specifically grocery stores in rural areas of Kansas. The objective of this research was to find the economic contribution of rural grocery stores in Kansas. IMPLAN (IMpacts for PLANning analysis) was used to measure the economic contribution of a rural grocery store. In addition, data describing city and county characteristics were gathered to determine the factors influencing the relative economic contribution of a grocery store. Ordinary Least Squares (OLS) estimation method was used to study the city and county characteristics in relation to IMPLAN results. These results showed what city and county characteristics influence the economic contribution of a rural grocery store.

In the next chapters, previous literature that related to food issues and small businesses is reviewed. Then, the economic impact analysis of the 163 rural stores, and the city and county characteristics that influence the economic contribution of the store, are presented. Finally, conclusions and implications of this research are discussed.

Chapter 2 - Literature Review

Having a grocery store is important for a community. While there is much research about grocery stores and food retail in general, there is little information about how rural grocery stores contribute to their local economies. Studies of farmer's markets, rural food access, and large chain stores are numerous, but there is very little research specifically related to rural grocery stores. Rural grocery stores constitute an important part of a rural economy by providing jobs, household income, and direct benefits to communities. Concepts such as food deserts and food insecurity bring to light the vital role these small town stores play in an area. Reviewing research related to the economic impact of food retail, food access, and the how large business affect an area, creates a foundation to build upon about rural business climate. This chapter considers previous research findings.

Economic Impact of Food Retail

Independently owned grocery stores provide jobs and revenue for communities across the United States. The National Grocers Association (2013) found that there were 20,884 grocery stores (independently owned) with sales between $2 million and $5 million that contributed 944,205 jobs to the U.S economy in 2012. In Kansas, it was estimated that 197 local independent grocery stores accounted for 10,310 jobs (Economic Impact Advisory Group, 2013).

Other food retail venues, such as farmers market, also have been shown to positively affect an economy. Hughes et al. (2008) studied the economic impact of 37 farmers' markets in West Virginia. Using IMPLAN, they found that there was a net gain of $2.39 million in output, $1.48 million in gross state product and 69.2 jobs attributed to farmers' markets in West Virginia. These researchers used a survey to collect data and had 183 useable vendor responses

about their direct sales at farmers markets across West Virginia. Other IMPLAN sectors that were impacted by farmers market included agriculture, mining, manufacturing, and trade.

Henneberry, Whitacre, and Agustini (2009) also used IMPLAN to measure the economic impact that farmers' markets had on the Oklahoma economy. They surveyed farmers markets' managers, producers, and consumers on various topics. Managers and producers were asked about production practices and dollars spent on operation. Consumers were asked about the amount they spend each week buying produce from local sources. The researchers measured data on gross sales, number of people employed, household income, and total spent at farmers markets. Results showed that for every $1 increase in sales, there was a $1.78 shock throughout the economy. This meant that for every $1 spent, an additional $.78 was generated across all other industries. Overall, farmers markets contributed a total of $5.9 million to Oklahoma economy.

Regardless of classification, stores or consumers that purchased more local food in general create an economic impact for the area. For example, purchasing local and regional food in Florida was shown to have a positive economic impact on the state's economy (Hodges, Stevens, and Wysocki, 2014). Seventy-five hundred surveys were sent to a random sample of households throughout the state of Florida with respondents being asked about the value of food they purchased from local sources including grocery stores, farmers markets, u-pick operations, and food service establishments. With an overall response rate of 21.4 percent from 2011 to 2012, local food purchased by consumers from producers, retailers or restaurants created over 183,000 jobs and added $10.47 billon to Florida's gross state product. This study also reported that the average household spent $1,114 on local food annually.

Sharp et al. (2011) studied the economic impact of increased food sales in Knox County, Ohio. Using IMPLAN, retail food sales were adjusted by increasing 10 percent. This increase created 243 new jobs and $12.8 million in sales in the restaurant and grocery industries, representing a less than one percent of the county's GDP, but a positive impact for the county.

Food Access

Food access is both a rural and urban issue. Food access issues relate to the physical distance to a store while other food issues can relate to the affordability of food, availability of the types of food, and food insecurity. Regardless of rural or urban classification, it has been shown that areas with higher poverty are more likely to be food deserts and have food access issues (Dutko, Ver Ploeg, and Farringan, 2012).

Studies have shown that the farther a consumer is from a grocery store, the less likely they are to consume fresh fruits and vegetables. Bodor et al. (2008) looked at the relationship between the availability of small food stores in New Orleans and the fruit and vegetables that were consumed in households. Residents in four census tracts were surveyed in 2001 about their fruit and vegetable intake. Household distances to food stores in these and surrounding tracts were obtained using geographical information system (GIS) mapping techniques. In-store fruit and vegetable availability was measured by linear shelf space. Multivariate linear regression models were used to measure the association of the store availability measures with household consumption. They found was that stores within 100 meters of a residence was a positive indicator of vegetable intake and that each additional unit of shelf space in a store correlated with a .35 serving per day increase in vegetables. The results for fruit consumption were similar, but not as high. These findings showed that people with greater access of fruits and vegetables ate more of them.

Rose and Richards (2004) studied the relationship between food store access and household fruit and vegetable consumption for participants in the food stamp program. Using the 1996-1997 National Food Stamp survey, 963 households were surveyed on household food consumption and two at-home interviews were conducted to measure fruit and vegetable consumption. In a linear regression to analyze fruit and vegetable intake, independent variables included distance to store, travel time, car ownership, difficulty of supermarket access, and many demographic characteristics. The research showed that when respondents lived greater than 5 miles away from a store, they consumed one serving less of fruit than those that lived within a mile from a store.

What a consumer buys is important, but the options for getting groceries could be limited because of location. Liese et al. (2007) did a cross sectional survey of 75 food stores in Orangeburg County, South Carolina, to find the various products carried. By looking at the differences among supermarkets, grocery stores and convenience stores, they found significant evidence that convenience stores carried fewer healthful options than supermarkets. Another finding was that 49 percent of the convenience stores were located in rural parts of Orangeburg County. The researchers argued that while there may be many ways for rural people to get food, they may not have the most healthful options. There is growing evidence that rural populations face greater disparities in terms of food selection across supermarkets, grocery stores and convenience stores than their urban counterparts. These disparities affect health outcomes and healthy behaviors (Patterson et al., 2004).

Yeager and Gatrell (2014) used statistical GIS and spatial modeling to find linear travel distances between an address and a group of food outlets in Macoupin County, Illinois. They measured the difficulty associated with going a certain distance to buy food. Each food outlet

was assigned a weighted value with grocery stores being given the highest value and convenience stores given the lowest value. They concluded there were a great disparity of food outlets between the more populated southern half and the more rural northern half of the county. This research again suggests that a rural population has limited food access and faces greater challenges.

It should be noted that healthier food options are becoming available across non-traditional food retail outlets including convenience stores, which are more prevalent in rural areas. When looking at rural food outlets in the Brazos Valley of Texas over the course of a month, researchers found that the presence of more nutritious food could be seen in convenience stores. Researchers also noticed that these convenience stores were close to rural neighborhoods, and that although grocery stores and supermarkets were not as prevalent, over half of these convenience stores were providing healthful food options (Bustillos et al., 2009).

Access to healthy foods is important to maintain a high quality of life whether it is in a rural or urban setting. The Mari Gallagher Consulting Group (Gallagher, 2011) determined how low-healthful food access and food imbalance patterns at the census tract level affected the overall health of a given area. These data were paired with diet-related death data to determine the years of life lost in a given area because of a diet-related illness. It was found that when a low access grocery store or convenience stores was less than half a mile away, there was 1,001 years of life lost in the Cincinnati area.

The Effect of Large Merchandisers

Large chain stores that offer groceries are available all across the United States. These large merchandisers include Super Walmart, Super Target, and Kroger chains, just to name a few. While these stores provide both employment and a valuable supply of grocery items to rural

areas of the United States, many studies have shown these large stores actually take away more jobs and contribute less to overall well-being of a rural economy. This discussion is not intended to discredit the economic value of large retail merchandisers. It simply shows how these large stores affect local economies.

