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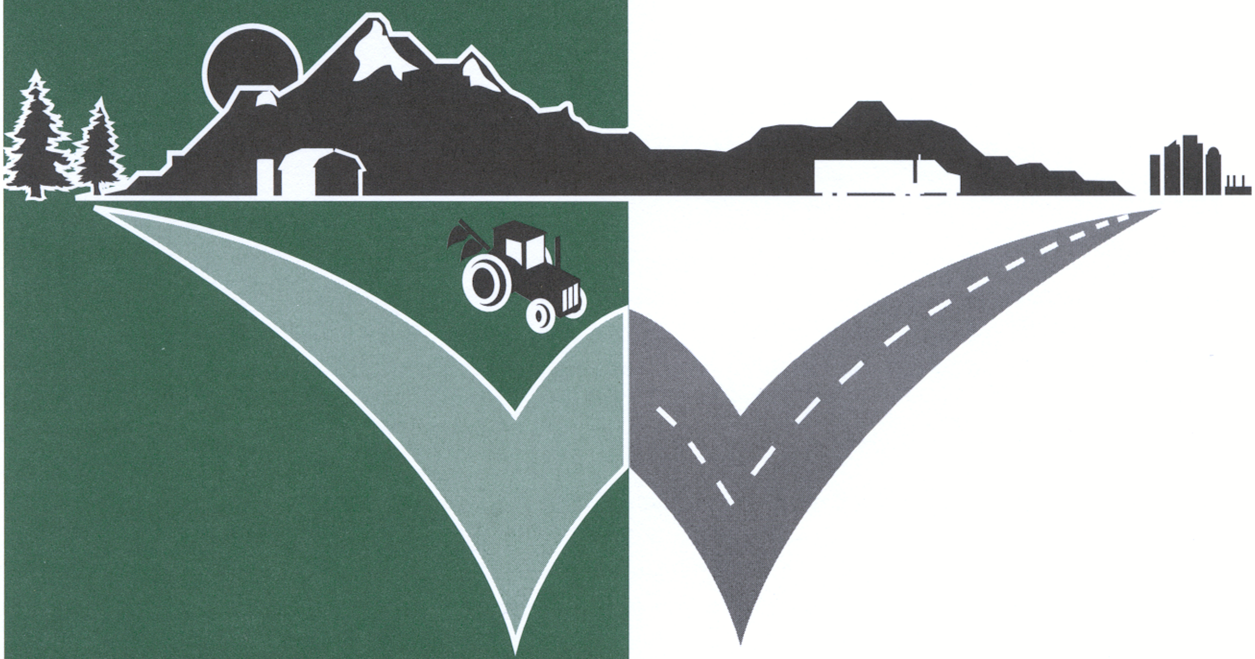

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Industry Location Modeling: Extensions of the Plains Economic Targeting System

By John Leatherman[1]

It has long been recognized that rural areas of the United States are diverse in character and prospects. In many areas, economic prosperity has led to rapid and, some contend, unrestrained growth. In these areas, there is increasing concern about sprawling and inefficient development, loss of farmland and open space, and the erosion of community character and rural culture. Nevertheless, many other rural areas have been bypassed, despite the recent robust performance of the national economy. Communities throughout the Great Plains continue to lose economic base and population. Similarly, many communities in western America continue to struggle with the transition from a traditionally extractive economic base as resource limitations are realized and rules governing resource use become more restrictive.

There are a number of local economic development strategies available to rural communities (Pulver). Among them is the notion of attracting new basic employers from outside the community. Many disparage a strategy of industrial recruitment as “smokestack chasing,” indicative of an economic development mind-set of decades past. Rather, entrepreneurial strategies have been in vogue (Eisinger; Flora et al.). Clearly, much has been learned about the efficacy of various economic development strategies. For communities in many rural regions, however, the simple acknowledgment of constraints and the need for new employment opportunities keep all options on the table. Among them is targeted business recruitment and development.

Business recruitment tends to be among the most competitive, costly and risky economic development strategies. Despite the risks, new business recruitment remains among the most common local economic development strategies (Finsterbusch and Kuennen). This makes it all the more important to develop analytic tools that may help local officials make better choices regarding targeting efforts.

The idea of building an industrial targeting system for rural communities has precedent. Notably, Goode and colleagues developed the Northeast Industrial Targeting (NIT) and Economic Development Database (EDD) System in the mid-1980's (Goode and Hastings 1989a, 1989b). The NIT system matched industry requirements with community characteristics for 69 aggregate manufacturing sectors for 730 non-metropolitan communities in the northeastern United States.

