

# HIGHWAY IMPACTS ON LOCAL ECONOMIC DEVELOPMENT

Cornelia Butler Flora  
North Central Regional Center for Rural Development  
Iowa State University

Jinsong J. Tan  
Department of Management  
University of Central Florida

Jan L. Flora  
Department of Sociology  
Iowa State University

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## Introduction

A transportation system is evaluated by the ultimate social and economic benefits it contributes, plus the negative influences it creates. Such an evaluation enables government officials, transportation planners, and citizens to understand the role that an existing transportation system plays in economic development, as well as the implications of a proposed road construction project. The purpose of this paper is to discuss the role of roads, in conjunction with other determinants, in the economic development in Kansas. There are many ways of defining and measuring economic development. In this paper, we will focus on indicators of development that look at three components of community: residence, shipping, and income. We do this by looking at net migration change in retail trade pull factor, and change in per capita income. In choosing these indicators, we are looking at three major functions of community residence, trade, and income generation. In the past, it has been assumed that a geographic location provides all these functions simultaneously. Whether a single non-metropolitan place continues to do so in the 1980s and into the future is an empirical question.

There has been a major restructuring of the U.S. economy in the last decade [Drucker, 1986]. Changing terms of trade, widely fluctuating exchange rates, and higher real interest rates have hastened the shift from an industrial economy to a service economy. The new conditions of rural development are very different from those that prevailed in the 1970s, where a weak dollar, low real interest rates, and high (although fluctuating) commodity prices favored rural development.

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Whereas during the 1970s, a number of rural counties experienced population and economic turn around, going from decline to growth, by the 1980s, the conditions had again changed. The kind of light manufacturing, export-oriented grain production and oil exploration and development non-metropolitan, that enabled Kansas to attract industries and capital in the 1970s. Those industries required adequate road transportation to prosper, as they generated low value, high volume products. And they are no longer areas of economic growth. Thus, although we review studies based on the conditions of the 1950s, 60s and 70s, our empirical analysis is based on data for rural Kansas counties for 1980s. It is clear that the conditions that led to growth early in this century no longer apply. Instead, we are looking for the kinds of infrastructure investment that make sense not only for the 1980s, but for the rest of the century.

Agricultural producers are highly dependent on the local transportation network, and from time to time that transportation system must be examined in light of its ability to meet the needs of agriculture. Kansas agriculture, with its dependence on grains and livestock, is a high volume, low value economic sector. The deregulation of railroads and the resulting cutback of availability of rail transport could have a negative effect on farming dependent counties. Agricultural producers are geographically dispersed and are generally located considerable distances from markets. Without an adequate transportation system, the agricultural community could not produce or market the commodities that currently feed and clothe the nation and help reduce the national trade deficit.

The question for public investment is what constitutes an adequate transportation system for agriculture. National and local press pay close attention to transportation in urban areas because of readership interest and the visibility of public facilities. This fact is reflected by the amount of literature available in urban transportation. Rural areas are often overlooked because of the lack of visibility and the small number of residents served.

The past decade has witnessed the recognition of transportation accessibility problems of residents of rural and small urban areas. In particular, the lack of effective public transportation services is now recognized as a major barrier to the full development of rural America [USDA, 1989]. Farmers and those living in rural communities are very much a part of America. They want to be involved in the whole spectrum of transportation in America. They demand a high-quality surface transportation system for use today that will endure for future generations.

Rebuilding the rural roads has largely been a local responsibility. Local communities provide the revenue and equipments needed for highway maintenance and replacement and other funds necessary to link rural communities to the primary and interstate highway system. About one-third of the nation's population are in rural and small urban areas, but this group makes more than half of the nation's poor [Burkhardt, 1981]. Inability to pay for roads could restrict rural communities from social and economic self-betterment. Although many rural areas now have fine all-weather road systems, some households and communities are still isolated from the mainstream of modern American society because of their inability to travel.