Halebsky (2010) studied the effect that chain stores had on the local economy of Courtland County, New York. Using Census data, County Business Patterns, and the economic Census, businesses were classified as chain or non-chain stores. InfoUSA was then used to note sales and net profit for each store. In this study, chain stores accounted for 67 percent of the total sales in the economy. From 1977 to 2002, it was observed that there was a loss of 15 retail trade establishments in the county. It was concluded that large chain stores had a negative impact on consumer welfare, because they displace local stores, hire fewer people, and citizens lose some control over their communities.

Artz and Stone (2006) estimated the economic impact Walmart Supercenters have on nonmetropolitan and metropolitan communities. Researchers regressed the difference in population, income, number of restaurants, casinos, on the economic growth of the food and beverage sector one, two, and three years before the opening and after the opening of a Walmart. Using OLS estimation, it was observed that within the first year of a Walmart Supercenters' opening, it reduced food and beverage sales growth by 2.8 percent and an additional 6.3 percent the following year. Using Instrumental Variable (IV) estimations, the impact was larger with a 6.3 percent decrease in the first year and 10.5 percent decrease in the food and beverage sector the second year. The estimated two-year reduction in sales growth from a Supercenter opening translated to a decline in sales of roughly $7.5 million in the host county. The researchers

concluded that when a Walmart Supercenter opened, nearby grocery stores would also reduce prices to compete.

Stiegert and Sharkey (2007) examined how food prices were affected by supercenters either merging, entering the market, or growing their market share in metropolitan statistical areas. Their dependent variable was the Consumer Price Index food-at-home price index, and independent variables were market share for supercenters, store concentration, income change, population, electricity, rental prices, and payroll-to-sales ratio. The researchers found that a supercenter growing their market share and supermarket entry did not have an effect on the price of food, but the merging of supercenters led to higher food prices. They noted that supercenters consolidate because of cost savings, but this savings is not passed on to the consumer via lower food prices.

Even in urban settings, there are data to support the negative effect Walmart has on employment. Ellickson and Grieco (2013) quantified the effect that Walmart had on rival firms by using a model to measure job creation, employment growth, store size, and revenue. From 1994 to 2006, when a Walmart opened in an urban area, researchers observed a 7 percent decrease in employment within a two-mile radius of a Walmart opening. This same effect was also seen when a Kroger chain opened within a 2-mile radius, but the decrease in employment was not as large.

Conclusion

As the reviewed literature shows, various types of food retail outlets contribute jobs and revenue throughout the areas studied. At the same time, the lack of food access can have serious health implications. Lastly, it was shown that the availability of large merchandisers can lead to lower prices for consumer, but may in turn stifle local economic growth. This paper adds to the

current literature by showing the economic impact that independently owned grocery stores in rural areas have on the Kansas economy using an IMPLAN analysis. This research also looks at what community and regional characteristics affect the economic impact of a rural grocery store using OLS regression. Large merchandisers may be able to help with problems related to food deserts and low food access issues, but they hurt a community's economy. Independently owned grocery stores may help with both food access and ancillary community economic benefit.

Chapter 3 - Rural Grocery Store Impact Analysis

In this section, we will look at the methods and results used for studying the economic impact of rural grocery stores in Kansas. Social Accounting Matrix (SAM) analysis is the way IMPLAN measures the economic activity in a geographic area. In this chapter, the theoretical framework for Input-Output (I-O) and SAM analysis will be presented. Also, the data, results, and conclusions from the rural grocery impact analysis will be discussed.

Methods

Input-Output Analysis

Input-Output analysis is the analytical framework developed by Wassily Leontief in the late 1930s. Leontief received the Nobel Prize in 1973 for his work on I-O analysis. The I-O framework is used to analyze the interdependence of industries in an economy. This system is built upon a system of linear equations that describes the distribution of an industry's product throughout an economy (Miller and Blair, 2009).

The I-O system accounts for the economic flows in a region at one point in time. The region can be as large as a nation to as small as a city. I-O looks at the economic activity between industries and assumes that a given industry is both producer and a consumer of goods and services. Industries purchase inputs in the production process to create outputs for intermediate and/or final demand. (Miller and Blair, 2009).

Theoretical framework of I-O

Miller and Blair (2009) provide the foundation for I-O analysis. Regional economies consist of many industries, which will be denoted by $i = 1,. 2,\ldots, n.$ The total production of an individual industry is designated by X_i and the total final demand for the industry is designated as

Y_i. Total final demand refers to value of sales of industry *i* goods to final consumers (Isard et al. 1998). Lastly, z_{ij} represents interindustry sales by one industry to another, such that:

$$X_i = z_{i1} + z_{i2} + \cdots + z_{ii} + \cdots z_{in} + Y_i$$

Different industries obtain goods and services from numerous sources. The relationship between an industry's output and inputs, can be represented by the ratio of $a_{ij=}z_{ij}/X_j$. The interindustry flow between *i* and *j* depends on the total output of *j*. This relationship can be depicted by rewriting $a_{ij=}z_{ij}/X_j$ to $z_{ij} = a_{ij}X_j$. Substituting the *z*'s for the interindustry transactions shows the relationship between an industry's total output, the fixed interindustry flow, and final demand. The systems of equations is rewritten:

$$\begin{gathered} X_1 = a_{11}X_1 + a_{12}X_1 + \cdots a_{1n}X_1 + Y_1 \\ X_2 = a_{21}X_2 + a_{22}X_2 + \cdots a_{2n}X_2 + Y_2 \\ \vdots \\ X_n = a_{n1}X_n + a_{n2}X_n + \cdots a_{nn}X_n + Y_n \end{gathered}$$

Letting *A* become a matrix of coefficients for the fixed values of a_{ij}, *X* be a vector of the total output and *Y* become the vector of final demand, the equation becomes:

$$X = AX + Y$$

This equation can be re-written as:

$$X = (I - A)^{-1}Y$$

This equation captures a linear system of regional economic transactions in response to a change in final demand.

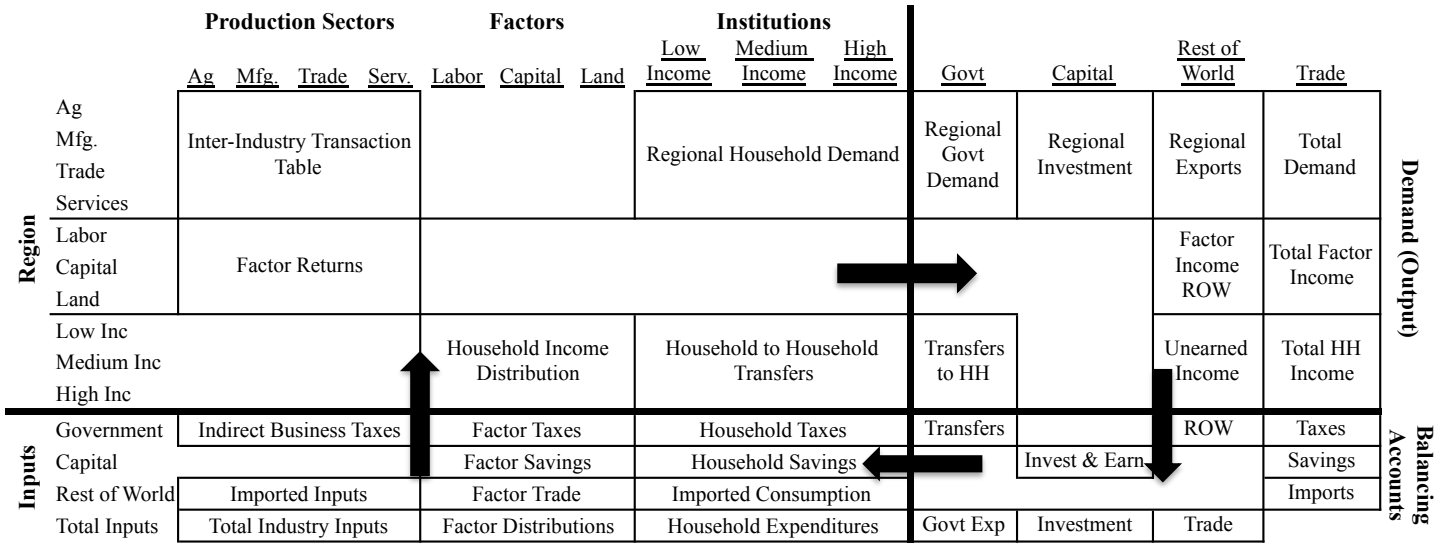
Social Accounting Matrix

Social Accounting Matrix (SAM) is a comprehensive accounting system tracking financial flows between industries and institutions within and external to the region. Institutions

include households, government, financial transfers and savings/investments. Finally, trade is accounted for by regional imports and exports (Leatherman 1995).

