Rural Growth in U.S. Heartland

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Abstract

This study identifies factors that explain growth in rural areas using data from 618 counties in the U.S. rural heartland. We evaluate many of the growth hypotheses in the context of sectoral employment growth for counties in Iowa, Minnesota, Missouri, Kansas, Nebraska, South Dakota and North Dakota. Separate estimates for rural and urban counties provide insight into factors that are important in explaining employment growth. The results support the importance of human capital as a factor contributing to sectoral employment growth and show that increased concentration and specialization of employment within a county lead to slower growth in the rural heartland counties.

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Introduction

In the last half of the Twentieth Century, many small towns in the U.S. Heartland declined both in population and business activity and the majority of rural counties lost population. Declining transportation costs, growing agglomeration economies, changing structure of agriculture, and declining relative economic contribution of agriculture, fueled a period of out-migration in many rural communities. A few, dispersed, central areas became growth centers, but their growth was seldom impressive unless they were adjacent to a metropolitan area.

But recently, some rural counties are growing in terms of non-agricultural employment and gross county product without being considered central places or without being adjacent to metro areas. Identifying and understanding the factors explaining employment and output growth in rural Heartland counties may provide useful insights in framing rural economic development policies and for promoting growth in other areas, regions, and countries.

The economic growth and development literature has focused on the growth of cities and urban areas while ignoring rural areas and their demise. Even the regional growth literature has focused on central place and metropolitan growth within a region, while maintaining rural areas for farming

landscape amenities and potential eco-tourism. A comprehensive framework to evaluate the potential for employment and output growth in rural areas, and to identify factors that explain rural area growth is lacking. In many rural counties, especially in the U.S. Heartland, the role of the agricultural sector is declining both in absolute and relative terms. Will economic activity decline with agriculture or under what circumstances will other sectors replace agriculture and sustain future economic growth? Our void in understanding of rural economic growth in a macro sense is not surprising given isolated rural growth, except in counties adjacent to metro areas in the Twentieth Century. Much of our public policy focus over the last 30 years has been on eliminating poverty, building infrastructure, and explaining out-migration.

Given the lack of macro theories of and isolated successes of rural economic growth, how can we develop a model of modern economic growth in rural areas? First, this paper will draw freely on the modern macroeconomic growth literature of countries and cities (Barro, 1991; Glaeser, et al, 1995; Glaeser, et al, 1992; Lucas, 1988; Romer, 1986) to develop hypotheses and insights to explain total and sector growth patterns in rural counties in an effort to better understand why some rural counties grow and others continue to decline. In no way are we arguing or advocating that all rural counties and areas should or will grow in employment and output. Rather, a few will grow, and we are attempting to identify the necessary endowments, location-specific factors and initial conditions needed to spur non-farm employment growth. It may be misallocating and wasting public resources to attempt to reverse the trend in many declining rural counties that are too isolated, lacking the necessary initial conditions, or do not have a natural endowment to support future growth.

Second, using data from 618 counties in the U.S. Heartland states (Minnesota, Iowa, Missouri, Kansas, Nebraska, South Dakota, and North Dakota), total and sector employment growth will be estimated and the factors explaining total and sector economic growth will be identified. The Heartland counties present an interesting study area because while over half the counties were declining in both population and employment, several counties posted significant growth in employment, especially manufacturing employment growth in rural counties in the 1990s.

Third, given the empirical evidence of the previous section, an attempt will be made to draw policy implications to formulate future rural development policy. Finally, the last section will summarize the analysis and discuss potential extensions of the analysis.

Analytical Framework

The modern economic growth literature is shifting emphasis from the traditional neoclassical framework to a focus on endogenous growth factors. Modern growth theories focus on the roles of ideas and technology embodied in human capital (Lucas, 1988), physical capital (Romer, 1986), social capital (Goldin and Katz, 1998), natural capital (Castle, 1988), and initial conditions, including infrastructure. Glaeser, et. al. (1992, 1995) have added cross-industry externalities and derived empirical estimates of total and sector employment growth in key industries for U.S. cities. Obviously, economic growth is far more complex than captured by these stylized macro models. Further, these macro models have not attempted to provide specific consideration of rural economic growth, but these marco models, especially Glaeser, et al (1992), do provide a useful starting point for our analysis.