The rural transportation issue is particularly difficult because of changing population and demands on the roads and bridges. The decline in the number of farms and in farm population means that fewer farm residents use the facilities. At the same time, however, in some non-metropolitan counties, urban dwellers are relocating in the surrounding rural countryside and commuting to work on low-volume rural roads. These residents place higher demand on the roads and are unwilling to tolerate the inconveniences of traveling over rough roads or detouring around unsafe bridges. They desire the tranquil rural living but also demand the conveniences of high-quality transportation facilities.

Larger equipments, including tractors, combines, and school buses, place expanded demands on rural roads often exceeding the design capacity of the rural road system. The result is that roads must be replaced or widened even though they may be structurally sound, since they are no longer adequate to accommodate the demands of modern agriculture and mass transportation.

A majority of the township-maintained roads in the Midwest have relatively low traffic volume. Based on a survey of over 3,000 midwestern township officials, 63 percent of the rural roads have fewer than 50 daily trips in average [Chicoine and Walzer, 1986]. Such small traffic volume makes justification of a high-quality, all-weather road surface and multi-lane road difficult. Residents normally expect a good road system with nice surface, enabling them to have the access of roads in all weathers and seasons. However, they are not anxious to pay the property taxes to support such a high level of service.

Changes in traffic patterns and composition of population pose particularly difficult problems for local road officials. An infrequently utilized road with minimal load demands can be transformed into a problem when a family with school age children moves into a farmhouse

adjoining the road. The family needs access to a school bus and, depending on location or the school bus route, may place a nine-ton load on the road.

As traffic patterns shift so does the tax base and sources of funding. Local governing bodies are most familiar with local needs, yet centrally devised criteria often impede local communities from setting their own priorities as to which roads to improve and which to maintain or close. As different non-metropolitan counties have different economic bases, local areas need to assess their comparative advantage for economic growth -- agriculture, service, manufacturing, etc. -- and make choice regarding roads and bridges that fit those needs.

## II

### Theoretical Framework

Costs and benefits of roads have been studied intensively by scholars and practitioners. Costs are the primary economic consideration and have been studied both qualitatively and quantitatively. Benefits, or the relationship between costs and benefits, on the other hand, are sometimes used, but are difficult to quantify.

The economic significance of roads can be best understood by looking at the entire range of factors that effect economic development. A variety of factors of production must be in place for economic development to occur. These include land (which includes the entire range of the natural resource base, including water, drainage, mineral resources, etc.), labor (which includes both the quantity and quality of labor), and capital (which includes both financial capital and fixed capital investment, such as physical plant and infrastructure, including, but not limited to roads). If all other factors of production are in place *except* for adequate transportation, economic growth occurs. However, there is little evidence to suggest that roads in themselves can attract the other factors of production when they are absent. For example, in much of Appalachia, the area remains poor and underdeveloped despite concerted efforts to improve infrastructure, particularly through

the construction of four lane highways [Tickamyer and Tickamyer, 1988]. Wimberley [1990] catalogues types of rural infrastructure that contribute to rural development. He breaks them down into physical infrastructure (systems of water, sewerage, solid waste, transportation, communications, public buildings, housing, and industrial sites) and social infrastructure (public education, health services, administration, and social services). Economic development involves a balanced investment in a wide variety of infrastructure. Wimberley points out that "the policy assumption that meeting farm needs will satisfy the rural nonfarm sectors as well has never been entirely sound and is less valid today than ever" (Wimberley, 1990).

There are several necessary conditions for economic development to be taken place. These include an adequate communication system, an adequate transportation system, and adequate resources which are free to flow among different sectors and regions. However, with the changing nature of the world economy, the definition of adequate has changed drastically. Location-neutral services require different kinds of infrastructure than does agricultural production. The function of roads is organically integrated into all these three elements.