The construction of a SAM looks at regional economic activities of an area. Each SAM account is labeled endogenous or exogenous to the economy. Exogenous changes in demand drive endogenous responses within the regional economy. The regional economy can be represented by a transaction table. This transactions table shows the relationship among households, industry, government and other outside factors that affect an economy. Figure 3.1 is a simplified version of a transactions table.

Figure 3.1 Transaction Table



Inputs flow into the economy from the lower left quadrant as government taxes, imported inputs and payments, other capital investment and labor. These come in the form of taxes on production and imports, imported production inputs, and payments to capital and labor. The flow in the transaction table then moves clockwise as inputs flow into the region where industries use inputs to generate goods and services. The region trades within itself, households demand goods and services, and households transfer other goods and services to each other. The transaction

table then flows from left to right as government demand, capital investment, and regional exports flow out of the regional economy to create total demand. The lower right quadrant includes balancing accounts that ensure inputs equals outputs, which are transferred in and out of the region.

The matrix of equations of this transaction table is presented in Adelman and Robinson (1986). Keeping households internal to the economy, the SAM can be represented in matrix form:

$$A^* = \begin{bmatrix} A & 0 & 0 & C \\ F & 0 & 0 & 0 \\ 0 & Y & 0 & 0 \\ 0 & 0 & H & T \end{bmatrix}$$

where A^* is the SAM matrix of the direct coefficients ($n+f+m+k,\ n+f+m+k$),

A is the matrix of direct coefficients for production activities ($n,\ n$),

F is the matrix of factor income (value added) coefficients ($f,\ n$),

Y is the matrix of factor income distribution coefficients (m,f),

C is the matrix of household expenditure coefficients (n,k),

H is the matrix of household info distribution coefficients (k,m),

T is the matrix of inter-institutional transfer coefficients (k,k),

n is the number of production sectors,

f is the number of factors,

m is the number of institutions, and

k is the number of household income classes.

Supply needs to equal demand, and when combining households and institutions the equation can be written:

$$\begin{bmatrix} X \\ F \\ Y \end{bmatrix} = A^* \begin{bmatrix} X \\ F \\ Y \end{bmatrix} + \begin{bmatrix} ex \\ ef \\ ey \end{bmatrix}$$

where X is a vector of sectoral supply (n,1),

F is a vector of factor income categories (land, labor, capital) (f, 1),

Y is a vector of institutional incomes (m+k, 1),

ex is a vector of exogenous demand for regional commodities (n,1),

ef is a vector of exogenous factor income (f,1), and

ey is a vector of exogenous institutional income (m+k,1).

The SAM inverse multiplier matrix is calculated by inverting the $(I - A^*)$ matrix that is related to sectoral supply, factor incomes and institutional incomes to exogenous demand. This equation is written:

$$\begin{bmatrix} X \\ F \\ Y \end{bmatrix} = M \begin{bmatrix} ex \\ ef \\ ey \end{bmatrix}$$

where M is the inverted coefficients matrix $(I - A)^{-1}$.

The inverted coefficients matrix yields the SAM multiplier table. The model is completely demand driven, with no supply constraints specified. Changes in demand are introduced through exogenous vectors (Leatherman, Cader, and Bloomquist, 2004). In this analysis, the change is introduced though the assumption that the rural grocery store of interest is taken out of the region and community households must seek a second best choice for obtaining groceries.

Among the limitations of I-O (SAM) analysis are its linear production function, unconstrained supply assumptions, and the lack of temporal considerations. Further extensions of I-O analysis techniques, various conjoined modeling techniques, and computable general

equilibrium modeling techniques address these shortcomings. A good overview of these techniques is found in Isard et al. (1998).

SAM Example

An illustration of I-O (SAM) may better represent the transactions made in IMPLAN. This discussion will focus around the basics of I-O (SAM) analysis and how the multipliers are built and reported on. This example will closely follow a Deller (2014) report on the contribution of agriculture to the Wisconsin economy.

I-O shows the relationships between producing (manufacturing firms) and consuming sectors (households) and the rest of the world (exports and imports). As previously shown, a transactions table shows the goods and services produced by sectors in the region. In this example, the transaction table can be read in two ways. Reading down the column yields the purchases by the sectors from other sectors in the economy. Reading across yields the sales of goods to other sectors.

Table 3.1 Example Transaction Table

	Purchasing Sectors (Demand)			Final Demand		
Processing Sectors	Ag	Mfg	Serv	HH	Exports	Output
Ag	10	6	2	20	12	50
Mfg	4	4	3	24	14	49
Services	6	2	1	34	10	53
HH	16	25	38	1	52	132
Imports	14	12	9	53	0	88
Inputs	50	49	53	132	88	372

Source: Deller (2014)

Reading down the column, we can see that agriculture purchases $10 of goods from other agriculture industries. Agriculture also purchases $4 from manufacturing, $6 from services and $16 from households (HH). Purchases from the household sector represent value added or income in the form of wages and investment returns. Agriculture purchased $50 worth of inputs

in total. Reading across, agriculture as a supplier sold $10 worth of output to agriculture, $6 to manufacturing, $2 to services and $20 to households. The $12 left was exported out of the region. This $32 worth sold to households and exported was sold for final demand. This transaction table is balanced in that supply equals demand. This transaction table shows the interdependencies between sectors and the total household income for a given region. In this model exports also equal imports, and more open economies will have a higher percentage devoted to imports, which has a direct effect on the size of the economic multipliers.

Patterns of expenditures made by a sector can be stated in terms of proportions. These are the proportions of all inputs needed to produce one dollar of output in a given sector. To get the value of proportions, this is done by dividing the dollar value of inputs purchased from each sector by the total expenditures. This is called the direct requirements table.

Table 3.2 Example Direct Requirements Table

	Purchasing Sectors (Demand)		
Processing Sectors	Ag	Mfg	Serv
Ag	0.20	0.12	0.04
Mfg	0.08	0.08	0.06
Services	0.12	0.04	0.02
HH	0.32	0.51	0.72
Imports	0.28	0.24	0.17
Inputs	1.00	1.00	1.00

Source: Deller (2014)

This table can only be read down and each cell represents the dollar amount of inputs required from the industry named at the left to produce $1 worth of output from the sector named at the top. In this table, to increase a $1 of output from agriculture would require 20 cents of products from other agriculture sectors, 8 cents from manufacturing, 12 cents from services and 32 cents from households. Twenty-eight cents worth of imported products are needed for each $1 of additional output. This table is unique in that if there is an increase in agriculture output, there

will also be an increase the other subsequent sectors. In order for manufacturing to produce more output for agriculture, it will need 12 cents from the agriculture sector, 8 cents from itself, and 4 cents from services. This process is repeated with services and continually repeated until the value is insignificant. These values that are not from the initial increase are known as the indirect effects.

The results of the direct and indirect effects are presented as the SAM inverse multiplier table. Each cell indicates the dollar value of output from the sector named at the left that will be required in total for a one-dollar increase in final demand from the sector at the top of the column.