The underlying theoretical model for this analysis follows Glaeser, et al (1992), which described

employment growth in city-industries in the U.S. For purposes of exposition, they postulated the model that follows.

Firms are assumed to take prices, wages, and technology as given and maximize a single input production function

$$A_t \; f(l_t) - w_t l_t \tag{1}$$

The firms choose labor input such that the marginal product of labor is equal to the wage rate. This relationship can be rewritten in terms of growth rates

$$\log\left(\frac{A_{t+1}}{A_t}\right) = \log\left(\frac{w_{t+1}}{w_t}\right) - \log\left(\frac{f'(l_{t+1})}{f'(l_t)}\right) \tag{2}$$

Glaeser, et al (1992) divides the growth in technology into two parts - local (city) and national. We also divide technology into two components - local (county) and Heartland region. We adopt the Glaeser, et al (1995) assumption that, '[w] e interpret $A_{i,t}$ broadly, to allow for the possibility that social, technological, and political forces determine the overall productivity of a county." The Heartland technology growth component depends on the diversity of employment in the 7-state Heartland region. Thus, we can express the growth in sector employment as a function of the growth in sector wages, regional technology growth and local technology growth or

$$a \ln\left(\frac{l_{t+1}}{l_t}\right) = -\ln\left(\frac{w_{t+1}}{w_t}\right) + \ln\left(\frac{R_{t+1}}{R_t}\right) + \ln\left(\frac{A_{c,t+1}}{A_{c,t}}\right) \tag{3}$$

Glaeser, et al (1992; 1995), using data from U.S. cities provide empirical tests of various

theories of economic growth. In Glaeser, et al (1992), they focus on the role of technological spillovers, and they assert knowledge spillovers in cities are particularly effective when there are ample opportunities for communication among people. They also find industry variety and local competition encourage industry growth while regional specialization has the opposite effect, implying knowledge spillovers may be more important between industries than within industries. Their unit of observation is the top six two-digit industries in a city in 1956. They have 1,066 observations over 170 cities and the cities included in the sample are defined by the authors as rather mature.

Glaeser, et al (1992) developed a number of hypotheses with respect to employment growth in city-industries and then proceeded to test these hypotheses using the **County Business Patterns** data for 1956 and 1987 produced by the Bureau of the Census.

A number of fascinating questions arise with respect to the Glaeser, et al (1992) analysis of rural economic growth. First, is urban employment growth significantly different from rural employment growth because of the lack of knowledge spillovers and agglomeration externalities?

Second, would the same factors that explain firm growth in cities explain the growth of rural firms? Third, would local industry employment grow slower in rural areas because of the limitations associated with isolation or faster because local rural industries are less mature or at an earlier stage of development? Echevarria (1997), using a general equilibrium simulation analysis with different rates of exogenous technical change in primaries, manufacturing, and services sectors and different income elasticities for these sectors, concludes, "sectoral composition explains an important part of the variation in growth rates observed across countries." Rural counties are typically at an earlier "stage of

development" with respect to employment growth in sectors than in more mature city-industries, identifies by Glaeser, et al (1992). Alternatively, entering at a later stage of development in a more service-oriented national, or at least regional economy, we might expect a different pattern of growth to emerge.

Like Glaeser, et al (1992), we model county employment growth as a function of similar dynamic externalities and local spillovers as well as initial endowments. Because our data are more aggregated to the county-sector level, as opposed to city-industries, and because we could not duplicate all the explanatory variables used by Glaeser, et al (1992), the results are not fully comparable. We use more aggregate data, so we can include more rural counties in our sample. Further, we have included variables to measure the "ruralness" of the sample counties as well as some variables of rural policy interest. Yet, some very interesting parallels can be drawn between our analyses. We also analyze 1969-1996 growth as opposed to 1957-1987 growth. Unlike many of the cities in Glaeser, et al (1992) most of the Heartland counties witnessed population declines in the 1970's and 1980's and some witnessed employment growth rates that exceeded population growth rates in the 1990's. Obviously, these differences create difficulties in directly comparing the two studies, but our results do provide some useful insights into modern economic growth, especially in rural areas.