One of the difficulties quantifying benefits is the problem of causality. One may argue that instead of roads causing economic development, economic development causes road innovation and construction. In studying the impact of infrastructure on economic development, Fox [1988] attempted to determine the direction of causality by identifying the linkages between infrastructure and economic development. He hypothesized that there may exist a positive correlation between infrastructure and development. As we proceed, we will attempt to test this hypothesis.

It is true that economic development increases the demand for roads, and a larger economic base is able to support more road projects. However, roads also affect (not necessarily CAUSE) economic development. It is no exaggeration to say that transportation is the very foundation of economic and social development. This effect can be discussed from both supply and demand sides.

A supply-pull mechanism means an adequate road system makes other inputs more productive and the distribution of outputs more efficient. In this sense, roads enter the process of production and distribution of goods and services. The use of roads creates both "time" and "space" utility. The cost of transportation is a determining factor for business location and expansion. However, the type of transportation and the proportion of costs it includes varies dramatically by

industry. The Saturn and Nissan decision to locate in Tennessee is such an example [Fox, 1988]. The availability of transportation system plays an imperative role in such decision-making process. Certainly being at a transportation hub eases distribution problems and attracts industry for whom shipping is a high portion of cost.

The development implication of plant location are still being determined. There is evidence to suggest the costs outweigh the benefits for the communities involved. Certainly, in the case of the Saturn plant, the existing transportation system influenced where the plant located. Sampson and Farris [1966] proposed that the creation of new road projects, or improvement and expansion of existing roads lead to the demand for their use. In other word, supply precedes demand. This might have significant policy implication for economically underdeveloped regions. In addition, it is also believed that the existence of roads stimulate the regional division and specialization of labor. However, Sampson and Farris were writing in the 1960s based on the circumstances of the 1950s.

A demand-driven effect, on the other hand, can be better explained by using the concept of multiplier effect. When investment is put into road projects, it creates employment opportunities for the residents of the construction site. These new employees create new purchasing power, in addition to the initial expenditure that may be in whole or in part spent locally. Historically transportation has been one of the largest employers in American economy [Sampson and Farris, 1966].<sup>2</sup> In the 1960s, wages in transportation-related jobs are superior to many other employments. More jobs and purchasing dollars are thus created.

The real impact, however, is determined by the magnitude of the investment multiplier of a particular unit of analysis. Gordon and Mulkey [1978] report that the multiplier for rural communities is usually low, ranging from 1.1 to 1.5 in most cases studied. In some cases, it falls below 1.0. This phenomenon is the result of leakage effect. A study of shopping pattern of 23 Kansas communities of 11,000 population or less suggests that the quality and price of goods and services are important determinants in addition to convenience [Darling and Tan, 1988]. This implies that people may shop elsewhere else for better and cheaper goods and products, both during

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<sup>2</sup> This includes all means of transportation, taken into account carrier personnel, transportation equipment manufacturing personnel, related industry personnel and transportation employees of federal and state governments.

and after the road project. Thus it should not be assumed that every dollar associated with roads will be spent within the site community of road-related projects. With more access to transportation system, a particular community may actually lose sales dollars, instead of gaining. Since any county or community is not isolated or excluded from suburban and other rural areas, such spillovers are too numerous to cite here. This is a typical example of positive externality, or external economies, and is socially desirable. The lost purchasing dollar flows to the neighbor counties, which benefits the economy as a whole, although not the specific community

Dodgson [1973] identified two kinds of externalities: technological externalities and pecuniary externalities. Pecuniary externalities include positive effects on land value, population change, economic and social activities, etc. In this paper, we will use Pull-Factor, an indicator developed by Vassar and Darling [1987] as a measurement of relative community business strength, to test how roads affect community commerce, one factor of community development

It should be pointed out that road investment from different sources may create different outcome. A road project is said to have greater contribution to local economy if it is financed by Federal grants rather than local taxes or user fees because the cost of the project is paid with outside revenue. Local community is able to direct the income which otherwise finances the road project to fulfill other local needs [Fox, 1988]. However, this assumes that the communities decides to invest the savings in roads in alternative public benefits. If state or federal funds are used to keep local taxes low, the money involved may be spent outside the community for consumption items.