In response to continuing requests for analytical assistance, my colleagues and I (Leatherman, Howard and Kastens) built a location model that predicts the probability of various types of economic growth for 414 counties in six Great Plains’ states (North and South Dakota, Nebraska, Kansas, Oklahoma, and northern Texas) for the period 1995 - 2003. Among the innovations incorporated into our Plains Economic Targeting System (PETS) was to expand the scope of industries modeled to recognize the greater variety of economic sectors representing growth potential for rural communities, including manufacturing, transportation, trade, services and finance. Further, we specified the model in a way that local officials could clearly see how local characteristics affected the probabilities of business location and how changing the community characteristics altered those probabilities.

We are currently constructing a new model for Kansas that will project growth probabilities between 2001 and 2008. I discuss the original PETS model and its implications below, and enhancements planned for the next version. With renewed interest in economic targeting strategies, it is hoped these ideas will help spur further development of industry location models.

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The PETS Model

In the original PETS model, industry growth was conceptualized as being a function of community economic conditions, social climate, local infrastructure, labor force characteristics, market access, and prior industry growth history. Independent variables operationalizing these characteristics were selected based on previous research and economic theory (Kusmin; Kusmin, Redman and Sears). Twenty-four county-level variables were used to explain economic growth, and included local government revenue and expenditure patterns, the structure of the local economy (percentage of employment in agriculture, manufacturing, services), characteristics of the local population (population, population density, age, education, poverty and labor force participation rates, worker earnings, housing values), the presence of major infrastructure (airports, interstate highways), lagged industry growth, and state dummy variables. Data were gathered from the U.S. Census Bureau and other sources generally centering around 1980 and 1990.

The dependent variable was a binary variable taken from County Business Patterns. Data were collected for manufacturing, transportation, communication and public utilities (TCPU), wholesale trade, finance, insurance and real estate (FIRE), and business services. Sectors such as agriculture, mining, construction, retail trade and government were excluded because it was perceived there was little a community could do to attract more of these activities beyond that which either natural endowments or market forces would otherwise dictate. The number of establishments by four-digit Standard Industry Classification (SIC) were counted for 1977, 1985, 1986 and 1994, and coded 1 if the number of establishments increased between 1977-1985 and 1986-1994 or 0 if the number of establishments remained the same or decreased. Industries were aggregated within SIC industry groups to the final 78 sectors after reaching a variable threshold of activity.

Two models were then estimated. First, the 1980 county characteristics were used to explain economic growth that occurred between 1986 and 1994. The parameter estimates from the 1980 model were inserted into a predictive equation containing 1990 county characteristics to generate probabilities of industry growth between 1995 and 2003. Finally, the coefficients from the second model were used to derive the marginal impacts associated with each of the independent variables. A fuller description of the modeling procedures used is available elsewhere (Leatherman, Howard and Kastens).

Thomas County, Kansas

The case of Thomas County, Kansas is used to illustrate the use of the PETS system. Thomas County is located in northwestern Kansas and had a 2000 population of 8,180. Selected industry probabilities for the county are shown in Table 1.

In Thomas County, depository institutions and trucking services are the industry sectors with the highest probability of growth between 1995-2003, with about a 95 percent chance of an increase in the number of establishments. In general, business services, TCPU, wholesale trade, and FIRE activities had the highest probability of growth over the period. The first manufacturing activities to show up on the list are 12th, printing and publishing, and 15th, newspapers. It is fairly typical for manufacturing to grow relatively slowly across rural counties. The information serves to point out the need to look beyond a narrow set of traditionally desired targets, i.e. manufacturers.

Calculating the marginal impacts of independent variables can show local officials how community characteristics influence the probability of different outcomes, and suggest how changing those characteristics might influence future probabilities. Considering the trucking sector, for example, in addition to several of the state dummy variables, total population, level of poverty, education expenditures, and manufacturing employment are statistically significant factors influencing the level of trucking activity. In the case of Thomas County, a one percent increase in manufacturing employment would increase the probability of new trucking activity by three-tenths of one percent, while a one percent increase in the poverty rate would decrease the probability of trucking activity by four-tenths of one percent.

Clearly, the marginal impacts in this case are small, and one also might conclude somewhat meaningless insofar as communities have few means to increase manufacturing activity or decrease poverty. The benefit of this information is first to suggest that a host of local conditions influence the probability of economic activity, which broadens the debate about what can constitute an economic development program. Secondly, it is empowering to communities to understand that at least to some extent the future is within local control to influence for the better or worse. And, finally, even if something like poverty defies local control, attendant factors such as public safety, social services outreach, or worker transportation barriers certainly are within local control. As such, there may be opportunities to mitigate the negative or accentuate the positive that may be associated with factors seemingly beyond local control.