Data

We consider county growth in non-farm employment over the period 1969-1996. The sample includes 618 counties in the U.S. Heartland states of Minnesota, Iowa, Missouri, Kansas, Nebraska, South Dakota, and North Dakota. As stated earlier, this region is largely rural. The farm sector is

struggling with low prices, the number of farms is slowly decreasing, the age distribution of farmers is shifting to the right, roughly 20 percent of the farms account for 80 percent of sales, and over half of the farmer operators work off-farm. If farm spouses are included, the probability that at least one spouse engages in off-farm work is close to 80 percent. The general economy has been healthy with strong employment growth while population has been growing more slowly. The general economy is growing in both rural and metro counties, but in different ways. Manufacturing employment has been growing more in rural areas in the region, but only in certain counties. Service-related sectors tend to fuel the employment growth in larger markets (metro areas). Relative earnings in the region, especially in rural counties are below the national average, but many rural people view this as a quality-of- life tradeoff.

Initially, we will consider all 618 sample counties in our models of total and sector employment growth and include measures of "ruralness." Then we will split our sample into metro counties and rural counties based on Beale codes for 1993. Splitting the sample will allow us to test the hypothesis that rural county employment growth is explained by different factors and different magnitudes of factors than city/metro employment growth.

Econometric Model

The models we estimate are based on a cross-section of Heartland counties. Total and sector employment growth between 1969 and 1996 is explained by resource endowments (human capital, natural capital and knowledge externalities, that are county-specific as opposed to sector-specific, a series of initial conditions including infrastructure and location-specific factors. Because we could not obtain measures of new physical capital investment, disembodied knowledge, a la Romer (1986) cannot

be captured. Likewise, we sympathize with the importance of social capital to the growth process (e.g., Castle, 1998; Goldin and Katz, 1998) but could not develop a suitable measure at the county level. The general model can be express as

$$\left[(Empl_{96,i} - Empl_{69,i}) / Empl_{69,i} \right] = f\left[Endowments_i, Initial\ \ Conditions, Location\text{-}\ Specific\ \ Factors \right]$$

Where i refers to total or sector-specific employment and explanatory variables. Separate models are estimated for total non-farm employment growth and for employment growth in sectors including: government, construction, manufacturing, retail, services, finances, insurance and real estate, transportation and public utilities, and wholesale. Farm, agricultural services, and mining sectors were excluded. Employment estimates in the farm sector are not comparable with the non-farm sectors, and the agriculture services and mining sectors were too small, and in many cases non-existent, for inclusion in the analyses.

Ordinary least squares (OLS) approach was used to explain the total employment growth rate and the seemingly unrelated regression (SUR) technique was used to estimate the sector-specific equations to account for the likely correlation of error terms between the individual sector-specific growth equations in this cross-section estimation. Unfortunately because of missing data, we lose 163 observations in the rural SUR estimation. Almost 80 percent of the excluded observations are from the smallest rural counties.

The models of county growth we present allow us to test a number of competing theories in modern economic growth, especially in the context of rural growth. First, Glaeser, et al (1992) state ". .

. all the models predict that cities grow faster than rural areas in which externalities are less important because people interact less." Is it that cities grow faster than rural areas, or rather, that at certain stages of development (a la Echevarria, 1997) they grow faster relative to more rural areas. Once rural counties achieve a certain level of development, they may grow more rapidly than more mature metro counties. At the same time many or even most, rural counties may never reach a self-sustaining level of development.

Second, are knowledge spillovers important in the context of rural growth relative to metro growth? Do the spillovers come from within the sector or from other sectors? Also, does local competition influence the way knowledge spillovers impact employment growth? Schumpeter (1942) and others argue that local monopoly allows the innovator to internalize externalities and that industry concentration increases the rate of growth. Jacobs (1969) argues and Glaeser, et al (1992) find concentration relative to the national industry average has a small negative impact and local competition within a city-industry has a positive impact on growth. We account for relative concentration using the employment share of a sector within a county relative to the employment share of that sector within the entire region. This county/regional employment share gives some indication into the strength of this sector in the local economy, relative to the sector's strength in the region. We further measure the degree of employment concentration within a county using an index computed in the same manner as the Herfindahl-Hirschman Index (HHI). This measure of county employment concentration is the sum of the squared employment shares across all sectors using 1969 employment levels. It provides a measure of county-sector employment concentrations as opposed to city-industry, but is still useful in accounting

for growth gains from internalizing externalities. Jacobs (1969) argues knowledge spillovers are important, essentially across different sectors, so the relative county/regional share of employment should be an appropriate proxy.