Population change is another indicator of development. The causal relationship between road investment and population change can be two directional. It can be argued that population change creates demand for roads. However, examples are available to suggest that the availability of transportation system effect population movements. One such example is that the Civil War proved the military and economic advantages of transportation network. It is believed by some people that the superior transportation network in the North guaranteed its victory over the South. The federal government heavily subsidized the construction of the first transcontinental railroad to secure California and the West to the Union [Sampson and Farris, 1966]. The mass migration westward in nineteenth century did not occur until the continental railroad network was available. This is a typical demonstration of supply-pull development principle, as mentioned previously.

Most of the research relating population change and transportation innovation suggested a causal relationship between transportation innovation and population change [e.g., Moline, 1971; Rodefeld et al., 1978], at least for the decades of the 1950s and 1960s, the era of massive road building in the U.S. In this paper, we will empirically test how roads affect population movement. More specifically, we will include net migration as a dependent variable indicating change in residence..

A statistical relation between a dependent and an independent variable does not provide sufficient information to determine which causes which. However, if there is appropriate theoretical background or common-sense based substantive knowledge, we then are able to identify a casual relationship.

As we discussed in the previous section, a transportation system is a necessary and even a limiting factor for economic development, but an adequate transportation system is not sufficient for economic development to take place. Other factors of production must exist in conjunction with the transportation system. These factors should also be identified so that policy can be implemented to revitalize the local economy.

Fox [1988] suggested that the net effect of roads on development is likely to vary by geographic area, since access to roads is only one aspect of business activity needs, and business activity is only one part of rural development. Other studies indicate that accessibility to metropolitan areas is also important in that it stimulates growth of specialization in community economic structure [Lincoln and Friedland, 1978]. This finding supports Durkheim's principle that density generates differentiation. It is thus hypothesized that such net effect is positive for some communities while negative or zero for others depending on different locations. This hypothesis will be tested by differentiating counties according to their geographic locations, as indicated by the Beale code, which indicates distance from a metropolitan area.

In a case study of county roads, Hamlett [1986] reported that nearly two-thirds of all traffic miles was for personal travel. This suggests that the future number, size, composition, and location of rural households have detrimental influence on local economic activities. Hamlett also found that farm-related traffic is another important component of rural road travel, and farm size was found to be a major determinant of farm-related travel. (The larger the farm, the less the travel.)

Barton [Rodefeld et al., 1978] found that interstate highways have positive influenced social and economic activities of the cities and communities they intersect, such as increase in property value, population growth, more businesses are established and more employment opportunities are being created. Barton suggested some negative impacts of interstate routes, but these impacts are more significant on cities than on rural areas. The overall local benefits more than offset the social costs to the local community. Fox [1988] also believes that the proximity to interstate highways is a very important factor for economic development. This raises the question of the role of highway interchanges. Twark and others [Twark et al., 1980] reported a positive effect of highway interchange on local communities. They suggest that interchange areas are advantageous locations for local business activity. Commercial or industrial establishments that are highway-oriented are developed, which create employment opportunities, increase income, stimulate general economic activities, and expand the tax base of the community. When development occurs related to highway interchanges, most of the development generated is highway-oriented commercial development--gas stations, motels and restaurants. The enterprises are generally absentee-owned, and generate minimum wage jobs locally. They do increase sales tax revenue. Interchanges near urban areas develop, while others do not (Sauerlender, et al., 1967).

As we mentioned above, residents tend to demand high-quality road surfaces. However, a concept gaining popularity involves designating specific roads as requiring lower surface quality. This primitive roads concept is not without complications. State legislation is needed to reduce the liability of township or local government for accidents. Furthermore, highway surface characteristics are generally considered to affect vehicle use through changes in speed. For tax payers facing the downgraded service, the costs exceed the benefits, and it is hypothesized that road surface quality affects efficiency [Chicoine and Walzer, 1986]. Chicoine and Walzer [1984] report that local residents and farmers are actually willing to pay more for better roads. Here is a case when local investment in roads is extremely important.