Table 1. Probability of Industry Growth in Thomas County, Kansas, 1995-2003.

Rank Order	Probability of Growth	Industry SIC Code	Industry Sector Description	Type of Industry Sector
1	0.956	6000	Depository Institutions	FIRE
2	0.951	4210	Trucking and Courier Services	TCPU
3	0.871	4900	Electric, Gas and Sanitary Services	TCPU
4	0.784	6100	Nondepository Institutions	FIRE
5	0.760	7380	Miscellaneous Business Services	Business Services
6	0.709	6500	Real Estate	FIRE
7	0.694	5191	Farm Supplies	Wholesale Trade
8	0.652	5190	Miscellaneous Nondurable Goods	Wholesale Trade
9	0.649	7340	Services to Buildings	Business Services
10	0.641	6400	Insurance Agents and Brokers	FIRE
11	0.634	6200	Security and Commodity Brokers	FIRE
12	0.609	2700	Printing and Publishing	Nondurable Manufacturing
13	0.609	7330	Mailing, Reproduction, Stenographic Services	Business Services
14	0.585	5170	Petroleum and Petroleum Products	Wholesale Trade
15	0.578	2710	Newspapers	Nondurable Manufacturing

Future Refinements of the Targeting System

A number of refinements are currently being incorporated into a new version of the industry location model.Currently, the model projects industry location probabilities between 1995 and 2003, a time period almost elapsed. Another shortcoming of the existing model is the high degree of sectoral aggregation resulting from County Business Patterns non-disclosure of data in many smaller counties.

Highly aggregated probabilities limit the model's utility as a "rural" development tool because much of the rural detail was aggregated. It also results in such broad sectors as to provi de little utility as a "targeting" tool, when detail is precisely what is needed to understand a sector's needs.

The next version of the model will focus on counties in Kansas. The source for data relating to changes in economic activity comes from fully-disclosed ES-202 unemployment compensation insurance tax files from the Labor Market Information Services office in Kansas. This is firm-level data showing monthly employment and quarterly wages for the period 1988-2001. Employment information aggregated to a four-digit SIC will be converted into the IMPLAN social accounting matrix sectoring system (MIG). This will permit use of the IMPLAN input-output information in the construction of some of the independent variables. Based on the data available, the new model will estimate probabilities for the period 2001 to 2008.

The industry sectors in the model include all those present in the IMPLAN system except agriculture, mining, construction and government. Based on the IMPLAN model for the state of Kansas, this leaves 357 economic sectors theoretically eligible for inclusion. Sectors meeting a threshold criteria of 50 or more employees and a minimum of $10 million annual sales will be included in the system. This will result in 271 economic sectors to be modeled.

Among the additional refinements of this version of the model will be the inclusion of variables representing the spatial interrelationships of industries and markets. Goode (1986) demonstrated the improved performance of the NIT and EDD system using spatial variables, which heretofore had been deemed too labor intensive to construct.

Industries consider two important types of spatial relationships that can be used to explain location decisions: the availability of input supply and market access for output demand. Spatial variables for each of the IMPLAN industry sectors will be constructed by examining the direct requirements coefficients and identifying all sectors with significant backward or forward linkages. For those inter-linked input/output sectors exceeding a threshold value of five percent input purchase for each IMPLAN sector, the input supply and market access variables will be constructed. The new modeling system will be available for use by fall 2002.

Conclusion

The system described in this paper represents one potential tool to help community leaders utilize scarce local resources with greater effect. The inclusion of a wide number of economic sectors representing rural growth potential will help local officials appreciate the need to look beyond a narrow range of targeted prospects. Inclusion of the marginal impacts associated with significant independent variables suggests "policy levers" local officials can use to improve that which they can control or mitigate that which may be beyond their direct control.

Finally, even for those places with an over-abundance of economic growth, the system can be used to help set priorities that promote a desired "quality" of growth. While the system can not be used in isolation from other information needed for economic development policy formation, it can provide valuable additional input.

Clearly, a system such as the one presented here does not provide all of the information local policy makers need to make informed economic development decisions. Additional information related to specific sectors is needed to understand growth prospects and industry needs. Information relating to likely impacts associated with individual sectors also needs to be considered. Not all economic activity is desirable activity. There may be any number of positive or negative externalities that are not considered in this analysis. Nor are community preferences explicitly incorporated into this system. Still, there is no claim that a location model is all that is needed. Indeed, supplementary information and assistance is strongly recommended. Tools to project likely impacts and community preference processes are readily available to add needed information.

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