The initial human capital endowment is measured by the percentages of high school graduates and college graduates in the county in 1969. Lucas (1988) argued and growth studies commonly find that human capital is a key component of economic growth.

Three additional control variables are included in the employment growth equation. We include the county employment levels in the total and the sector growth equations. Glaeser, et al (1992), concluded higher observed initial employment levels reduce growth in city-industries. They suggest this occurs because of measurement error or more serious economic factors. Following Glaeser, et al (1992), we also include the initial wage level (1969) in our regressions. Other analysts have suggested that firms move to low wage areas and workers move to high wage areas, which is not totally consistent with the assumption of a national market for workers. They found employment growth was uncorrelated with initial wage levels in a city-industry. Finally, the county value of agricultural land was included as a control. We do harbor some concern that the initial value of agricultural land may be correlated with past urban sprawl, but it also may serve as an indicator of productive potential in farming.

The location-specific information component of the model is important when considering growth over rural counties and space. The general assumption is that cities grow (benefit) because of agglomeration economies and potential knowledge spillovers that come from being in close proximity to

other people, which reduce communication and transaction costs. On the cost side, city growth leads to rising economic rents, congestion, and crowding. If the benefits outweigh the costs, then rural areas should be at a distinct disadvantage with respect to non-farm employment growth. The location-specific measures that we use are (1) 1968 distance from the county to the nearest MSA; (2) distance squared; (3) 0/1 dummy for presence of interstate highway in county in 1972; and (4) Beale code 0/1 dummies for the county in 1993 (see Appendix A).

The Beale codes classify counties by metropolitan, urban, and rural as well as population size and adjacency to metro areas for non-metro counties. These codes are not available before 1993, but given population declines in most Heartland counties prior to the 1990's, the 1993 data should cause limited dummy misclassification relative to 1969.

Finally, we have included zero/one dummies for six of the seven states in the Heartland. Differences in state growth and rural development policies and programs, citizens attitudes toward growth and attracting new immigrants, and state market potential can be decisive factors in future employment growth. Further, we would go so far as to conjecture that the types of firms recruited and the sectors from which they originate may be critical to sustaining future growth.

Results and Implications

The results for the employment growth equations for the full sample of 618 counties are presented in Table 2. Most of the estimated coefficients are significantly different from zero at the 90% confidence level or higher, and a significant amount of the employment growth variation, both in total and by sectors, is explained by the variables included in the cross-section estimation.

There is a lot of similarity in, and some important differences between, Equations 1 B 9 reported in Table 2. Generally the initial total and sector employment coefficients are negative and significantly different from zero; not unlike the results obtained by Glaeser, et al (1992). Larger initial employment in a sector may imply that a county is more developed and more mature in the growth process. Alternatively Glaeser, et al (1992) attributed this result to measurement error or more serious economic factors.

More surprisingly, the initial wage rate positively impacts employment growth in all sectors except manufacturing and the coefficient is significantly different from zero in all sectors except retail. A possible explanation is that manufacturing firms in the 1990's have sought lower wage opportunities in rural counties in the Heartland. This interpretation would challenge the assumption of a national, or even regional labor market. Also, the service-type sectors would tend to grow faster in larger market areas where wage rates would be higher if a rural-metro wage rate dichotomy persists. The value of agricultural land has a negative and usually significantly different from zero impact on growth accept in the wholesale sector, where the coefficient is positive but not significantly different from zero at the 90% confidence level. One interpretation is that good agricultural land "crowds out" non-farm employment growth. Another interpretation is that high valued agricultural lands tend to exist in rather homogeneous areas that offer few other natural amenities and limited attractions for potential urban dwellers. Other interpretations may be equally plausible.

For the most part, the human capital variables performed as anticipated. Except for wholesale when the percentage of high school graduates has a negative but not significant impact on growth and

manufacturing where the percentage of college graduates has a negative and not significant impact, the signs are positive as anticipated. Expect for manufacturing, the impact of college graduates is positive on employment growth as might be expected. Another interpretation that has been advanced by Goldin and Katz (1998) is that education, especially college training, is a form of social capital. All other things equal, college graduates are more likely to be community leaders and "shakers and movers." They may be more likely to provide the innovation and entrepreneurial skills needed to grow employment in sectors other than manufacturing.