Table 3.3 Multiplier Table

	Purchasing Sectors (Demand)		
Processing Sectors	Ag	Mfg	Serv
Ag	1.28	0.17	0.06
Mfg	0.12	1.11	0.07
Services	0.16	0.07	1.03
Total	1.56	1.35	1.16

Source: Deller (2014)

In agriculture production, a $1 increase results in a $1.28 for final demand. For every $1 of direct agriculture sales there will be an additional 28 cents of economic activity. This table also shows the economic linkages between industries. For a $1 increase in demand for agricultural products there is a 12 cent increase in manufacturing goods.

Regional economies are not entirely self-sufficient. They need goods and services from outside the area in order to produce. However, some economies are more open than others and rely on imported goods and services. This “openness” of an economy can be reflected by the value of the import proportion. The higher the proportion of the import row in the direct requirement table (Table 3.2), the more open an economy. As imports increase, the values of the

direct requirement coefficients will decline. The multipliers then will be smaller due to larger imports. These smaller multipliers were important in our research, as they impacted our results when looking at grocery stores across Kansas.

This SAM inverse multiplier table can then be used to see what impacts exogenous factors have on an economy. It can also show the changes that ripple throughout the economy and what industries are affected. In this example, a $1 increase in the final demand for agricultural output yields output equal to a $1.56. For every initial dollar increase there is 56 cents in indirect and induced effects.

IMPLAN Applications

IMPLAN (IMpact for PLANning analysis) was created beginning in 1976 as a regional economic impact modeling system for the USDA Forest Service. Since its creation, organizations like U.S. Bureau of Economic Analysis, the Federal Emergency Management system (FEMA), private consulting firms and the Federal Reserve Banks, are all IMPLAN users (IMPLAN Group, 2015).

IMPLAN has many ways that it can help a researcher characterize a regional economy. This includes estimating the jobs created, tax implications, and the total effects of an economic shock. Some of the IMPLAN descriptive variables used in this study are:

- Employment: jobs that the industry supports, including both full- and part-time jobs
- Labor Income: all forms of employment income, including employee compensation (wages and benefits) and proprietor income
- Value Added: difference between an industry or an establishment's total output and the cost of its intermediate inputs. It equals gross output (sales or receipts and

other operating income, plus inventory change) minus intermediate inputs (consumption of goods and services purchased from other industries or imported). Value added consists of compensation of employees, taxes on production and imports less subsidies (formerly indirect business taxes and nontax payments), and gross operating surplus. This value is referred to here as the economic contribution.

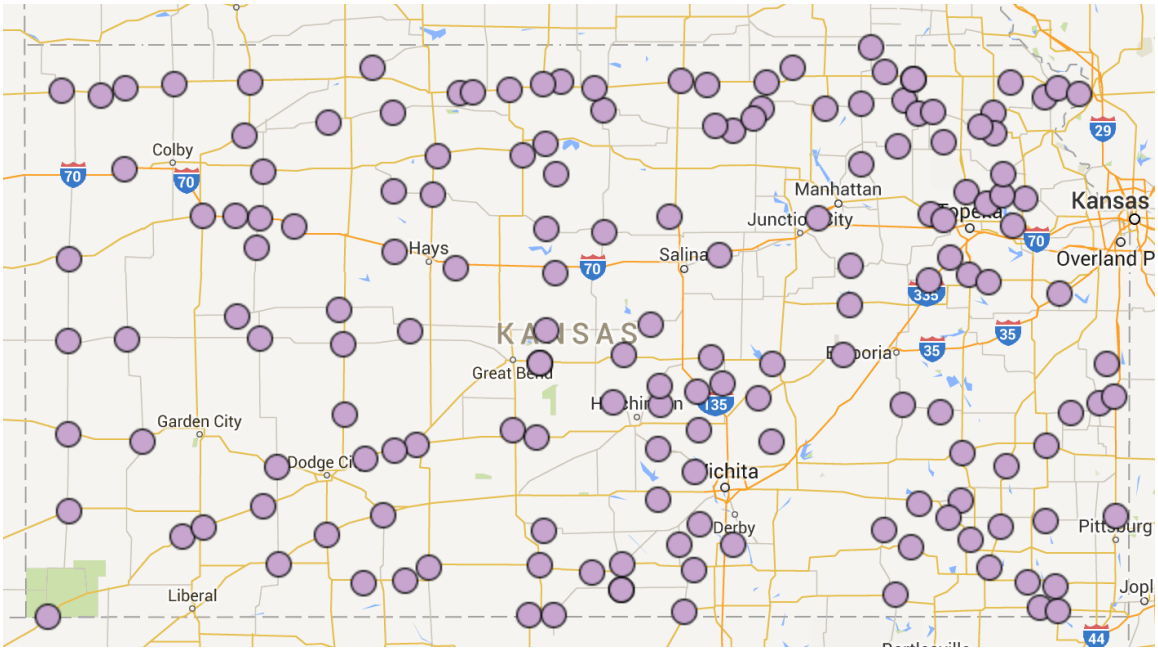
- Output: represents the value of industry production. In IMPLAN, these are annual production estimates for the year of the data set and are in producer prices. For manufacturers, this would be sales plus/minus change in inventory. For service sectors, production equals sales. For retail and wholesale trade, output equals gross margin (IMPLAN Group, 2015)

The unit of analysis for our analysis focuses on changes to regional (county) value added data.

Data

This section focuses on the data gathered for the impact analysis. The first step was to define what constituted a rural community. For this analysis, a rural community was defined using the population threshold of under 2,500 residents from the U.S Census Bureau American Community Survey (ACS) five year estimates for 2009-2013 (2015). A list of grocery stores was provided by the Center for Engagement and Community Development Rural Grocery Initiative at Kansas State University and was used in this study as the stores that were evaluated. The original list of stores included 190 stores. The list was narrowed to 163 stores based on the population threshold, a store being locally managed, and the availability of employment and ACS survey data. Figure 3.2 shows the locations of the stores that were used in this study.

Figure 3.2 Map of Rural Grocery Stores used in this Study



Our sample covers a great range of areas across Kansas. Seventy-nine of the 105 counties in Kansas were represented by this data.

In this research, we estimated the economic contribution by calculating the avoided loss of grocery store activity and household income. Household income loss of a city was measured by the costs a household would incur by driving a farther distance to the next alternative grocery store. Employment for each store was obtained by the using Kansas Quarterly Census of Employment and Wages data (Bureau of Labor Statistics, 2012) and ReferenceUSA (Infogroup, 2015). This value captured the number of employees a store paid in 2012. When evaluating the loss of household income from traveling a farther distance, Google Maps® was used to find the store and the next nearest alternative store in the shortest amount of driving miles. The Internal Revenue Service value for travel reimbursement for 2014 of $.56 per mile was used to calculate the cost of gas and other car expenses for traveling (Internal Revenue Service, 2015). If a town had more than one grocery store, the distance was given a zero value for the travel expense since it was likely that customers would shop at the other store. Using the U.S Department of

Transportation personal travel time estimates for 2014 of $12.25 per hour, the extra time to travel to the next alternative grocery store was also included (Ayala, 2014). The assumption was then made that people shop for groceries once a week. The cost of traveling and time to travel to the next alternative grocery store would be incurred at least once a week giving a yearly cost of shopping at the alternative grocery store.

It was not reasonable to assume that every household in a city shops at their local grocery store. We assumed that one population group would likely experience hardship associated with the loss of a grocery store: the elderly. To define and calculate this estimate, 2010 Census data for the number of householders that were over the age of 65 was used for each city. Half of the households with someone over the age of 65-74 were used along with all households that had someone over the 75 and above. Taking this value and dividing by the total number households gave a percentage of households that would be affected by the loss of the store. Multiplying the number of households affected by the costs incurred traveling to the alternative grocery store yielded an estimate of the loss of income from each city. To select the appropriate household income class to model in IMPLAN, median household income was looked up for each city using ACS 2013 five-year estimates.