Case studies on the impact of highways on communities have shown mixed results. While non-user benefits in terms of population growth have often accrued as a result of highway development near large population centers, there are problems resulting from the growth (Frey, et al., 1960). For more isolated communities, the impact of highways is less clear. Studies have shown that while highways can channel resources into a community, they can also channel

resources out. Positive impact accrues when all other productive resources--labor, capital, and natural resources--are in place, and only transportation is lacking for development to occur.

The Federal Highway Administration conducted studies on effects of interstate highways on population growth in rural America. By contrasting all rural counties with access to interstate highway, the studies found that between 1960 and 1970, population growth was 7 percent in average for all rural counties, 11.1 percent for counties with access to interstate and 3.4 percent for those without access to interstate. With urbanization and county population growth prior to the construction of interstate highway being controlled for, Bohm and Patterson[1971] found interstate had significant impact on population growth on counties that were not served by highways, including Kansas, which lagged behind the other part of the country. They observed 2.3 to 4.2 percent higher ten year population growth in counties with access to interstates than those without. Counties served by interstates also experienced higher in-migration rate [Lichter & Fuguitt, 1980]. Humphrey and Sell [1975] used statistical analysis to investigate the impact of interstate highways on population growth in Pennsylvania. By comparing communities located along the interstates with those more than 25 miles from an interstate, they found that communities near interstates experienced a 3.7 percent population growth from 1950 to 1960, and 2.7 from 1960 to 1970, while communities away from interstates had .53 and .72 percent growth rates, respectively, during the same periods. The current research question then becomes: given the roads already in place, and given the new economic conditions of the 1980s, will interstate highways have the same impact?

Many studies have been conducted to investigate the impact of interstate highways on economic development. In Vermont, they found no relationship between interstate highway access and individual economic welfare and residential patterns at the town level (Huffman, 1974). The existence of, or increase in, accessibility to individual Vermont towns afforded by construction of interstate highways has had no demonstrable effect in the varying levels of economic welfare at the town level of individual Vermonters. Kansas's experience with the effects of interstate highways has been quite similar to that of other states. We therefore hypothesize that counties and communities that are served by interstate or four-lane highways would more likely experience higher economic growth than those without the access to the highway system.

A review of the literature suggests roads have played important role in social and economic development from the time of settlement through the 1970s. Is the same true for the 1980s? In a

state such as Kansas where the majority of counties are represented by rural communities, the impact might be significant. Although the literature suggests positive relationship between roads and socio-economic activities, no consensus has been reached on the direction and magnitude of such impact. It may well depend on the particular environment defined by other social, economic and geographical variables.

### III

## Data and Operational Definition

The data are drawn from U.S. Census Bureau (for migration estimates), *Kansas Statistical Abstract* for per capital increase, and Cooperative Extension for the retail trade measures. Operational Definitions follow: *Dependent Variables*

A lot of the literature on the relation of roads to economic development has assumed that the presence of a new factory was synonymous with economic development. However, studies of economic growth demonstrate that measures of development and quality of life are influenced both by the nature of the local economy and by distribution of income and jobs resulting from the type of economic activity found in each county [Tickamyer and Duncan, 1984].

In choosing our indicators of economic development, we hoped to tap several dimensions of development. It is generally assumed that changes in one of the dimensions is related to changes in the other, but the tendency in previous studies has been to use only one indicator of development. We use three.

Economic development is assumed to create jobs and increase the standard of living of those in the area developed. We used per capita income as an indicator of a combination of number of sources of income and amount of income generated by each source. Income involves more than wage income. Transfer payments, including farm payments and social security benefits, as well as rents are included in the number. We looked at both absolute per capita income in the last year for which data was available, 1987, and change in per capita income between 1980 and 1987.