The dynamic externality and knowledge spillover variables parallel the results of Glaeser, et al (1992), but at the county-sector as opposed to the city-industry level. The concentration index (HHI) has a negative, and frequently significantly different from zero, impact on sector-employment except for the transportation and public utilities sector where it is positive and significant. The latter exception may be explained by the fact that transportation and public utilities are faced with a continually declining long run cost curve and significant economies of large scale production. But in general, concentration has a negative county-sector impact as well as city-industry growth impact. Likewise the measure of specialization or the county/region sector employment share always has a negative coefficient that is significantly different from zero at the 99% level, further confirming Glaeser, et al (1992) even with a more aggregate measure of specialization.

Overall, distance from an MSA had a negative impact, and at an increasing rate, on employment growth except in the manufacturing, transportation and wholesale sectors. The Beale dummies, which really measure increasing "ruralness" of counties, are always negative and significantly different from

zero, and with only a few exceptions, increasing in negative value with increasing "ruralness." The state dummies do illustrate significant difference in many sectors and overall relative to Iowa.

The interstate infrastructure efforts of the U.S., as reflected in the zero/one dummy for the presence of an interstate in the county, had no impact on total or county-sector employment growth in the U.S. Heartland.

Rural vs. Urban-Metro Comparisons

We split the sample of 618 observations into two subsets - rural and urban-metro based on the Beale code categories. Equation 1 in Tables 3 and 4 provide coefficient estimates for total employment growth in rural and urban metro counties.

Most of the coefficients of total employment growth have the same signs and are significant at least at the 90% level in both sub samples. The three control variables all have the same signs, but the initial wage and land values are significantly different in the rural model. Interestingly, the sector concentration has a strong negative impact in rural as well as urban-metro settings. This finding illustrates the importance of knowledge spillovers in rural as well as urban-metro areas. Especially college matters in both environments as a contributor to total employment growth. Obviously, distance matters little in the urban-metro context and presence of interstates continue to be insignificant with respect to employment growth. Some of the state dummy impacts are different, possibly reflecting policy differences between rural and urban-metro areas.

The sector specific growth equations reflect important differences and similarities in Tables 3 and 4. In construction, the control variables are similar but initial wage is positive and significant in rural

areas and initial employment negative and significant in urban-metro. Sector concentration does not matter but sector specialization does in both rural and urban-metro areas. High school human capital has a positive impact, as might be anticipated, in both environments and college is not significantly different from zero. Again, distance only matters for rural areas.

With respect to government employment growth, the initial wage has a positive and significant impact in rural areas as opposed to negative but marginally significant impact in urban areas. The opposite impacts would be anticipated if governments tend to locate government projects in more depressed rural areas. The other coefficients are reasonably consistent with the specialization impacts remaining negative for employment growth. Governments do not locate projects in counties that are specialized in government.

Initial wages have a negative impact on manufacturing growth in rural areas and high school graduates have a positive impact in both environments. Specialization as opposed to diversity has a strong negative impact on employment growth in all sectors and both rural and urban-metro areas.

As might be anticipated, initial retail employment has a positive impact on growth in the sector in rural areas, i.e., a retail trade center, and a negative impact in urban-metro areas, while initial wage only has a positive impact on growth in urban-metro areas. Concentration has a negative impact in both areas, but the coefficient is only significantly different from zero in rural areas. College and high school human capital measures are positive in both environments but college is significantly different from zero only in rural areas; possibly reflecting the social capital/entrepreneurship needed in more isolated settings. Agricultural land values have a strong negative impact on the sector in both situations. Similar

patterns are reflected in service sector growth for both human capital and land values. In both retail and services sectors, urban-metro growth is impacted by the degree of "ruralness" in a negative way.

The rural vs. urban-metro dichotomy has little impact on the coefficients of the finance, insurance, and real estate sector except that college has an important impact in rural areas and high school on urban-metro areas.

The transportation and public utilities sectors both demonstrate important rural and urban-metro differences. In transportation growth concentration has a positive and significant impact on urban-metro sector employment growth, the proportion of the population with a high school education has positive growth impact in urban-metro areas, distance has a positive and decreasing impact in urban-metro areas, and the interstate dummy has a positive impact in rural areas. All of these differences make intuitive sense given the economic characteristics of the transportation sector.