For our IMPLAN models, 2012 county data were used. Exogenous factors to the model included the loss of the grocery store and the loss of household income due to increased travel. To do this, the loss of jobs for each store in sector 400 of IMPLAN was entered. Sector 324 of IMPLAN was used because that is the sector that captures food and beverage establishments, which would include grocery store. Eliminating the employment also eliminated all of the associated income of the business activity. Next, the loss of household income was entered into the software. The median household income was obtained for each city, multiplied by the

number of affected households and applied to the appropriate household income category within IMPLAN. This yielded an estimate of the total economic contribution of each grocery store.

Results

As shown in Table 3.4, the total household income loss for all affected Kansas communities was $18,208,036 and the average loss of income for a city was $111,705. The variables used to calculate the loss of household income from increased travel are labeled:

- Distance: number of miles for a one-way trip to the next nearest grocery store
- Annual Travel Cost per Household (HH): number of miles times 0.56 per mile times two for a round trip, then times 52 weeks
- Annual Time Cost per HH: time that it takes to travel times $12.25 per hour of travel times 52 weeks
- Total Cost: the total cost per year it would take to travel to the next alternative grocery store
- Total Number of HH: total number of households in the city
- % of HH Affected: the percentage of elderly households that would be affected by the loss of the grocery store
- Total City Cost: the total travel cost times the total number of households times the percent of households affected
- City Median HH Income
- Store Employment: store employment as reported by the Kansas Quarterly Census of Employment and Wages
- Employment loss from increased travel costs: the number of jobs loss because of a loss to household income

Looking at the data from geographical standpoint, the farther west a store was in Kansas, the greater travel costs that were incurred. The loss of household income translated to the loss of 404.1 jobs throughout the state of Kansas. This data showed not only the loss of the grocery business but also the jobs that were lost because Kansans did not have the time or money to spend on other goods or services.

Table 3.4 Direct Effects of Increased Travel Costs and Loss of Grocery Store

	Total	Average	Median	Max	Min
Distance	2,193.70	13.46	13.10	33.80	0.00
Annual Travel Cost per HH	$127,761.09	$783.81	$762.94	$1,968.51	$0.00
Annual Time Cost per HH	$54,638.04	$335.20	$318.50	$789.88	$0.00
Total Cost	$182,399.13	$1,119.01	$1,077.80	$2,758.39	$0.00
Total Number of HH	68,778.00	421.95	405.00	1,048.00	32.00
% of HH Affected	--	24.71%	24.80%	36.50%	5.10%
Total City Cost	$18,208,036.44	$111,705.75	$73,793.25	$574,790.25	$0.00
Median HH Income		$42,154.46	$41,563.00	$92,813.00	$19,779.00
Store Employment	2,324.00	14.26	12.00	102.00	1.00
Employment lost from increased travel costs	-404.1	-2.48	-2	-13.6	-0.1

The IMPLAN results in Table 3.5 showed the economic contribution of rural grocery stores in Kansas. Losing these grocery stores would take away a total of 2,728 direct and indirect jobs and over $105 million of total income to the Kansas economy. The Kansas economy supports 1,827,154 jobs, and the loss of these stores would result is a 0.14 percent decrease in the total number of jobs. On average, these stores contributed 16.7 jobs and $644,413 of value added to their communities. The minimum value that a store contributed to the community economy was 1.1 job and $38,441 total income. The maximum value that a store contributed to the economy was 113.5 jobs and $3.9 million total income. Ironically, these two stores were located in the same city.

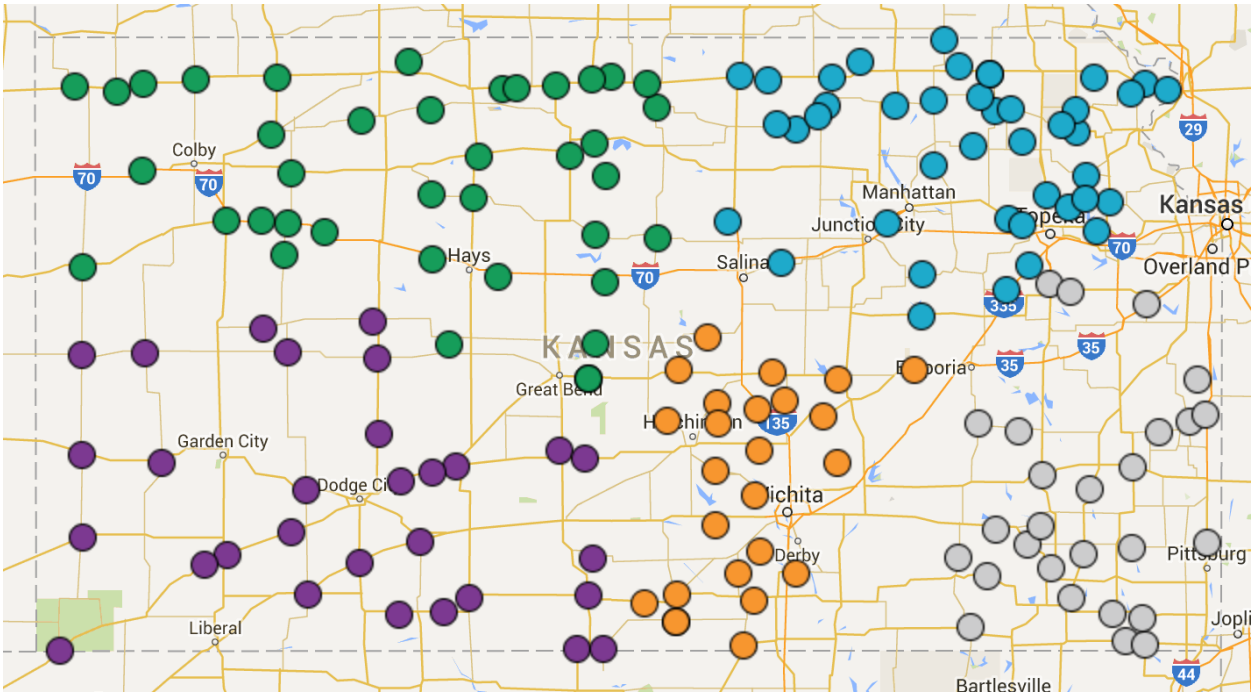
Table 3.5 Total Economic Contribution of Rural Grocery Stores: IMPLAN Results

	Total	Average	Median	Max	Min
Total Employment Change	-2,728.10	-16.74	-13.50	-113.50	-1.10
Labor Income Change	$68,795,138	$422,056.06	$352,414	$2,518,605	$24,672
Value Added	$105,039,398	$644,413.48	$522,407	$3,921,027	$38,441
Output	$167,273,058	$1,026,215.08	$822,103	$6,400,174	$62,747

Location Matters

The economic contribution of a rural grocery depended on its location within the state of Kansas. The stores were divided into five different regions based on county the store is located in: Northeast, Southeast, South Central, North Central, Northwest, and Southwest, as color-coded in Figure 3.3.

Figure 3.3 Map of Area Locations



There were 42 stores in the Northeast, 39 in the Northwest, 25 in South Central, 27 in the Southeast, and 30 stores in the Southwest. As shown in Table 3.6, the stores in the Northeast had the highest total economic contribution (value added) of over $29 million to the economy.

Northwest had a total of over $22 million, Southwest over $19 million, Southeast $17 million, and lastly South Central $16 million. Since our sample had varying ranges of values across districts, the average or median values tell a clearer picture of how the areas differ from each other.

On average, stores in the Northeast contributed $698,940 of value added, $678,980 in the South Central, $647,177 in the Southwest, $633,166 in the Southeast, $569,196 in the Northwest. The farther west a city was, the greater travel costs incurred. Hence, cities in the Northwest and Southwest faced much higher costs associated with traveling to the next alternative grocery store than the other regions. It was also seen that there was a higher percentage of households that would also be affected by the loss of a grocery store within these two regions. Adding the total household income loss from traveling to the next alternative grocery, the Northwest and Southwest had a loss of over $9.6 million to the cities included in this study.