Income was measured where the individuals lived, rather than where they worked. Since bringing in a factory often causes an influx of workers from other counties, this seems a better measure of economic development than payroll changes in a county. Where the county taxpayers might or might not reap the benefits of additional jobs.

Much of the concern about what is happening in rural America revolves around the symbol of the decline in Main Street. Closing businesses are assumed to be an indicator of community decline. We used the County Pull Factor to measure the degree to which a county's actual retail sales (as measured by sales tax collections) compared to the retail sales expected from the size of the population. A figure of one indicates that the sales were equal to those expected in Kansas given that population size. A figure of less than one meant that the county performed below the state average on a per capita basis, and a figure of more than one meant that the county's relative retail strength is higher than the state average. We used the change in Pull Factor between 1980 and 1987 as dependent variables, controlling for the 1980 level.

A final measure that we used was net migration. Population increase often is viewed as an indicator of economic development. Particularly in rural areas of Kansas, where population loss has been extreme, a major goal of economic development is to maintain population size to assure the population density necessary to maintain the service base required for a reasonable quality of life.

**Per capita income improvement:** change of per capita income from 1980 to 1987 (income based on the place of residence);

**Net migration:** net migration equals the mid year 1986 population, minus the mid year 1980 population minus births plus deaths. That figure was divided by the 1980 population to standardize for population size and yield a percentage net migration.

**County Pull-Factor change:** change in county Pull-Factor from 1980 to 1987.

We will also include Pull-Factor in 1987 and per capita income in 1987 as dependent variables.

### *Independent Variables*

The major dependent variable we wished to examine was roads, particularly different kinds of roads and investments in roads, on non-metropolitan counties. We tried a number of measures: roads per capita, state investment in roads (available only for one point in time), presence of an interstate highway through the county, and presence of a four lane road through the county, road and bridge levy in 1980 and 1987, the change in that levy between the two periods, highway investment per capita 1982, highway investment per mile 1982, rural miles per capita for 1982 and 1985, and lack of any four lane highway or interstate). For our non-metropolitan sample, only the lack of any type of four lane highway contributed to explaining any of the dependent variables when step-wise multiple regression was carried out.

**Wealth of the county:** measured by county assessed tangible valuation in 1980;

**Willingness to invest in highway:** measured by county highway expenditure as a percentage of county assessed tangible valuation per capita in 1980.

In our on-going studies of self-development communities and entrepreneurial rural counties, we found that a willingness to invest both private and public local capital was associated with development. Thus, we created a measure showing willingness of counties to invest in highways. It has been hypothesized by many that willingness to pay was simply an indicator of community wealth, with wealthier counties more willing to invest in themselves than poorer counties, which would be disadvantaged by any demand that they provide part of the funding for their road system. Therefore we used total assessed tangible valuation per capita as an indicator of wealth, or "ability to pay."

Counties were classified as either metropolitan or non-metropolitan counties. In order not to skew the results toward the heavily populated metropolitan counties, the eight metropolitan counties were eliminated from our analysis so that results would not be distorted.<sup>3</sup>

**Commodity dependent counties:** The ninety seven non-metropolitan Kansas counties were further classified by dominant economic activities. Fifty three of these are identified as

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<sup>3</sup> Refer to Appendix, table 5, for detail.

commodity dependent counties. This includes counties where at least 20 percent of the income or labor force was involved in either agriculture or mining, which in the case of Kansas, involves petroleum. This dummy variable is one if county is commodity dependent and zero if it is not commodity dependent.

**Access to highways:** measured by the availability of interstate highways of four-lane highways. The dummy variable is one if the county has no access to interstate or four-lane highways.