Table 3.6 Area IMPLAN Results

		Distance	Annual Travel Cost per HH	Annual Time Cost per HH	Total Cost	Total Number of HH	% of HH Affected	Total City Cost	Median HH Income	Employment	Total Emp Change	Labor Inc Change	Value Added	Output	Employment lost from increased travel costs
Northeast	**Total**	470.50	$27,401.92	$11,941.20	$39,343.12	15168.00		$3,432,745		712	-826.4	$18,536,113	$29,355,472	$48,171,728	-114.4
	Average	11.20	$652.43	$284.31	$936.74	361.14	0.23	$81,732	$44,040.21	16.95	-19.68	$441,336	$698,940	$1,146,946	-2.72
	Median	10.35	$602.78	$293.02	$901.63	299.00	0.24	$50,375	$42,299.00	10.5	-12.45	$264,995	$432,394	$726,948	-1.4
Northwest	**Total**	591.00	$34,419.84	$15,021.73	$49,441.57	15267.00		$5,199,399		492	-586	$14,507,108	$22,198,640	$35,663,083	-94
	Average	15.15	$882.56	$385.17	$1,267.73	391.46	0.28	$133,318	$39,080.00	12.62	-15.03	$371,977	$569,196	$914,438	-2.41
	Median	14.50	$844.48	$382.20	$1,235.78	327.00	0.29	$105,688	$38,917.00	8	-10.4	$261,198	$360,805	$602,634	-1.5
South Central	**Total**	298.3	$17,372.99	$7,669.48	$25,042.47	12765.00		$2,689,012		325	-396.2	$11,529,673	$16,974,506	$26,341,451	-71.2
	Average	11.93	$694.92	$306.78	$1,001.70	510.60	0.23	$107,560	$43,846.72	13	-15.85	$461,187	$678,980	$1,053,658	-2.85
	Median	12.6	$733.82	$340.16	$1,067.25	483.00	0.23	$77,307	$41,591.00	10	-13	$369,641	$568,326	$880,028	-2.5
Southeast	**Total**	316.5	$18,432.96	$7,937.02	$26,369.98	12153.00		$2,342,448		365	-427	$11,340,853	$17,095,472	$26,749,005	-62
	Average	11.72	$682.70	$293.96	$976.67	450.11	0.23	$86,757	$36,513.33	13.52	-15.81	$420,032	$633,166	$990,704	-2.30
	Median	12	$698.88	$296.84	$1,017.38	419.00	0.25	$63,966	$37,045.00	12	-14.6	$430,028	$699,216	$1,145,084	-2.3
Southwest	**Total**	517.40	$30,133.38	$12,068.60	$42,201.98	13425.00		$4,544,434		430	-492.5	$12,881,391	$19,415,308	$30,347,791	-62.5
	Average	17.25	$1,004.45	$402.29	$1,406.73	447.50	0.24	$151,481	$47,178.00	14.33	-16.42	$429,380	$647,177	$1,011,593	-2.08
	Median	16.80	$978.43	$394.94	$1,360.63	445.00	0.25	$142,791	$46,423.00	13.5	-15.55	$408,446	$634,185	$965,219	-1.85

When examining the median values of each of the regions, the Southeast region had a median value of $699,216, $634,185 in the Southwest, $568,326 in the South Central, $432,394 in the Northeast and $360,805 in the Northwest. This high value in the Southeast region could be showing how the different store characteristics affect the economic contribution of rural grocery stores. These influencing characteristics are discussed in Chapter 4. Whether looking at the averages or median values, it is clear that population densities have a significant effect on the economic contribution of a rural grocery store.

While the Northeast saw the greatest economic contribution both in total and on average, the Northwest, Southeast, and Southwest areas would be the hardest hit by the loss of a local grocery store. As mentioned in the SAM Example section, regions that are more open have smaller economic multipliers. With western and southeast communities being heavily focused in agriculture, they would need more imports to provide the goods and services they demand. Communities in the east, however, would have larger economic multipliers because it is a more complex economy and a shock to one industry would have a greater ripple-effect throughout the rest of the economy.

The IMPLAN multipliers were also studied and found that these economic multipliers ranged from 1.17 to 1.57. These multipliers indicate that for every dollar spent at these local grocery stores meant an extra .17 cents and .57 cents of economic activity within the community, respectively. This varying range reflects the diversity of communities within Kansas. As previously mentioned, the more complex the economy, the greater the economic impact and greater the economic multiplier. The range of multipliers shows that no matter how small the store maybe, there is distinct economic benefit to having it in a rural area of Kansas.

Conclusions

In conclusion, these grocery stores provide a notable, direct economic benefit to the communities they serve. Using IMPLAN analysis, we see the total impact (loss/contribution) to the communities. These stores create jobs and save travel costs for a city. One of the biggest limitations of this part of the study is that this data can only estimate what might happen. Assumptions regarding the population that would be affected are only estimates. It is common for many people to commute to work and shop where they work. It is unclear what the exact behavioral responses of city residents would be if they were to lose the local store. They may already be shopping elsewhere. At the same time, it should be noted though that these estimates likely to be on the conservative side because IMPLAN only measures one point in time. If a grocery store were lost in a community, the local jobs would be gone and the travel costs would be incurred year after year. IMPLAN does not measure over multiple years or do any time series estimates. Another limitation of this study is that multipliers presented in this research are just estimates of dollars generated back to the community. IMPLAN uses an overall multiplier to compute the economic contribution of an event. Originally, an attempt was made to find a rural grocery store multiplier, but the response rate to the surveys that were sent out was too low for the task to be feasible. Overall, these estimates provide a foundation for further analyzing rural grocery stores.

Chapter 4 - Economic Contribution of Rural Grocery Stores and Community Characteristics

While many grocery stores do provide valuable economic contributions, what makes one grocery store economically more valuable than another? In this chapter, this question is explored through Ordinary Least Squares (OLS) regression analysis using the information that was generated from IMPLAN. This section provides a foundation for community planners or economic developers to better understand how the local economy functions. This section also helps identify the community characteristics and other factors that help maximize the economic benefits of a rural grocery store.

Data

To provide an accurate data set that describes why one store provides a greater economic contribution than another, city and county characteristics were used in the model. Because it was unclear what community characteristics would contribute to a store's economic contribution, a comprehensive data set was developed, consisting of observations of over 40 variables for all 163 cities where stores in the IMPLAN analysis were located.