**Ruralness:** measured as an ordinal variable to classify the degree of ruralness of a county, ranging from 0, which represents central counties of metropolitan areas of 1 million population or more, to 9, which represents counties completely rural and are not adjacent to a metropolitan area, according to Beale Code.<sup>4</sup>

In summary, the foregoing discussion of factors related to roads suggests the following multiple regression models:

$$PF0TO7_i = a + b_1X1_i + b_2X2_i + b_3X3_i + b_4X4_i + b_5X5_i + b_6X6_i(1)$$

$$MIGRATE_i = a + b_1X1_i + b_2X2_i + b_3X3_i + b_4X4_i + b_5X5_i(2)$$

$$PCI0TO7_i = a + b_1X1_i + b_2X2_i + b_3X3_i + b_4X4_i + b_5X5_i + b_7X7_i(3)$$

where

**PF0TO7:** output Pull-Factor change from 1980 to 1987 in county i;

**PCI0TO7:** change in per capita income from 1980 to 1987 in county i;

**MIGRATE:** change in in-migration rate in 1987 in county i;

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<sup>4</sup> This code was developed by Calvin Beale of Economic Research Service, U.S. Department of Agriculture.

- X1: per capita assessed tangible valuation in 1980 in county  $i$ , and is named ATVPC80 in correlation matrix;
- X2: county road investment as percentage to per capita assessed tangible valuation in 1980 in county  $i$ , and is named IVTZATV in correlation matrix;
- X3: commodity dependent counties, and is named COMDEP in correlation matrix;
- X4: counties without access to interstate or four-lane highways, and is named DAN in correlation matrix;
- X5: ordinal dummy variable to classify ruralness of county  $i$  according to Beale Code, and is named RUZURB in correlation matrix;
- X6: Pull-Factor in 1980 in county  $i$ , and is named PULF80 in correlation matrix;
- X7: per capita income in 1980 in county  $i$  and is named PCPI80 in correlation matrix;
- a: constant term to be estimated;
- b: vector of coefficients to be estimated;
- $i$ : the  $i$ th counties in Kansas ( $i = 1, 2, \dots, 105$ ).

It is assumed that all functions are linear. Our analysis will be conducted based on the regression equations above.

## Analysis

A common problem often encountered by social scientists is multicollinearity. We assessed the existence or severity of multicollinearity with reference to variance inflation factors. Results of the test are reported in table 3. The resulting scores for all predictor variables are below 4.0, which indicates, according to the rule of thumb, that multicollinearity is not considered as significant problem in this study [Fisher and Mason, 1981].

The zero order Pearsonian correlation coefficients of all the variables analyzed are presented in Appendix Table 1 for all Kansas counties and in Appendix Table 2 for the non-metropolitan Kansas counties.

The three dependent variables, net migration, change in pull factor (retail trade), and change in per capita income are not significantly correlated with each other. This means that under the conditions of the 1980s, the three major dimensions of community development, which we previously assumed would vary coterminously, are unrelated. Change in where people live (net migration) is not related to changes in amount and sources of income (change in per capita income), and neither are related to changes in retail trade (the pull factor). No longer can it be assumed that increasing one of the variables will lead to an increase in the other. This is true for Kansas as a whole, as well as the non-metropolitan counties considered separately. Therefore those concerned about economic development must decide which dimension of community development is most of interest to them. In Kansas in the 1980s, where people lived, where they shopped, and where they worked were different, at least in terms of change.

Net migration was positively associated with the willingness to pay variable ( $r = .39$  for Kansas and  $.19$  for the non-metro counties analyzed separately). It was highly negatively related to the degree of ruralness of the county ( $r = -.38$  for Kansas as a whole and  $-.14$  for the non-metro counties). Ruralness was only significant when the metro counties were included in the analysis. Migration was also positively correlated to highway investment per mile in 1982 for all of Kansas ( $r = .53$ ), but less so for non-metro counties ( $r = .19$ ). Highway investment per mile is more an indicator of ruralness ( $r = -.63$  with the Beale index) than of roads as a factor independent of population density and location. Indeed, in multiple regression, the variable washed out as a predictor of net migration.

Change in retail trade (change in pull factor between 1980 and 1987) was significantly negatively correlated to 1980 pull factor and per capita sales tax collection in 1980 (a input into the 1980 pull factor measure). It was positively correlated with the 1987 pull factor. These changes suggest that there was an equalization among Kansas counties in retail trade in the 1980s, as those that started out with the lowest pull factors increased the most.

Change in per capita income was positively related to commodity dependence and agricultural for Kansas as a whole ( $r = .24$ ) and for the non-metro counties ( $r = .24$ ). This suggests that the farm programs instituted with the Food Security Act of 1985 had positive income implications for agricultural counties. Change in per capita income was negatively associated with retirement counties and with county wealth, as measured by assessed per capita tangible valuation in 1987. While county wealth and per capita income were positively related, change in per capita income was negatively influenced by the initial wealth of a county. Change in per capita income was significantly negatively correlated with 1982 highway investment per mile (a measure of urbanness) for non-metropolitan counties, but not for Kansas as a whole. Change in per capita income was highly negatively correlated to 1980 per capita income ( $r = -.52$  for Kansas as a whole and  $-.55$  for non-metropolitan Kansas counties), which suggest a leveling of income differences among counties in the decade of the 1980s.

After examining the zero-order correlations, we performed a series of step-wise multiple regression analyses in order to determine the most variation in the dependent variables with the smallest number of independent variables. We then submitted each dependent variable to multiple regression analysis. The results are shown in Table 4.

Our regression equation explained very little of the variance in net migration. Only county wealth, as measured by assessed tangible valuation had a significant, but small, effect on net migration.

Multiple regression explained 27 percent of the variation in change in per capita income between 1980 and 1987. That change is negatively related to 1980 income, our control variable, suggested that there was a leveling of income differences among non-metropolitan counties in the decade of the 1980s. Commodity dependence and the absence of interstate and four lane highways contributed to increase in per capita income. county wealth and willingness to pay for roads.

Our multiple regression equation explained 44% of the variance in increase of retail trade, as measured by the change in the Pull-Factor between 1980 and 1987. It was significantly positively associated with degree of ruralness (the Beale code). In rural counties in Kansas, there was a leveling of retail trade differences between 1980 and 1987. The presence of roads, wealth and willingness to pay for roads were all unrelated to change in the Pull-Factor.

Our analysis with other independent variables indicated that rural road mileage per capita relates negatively to trade change, suggesting that availability of roads in rural Kansas does take away sales dollars from the community, as we discussed. It also has similar impact on migration and per capita income change. An alternative explanation is that the most rural counties had the highest level of rural roads per capita. Thus rural roads per capita is a proxy measure for degree of ruralness, as indicated by its .58 correlation with the Beale code. Highways were found to experience positive change in the dependent variables.

In the past, such measures have been highly intercorrelated because people lived and worked and shopped in the same community. In rural Kansas, this does not appear to be the case. Measured by zero order Pearson correlations, we found that the three different kinds of indicators of development were not significantly related to each other. (in Table 1).

To conclude, the presence of an interstate or four-lane highway in a county is unrelated to economic development for Kansas as a whole and in non-metropolitan Kansas, as measured in a variety of ways. County wealth and willingness to pay for highways were negatively related to each other, suggesting that it is not the wealthiest non-metropolitan counties that invest themselves, but those counties more committed to bring about local change. Net migration, which indicates conscious decision about where to locate, was related to the willingness to invest variable. This key finding relating self-investment with positive development changes at the local level is supported by current research at Kansas State University on community self-development and case study research on non-metropolitan Kansas counties.

We find no evidence that residents of towns most served by interstate highways are better off economically as a result. The presence of four lane and interstate highways are not related to development in Kansas under the radical restructuring of U.S. economy represented by the decade of 1980s. This study suggests that attention to investments in infrastructure that positively effects

the quality of life of current residents, rather than those aimed at attracting new enterprises, contribute most to community development.

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