Table 4.1 Definitions of Variables for OLS Modeling

Variable	Definition (Source)
Value Added	Value Added is the economic contribution of the rural grocery store (from IMPLAN)
lnValue Added	the natural log form of value added
Value Added Proportion	the percentage to which the grocery store contributed to the county economy
City Population	total city population (ACS 2013)
lnCity Population	natural log form of city population
City Median HH Income	median household income (ACS 2013)
lnCity Median Income	natural log form of city median income (ACS 2013)
County Seat	dummy variable 1=county seat, 0=not the county seat
City Total HH	number of households in a city (ACS 2013)
City Poverty Level	percentage of household at the poverty level (ACS 2013)
City Female HOH	percentage of households that have no male present, female is the sole caretaker (ACS 2013)
City HH with 60<	percentage of households that has someone over the age of 60 (ACS 2013)
City HH with 0to17	percentage of households that have someone the age of 0 to 17 (ACS 2013)
City HH w/Disability	percentage of households that has someone with a disability (ACS 2013)
City Median Age	median age of the city (ACS 2013)
City Median Housing Values	median housing values for the city (ACS 2013)
lnCity Median Housing	natural log for of median housing values
City Labor Force Participation Rate	percentage of the city that is able to work and is working (ACS 2013)
County Population	total county population (ACS 2013)
Interstate Highway	interstate highway that goes through a county 1=yes, 0=no
Rural Urban Code (RUC)	defines the how rural a county is; given a value 1-9, 1 for more urban, 9 for rural (ERS 2013)[2]
RUC 20,000 or more	values 1-5 in the RUC, given a 1=yes, 0=no
RUC 2500 to 19,999	values 6 and 7 in the RUC, given a 1=yes, 0=no
RUC less than 2500	values 8 and 9 in the RUC, given a 1=yes, 0=no
Adjacent/Nonadjacent	based off the RUC values 1-4, 6,8; 1=yes, 0=no
MSA/Non MSA	county classification of a MSA or Non MSA; 1=MSA, 0=Non MSA (US Census Bureau)
Population Low Access	percentage of people in a county living more than 1 mile from a supermarket or large grocery store if in an urban area, or more than 10 miles from a supermarket or large grocery store if in a rural area (ERS 2014)[1]
Seniors Low Access	percentage of seniors (age >64) in a county living more than 1 mile from a supermarket or large grocery store if in an urban area, or more than 10 miles from a supermarket or large grocery store if in a rural area (ERS 2014)[1]
Grocery Stores/1,000 pop	number of grocery stores per 1000 (ERS 2014)[1]
Supercenters/1,000 pop	number of supercenters per 1000 (ERS 2014)[1]
Convenience Stores/1,000 pop	number of convenience store per 1000 (ERS 2014)[1]
Total County Employment	total number of people employed in the county in 2013(Woods and Poole 2015)
Total County Establishments	total number of business establishments in the county in 2013 (Woods and Poole 2015)
Establishment/1000 Pop	number of business establishments per 1000 people (OLG KSU 2015)[3]
Total Expend	total expenditures for a county (OLG KSU 2015)
Total Assessed Value	total wealth for a county or value of county assets (OLG KSU 2015)
lnTotal Assessed Value	natural log form of total assessed value (OLG KSU2015)
Retail Sales Tax	revenue generated from sales tax (OLG KSU 2015)
Totaled	total revenue for the county (OLG KSU 2015)
Expenditures/capita	value of expenditure per capita (OLG KSU 2015)
Total Assessed/capita	total assessed value per capita (OLG KSU 2015)
Total Revenue/Capita	total revenue per capita (OLG KSU 2015)

[1] http://www.ers.usda.gov/data-products/food-environment-atlas.aspx

[2] http://www.ers.usda.gov/topics/rural-economy-population/rural-classifications.aspx

[3] Office of Local Governement-Kansas State University

The dependent variable for our model was the value added totals (*Value Added*) obtained from IMPLAN for each grocery store. Stata Version 13.1 was used to run the regression models. There were no clear hypotheses regarding which variables would be statistically significant. To determine which variables to include, correlations were computed for the explanatory variables in the dataset using Stata. After determining which variables could not be used together, multiple regression models were run to find the best fitting model. Numerous models were tested using the raw value added estimates from IMPLAN, but were consistently poor-performing. To enhance statistical performance, the natural logarithm form of value added (*ln Value Added*) was considered for the dependent variable. Also, total value added for each grocery store was divided by the total county value added. This gave a proportionate contribution of the grocery store activity to the county's economy. This variable was labeled the *Value Added Proportion*. Both versions of the dependent variable have justification for being used to determine the economic contribution a rural grocery store could have on a community.

The final models are presented in their equation form with related summary statistics of variables in each model:

$$lnValueAdded$$
$$= \beta_0 + \beta_1(lnCityPop) + \beta_2(lnCityMedianIncome) + \beta_3(CityHHwith0to17)$$
$$+ \beta_4(RUClessthan2500) + \beta_5(PopulationLowAccess)$$
$$+ \beta_6(ConvenienceStoreper1000) + \beta_7(lnTotalAssessedValue) + \varepsilon$$

Table 4.2 Summary Statistics for the *lnTotalValueAdded* Model

	n	Mean	Max	Min	SD
lnTotalValue Added	163	12.94	15.18	10.56	1.05
lnCityPopulation	163	6.61	7.82	4.26	0.90
lnCityMedianIncome	163	10.63	11.44	9.89	0.22
CityHHwith0to17	163	0.29	0.50	0.06	0.08
RUClessthan2500	163	0.44	1.00	0.00	0.50
PopulationLowAccess	163	0.36	1.00	0.02	0.28
ConvenienceStoreper1000	163	0.63	1.25	0.00	0.29
lnTotalAssessedValue	163	9.46	10.83	8.65	0.51

$$ValueAddedProportion$$
$$= \beta_0 + \beta_1(lnCityPopulation) + \beta_2(County\ Seat) + \beta_3(CityHHwith60)$$
$$+ \beta_4(CityHHwith0to17) + \beta_5(RUCless2500)$$
$$+ \beta_6(ConvenienceStoreper1000) + \beta_7(lnTotalAssessedValue) + \varepsilon$$

Table 4.3 Summary Statistics for the *Value Added Proportion* Model

	n	Mean	Max	Min	SD
ValueAddedProportion	163	0.00	0.02	0.00	0.00
lnCityPopulation	163	6.61	7.82	4.26	0.90
CountySeat	163	0.28	1.00	0.00	0.45
CityHHwith60	163	0.42	0.64	0.11	0.09
CityHHwith0to17	163	0.29	0.50	0.06	0.08
RUClessthan2500	163	0.44	1.00	0.00	0.50
ConvenienceStoreper1000	163	0.63	1.25	0.00	0.29
lnTotalAssessedValue	163	9.46	10.83	8.65	0.51

The elasticity for each variable was also calculated to represent the effect a 1 percent increase in the given variable had on the economic contribution of a store. In the *lnValueAdded* model, four of the independent variables were in semi-log form. The elasticities for these variables were calculated by dividing the average of the respective independent variable by its associated coefficient. The other coefficients were directly interpreted as elasticities. In the *ValueAddedProportion* model, elasticities for all variables were computed by transforming coefficients. For variables in semi-log form, the average of the dependent variable divided by the

coefficients was used to calculate the elasticity. For the other variables, the coefficient was multiplied by the average of the independent variable divided by the average of the dependent variable.

Results

The lnTotal Value Added Model

Using the natural log of the value added as the dependent variable allowed for a clean interpretation of the coefficients and one that gave the highest R^2. The results are presented in Table 4.4. The independent variables gave an indication of what factors are important in explaining the relative contribution of a rural grocery store.

Population was a main driver in almost all models that were considered. In Table 4.4, we see that a 1 percent increase in the population leads to a .95 percent increase in the economic contribution of a rural grocery store (*lnCityPopulation*). This was not surprising as overall population gets larger a greater number of people would be available to shop at a local store. The coefficient on the city median income (*lnCityMedianIncome*) was also positive and significant, indicating that the higher income a median household in the city earned the greater the economic impact the store had on the community, potentially meaning that these populations have more money to spend on food. In general, the more rural the county, the greater the relative economic contribution of the grocery store (*RUClessthan2500*). This was in line with the IMPLAN findings in that rural and western counties tended to have a greatest economic contribution. The economic rationale here is that more rural communities have less economic activities. Thus, the contribution of any single business will be greater.

Some of the findings that were harder to logically justify included the households with children variable (*CityHHwith0to17*). As the percentage of families with children increased, the

economic impact of the grocery store declined. With a 1 percent increase in families with children, there was a .76 percent decrease in the economic contribution of a rural grocery store. This variable was originally expected to be positive. After further consideration, however, the economic rationale is that families with children are also families that have working parents. Many of these parents or guardians have a job outside the city where the grocery store is located and may be shopping non-locally. They could also be buying items in larger quantities and maybe shopping at a larger discounter, even if it means traveling farther.

The coefficient on the population with low access variable (*PopulationLowAccess*) was negative suggesting that these populations live far away from a grocery store. The counter-intuitive sign might be capturing the willingness of individuals to travel farther for groceries in a very thin grocery market with fewer customers for grocery stores. The more convenience stores per 1000 population the greater the economic impact (*ConvenienceStore1000pop*). This variable can be justified in that convenience stores cannot replace a full service grocery store. Finally, the more overall wealth (tangible assessed valuation) a county had, the grocery store would have less economic contribution (*lnTotalAssessedValuation*). This would be consistent with other real assets (business activity) in the county substituting for the rural grocery store.

Table 4.4 The *lnTotal Value Added* Model Results

n=163	Coefficients	Std Errors	Elasticity
lnCityPopulation	0.9592 ***	0.0577	0.9592
lnCityMedianIncome	0.6932 **	0.2508	0.6932
CityHHwith0to17	-2.5973 **	0.6938	-0.7615
RUClessthan2500	0.3737 **	0.1247	0.1628
PopulationLowAccess	-0.3504 *	0.1954	-0.1273
ConvenienceStores1000pop	0.3324 *	0.1811	0.2079
lnTotalAssessedValuation	-0.3253 **	0.1174	-0.3253
_cons	2.8367	2.6066	
Mean Std Error	0.6188		
R^2	0.665		
*P-values significant at the .99***, .95**, .9**			

The Value Added Proportion Model

When interpreting the results of the model with *Value Added Proportion* as the dependent variable, there were similarities to the first model with the natural log form of the value added variable. As previously mentioned, the value added proportion is the proportionate contribution of the grocery store's total value added to county total value added. City population, households with children, rural counties with less than 2,500 people, convenience stores per 1,000, and the overall wealth of the county had the same signs and proved to significant in this model as well. Similar economic justification can be applied to these variables as well. The differences in the two models were the variables of county seat (*CountySeat*) and city households that have someone over the age of 60 (*CityHHwith60*). The county seat variable is positive suggesting that the city being the county seat would mean that the grocery store contributed more the county's economy. City households that had someone who was over the age of 60 also showed to be positive in this model. This could be attributed to that the older population is more likely to shop locally because of mobility issues or other disability factors.

Table 4.5 Value Added Proportion

n=163	Coefficients		Std Error	Elasticity
lnCityPopulation	0.00139	***	0.0003	0.4793
CountySeat	0.00202	***	0.0006	0.1923
CityHHwith60	0.00689	**	0.0029	0.9964
CityHHwith0to17	-0.00642	**	0.0032	-0.6491
RUClessthan2500	0.00302	***	0.0005	0.4536
ConvenienceStores1000pop	0.00198	**	0.0007	0.4270
lnTotalAssessedValuation	-0.00178	***	0.0005	-0.6138
_cons	0.00646		0.0050	
Mean Std Error	0.00265			
R^2	0.5324			
*P-values significant at the .99***, .95**, .9**				

Based the elasticities in this model, households with members over the age of 60 was the most significant in this model. This elasticity is stating that for 1 percent increase households with someone over the age of 60, there would a 1 percent increase in the economic contribution of a rural grocery store. Again, it was observed that households with children were the second driver of this model. For a one percent increase in households with children, there would also be .64 percent decrease in the economic contribution of a rural grocery store. County wealth also was a main driver. For a 1 percent increase in county wealth, there would be a .61 decrease in the economic contribution of a rural grocery store. Overall in this model, it was observed that age composition of the city was an important factor.

While the two models have many similarities, they do show some differences. One area to note is that by using the natural log form of value added as the dependent variable, the more county-level variables tended to be more significant than city-level variables. In the value added proportion model, more city-level data showed to be significant than county level. This may be built into the structure of the models as the natural log form of value added is a number that is strongly influenced local data, while the value added proportion number is influenced by county data. This could be showing how the county level data was used to develop IMPLAN multipliers. Therefore, the *lnTotalValueAdded* model is showing more independent variables that are representing more regional characteristics. When explaining the *Value Added Proportion*, we are capturing how the city relates the rest of county and more city level data is showing up to relevant in these models. We saw a similar trend when looking at the elasticities from the two models. In particular, the elasticities of county characteristics from the *lnTotalValueAdded* model were about half of what the *Value Added Proportion* elasticities were. Again, this would be consistent with the way the dependent variables were specified in each model. With both models,

it is clear that population, households with children, the more rural a county is, the number of convenience stores, and the wealth of a county do hold substantial power in explaining the variation in the economic contribution of a rural grocery store. When examining the elasticities of the two models, population had the highest value in the log value added model, while in the value added proportion model, the number of households with elder residents in the city was the main driver.

Example

To show how this research can be applied, we look at the case of a fictitious store in Ruralville, Kansas. Ruralville currently has a small grocery store, and they want to know the potential economic contribution of their store. In this example, using the *lnTotalValueAdded* model, the characteristics for each independent variable were looked up and applied to the model. These characteristics included the natural log of city population (6.9217), natural log of city median income (10.5271), city households 0 to 17 (0.269), RUC less than 2500 (1.00), percentage of population that are loss access (.3568), number of convenience stores per 1000 population (.7962), and the natural log of the total assessed valuation (17.294). The exponential was then taken to find the total dollar value for the store. For Ruralville, Kansas, the store had the potential to have an economic contribution of $57,000 to the community.

Conclusion

In conclusion, city or county planners could utilize these findings to better understand the functioning of the local economy. These models, though, should be used for descriptive purposes only. A limitation of this analysis it that these models are based of factors that a city or county cannot directly control. That being noted, a grocery store owner, rural developer, or city council can be sensitive to the needs of their community and find ways to better help their residents. It is

also important to note that it is not possible to predict human behavior using these models. Overall, these models do provide a snapshot of the different community characteristics at the city and county level that can influence to the economic contribution of a grocery store.

Chapter 5 - Conclusion

This research adds to the growing literature on both small business vitality and rural food access. Both rural grocery store owners and rural community developers can use these findings to enhance the retail food landscape in their communities. This research has shown that rural grocery stores provide substantial economic benefits to their communities. These stores provide jobs, tax revenue and other economic benefits. The loss of these stores could mean that some Kansans would have to travel over 60 miles round trip to buy groceries. These 163 stores contributed over $105 million to the Kansas economy. It was observed that communities in the western and the southeast part of Kansas would suffer the worst if they were to lose a store. The increased travel costs would severely affect household incomes of communities in those regions.

When reviewing what community characteristics have the greatest effect on a stores economic contribution, it was observed that population, cities with a higher proportion of families with children, most rural counties, number of convenience stores, and the overall wealth of a county influenced the economic contribution of a store in both models. When comparing elasticities, population proved the most influential in the log form of value added model and communities with a higher proportion of older people was the main driver in the value added proportion model.

As previously mentioned, there are characteristics of a city or county that a grocery store owner cannot control. What grocers can control though is their store and how they market themselves to community. A grocery store knowing that population is one of the largest drivers of their economic contribution, needs cater to the residents they serve. Essentially, they need to create a niche to convince people of the community to come to the store. Knowing that households with children are less likely to shop at your store, a store operator may be able to

offer product varieties to elderly customers or offer bulk discounts to families. Knowing that being in a more rural county increases the economic impact of the store, a store could emphasize services they offer, not just groceries. While we were able to measure the economic loss of a store, it would of interest to also consider social consequences. Interviewing all ages of community members about how they perceive their local store, for example, would be beneficial to learn about the social benefit of their store.

Rural communities are continually at a disadvantage. They have less access to hospitals, fitness centers, restaurants, or other social places just to name a few. These communities also struggle with having an easily accessible grocery store as well. Knowing that there are many rural Kansans that are living at or below the poverty line and have a limited food access is one the reasons rural grocery stores are important to their communities. These Kansans are faced with the challenge of affording food and having access to a grocery store. These rural grocery stores can help close this gap by communicating the economic contributions of their business.

Some of the implications of this research are the ability for community planners or economic developers to measure the economic contribution their existing store or the potential for re-opening of a new rural grocery. These values could also be used within a marketing campaign to encourage customers to purchase groceries locally. There is an increasing trend encouraging people to “buy local”. These values help justify why.

No matter where someone is located in Kansas, they should have access to buy the groceries and supplies needed to maintain healthy diets. These locally-owned stores can facilitate the objective of Kansans having healthy food to feed their families and not having to travel great distances to do it.

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