Initial wages have a positive impact on rural wholesale as do agricultural land values, concentration has a negative impact on wholesale growth in rural areas, and high school graduation rates have a positive impact in urban-metro areas, but a negative impact on wholesale employment growth in rural areas.

Conclusions and Extensions

A number of important hypotheses were tested with respect to Heartland employment growth as well as rural vs. urban-metro employment growth in total and by major sectors. In the context of this analysis, there are far too many policy implications to do justice to within the constraints of this paper, but we would like to highlight a few important findings.

First, what matters in city-industries in the U.S. Heartland also matters in county-sectors. Initial employment and wage difference are important control variables as are agricultural land values in the region's employment growth although the latter factor does vary by rural versus urban-metro sectors. Second, measures of concentration and specialization have a negative impact on employment growth and support the findings of Glaeser, et al, (1992). Measures of human capital and possible social capital as it is embodied in college graduates have important, positive impacts on economic growth, especially in rural areas. Third, measures of distance from metro counties are generally negative and increasing except in manufacturing, transportation, and wholesale, but the presence of an interstate in the county has no impact on total or sector growth in the Heartland. Further, the degree of "ruralness" does matter, even when we split the sample and re-estimate the models. Finally, state programs, policies, and growth climate do matter.

The rural versus urban-metro estimates shed interesting new light on pre-conditions for growth in the two areas. Yet, the human capital variables retain the right signs even though differing in the importance of high school versus college and the concentration and specialization variables generally have the same signs as in the overall region models.

The two important extensions that we would like to do are to obtain a measure of social capital and a measure of the potential domestic market for the products of the sector. Also, we are not able to say anything about technology in the manufacturing sector and the potential for future growth in rural areas. A final and perhaps very significant dimension of extension is into policy implications of the results. Have we pursued appropriate strategies for Heartland growth, especially in rural areas? What

state policies and environments might explain the state differences relative to Iowa in zero-one dummy variables? What growth policies would be most effective in rural and urban-metro environments in the future?

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Table 1: Summary Statistics

Variable Name	Mean (total)	Std. Dev (total)	Mean (SUR)	Std. Dev (SUR)
Dependant Variables (Employment Growth Rate)				
Total	0.273	0.339		
Construction			0.467	0.534
Government			0.231	0.325
Manufacturing			0.580	0.804
Retail			0.324	0.440
Service			0.783	0.405
FIRE			0.266	0.463
Transportation			0.323	0.559
Wholesale			0.877	0.636
Independent Variables				
Initial Employment				
Total	12146.120	40319.960		
Construction			757.739	2289.143
Government			2556.458	6480.281
Manufacturing			2820.234	11405.700
Retail			2476.464	7360.020
Service			2708.931	9454.230
FIRE			1035.589	3984.200
Transportation			885.915	3355.948
Wholesale			733.770	3549.437
			1866.476	500.586
Initial Wage				
Total	7.986	3.108		
Construction			20.227	5.773
Government			13.100	1.984
Manufacturing			16.810	4.701
Retail			12.408	1.544
Service			11.985	2.641
FIRE			9.488	3.095
Transportation			23.387	5.487
Wholesale			23.733	6.311
Human Capital				
High School Graduates	49.608	15.810	50.497	17.583
College Graduates	6.562	3.343	6.915	3.562
Other				
Herfindahl-Hirschman	1936.654	540.294	1866.476	500.5857
Distance to a MSA	109.222	68.420	96.688	64.371
Observations	618		448	

Table 2: OLS and SUR Employment Growth Regression Results – All Counties

	Total	Construction	Government	Manufacturing	Retail	Service	FIRE	Transportation	Wholesale
Initial Total Employment	***-1.92E-06	***-0.0000401	***-9.79E-06	**-8.23E-06	***-7.39E-06	***-5.10E-06	***-0.0000117	***-0.0000199	**-0.000018
Initial Wage	***0.0201353	***0.0079798	*0.0113498	***-0.0313169	0.0036418	***0.0183081	***0.0219951	***0.0181246	***0.0094589
Initial Land Value	***-0.0002325	***-0.0004302	***-0.0002017	-6.42E-08	***-0.0004026	***-0.0002581	***-0.0002293	-0.0000439	0.0001276
Herfindahl-Hirschman	***-0.0000986	-0.0000281	-0.0000385	*-0.0001129	***-0.0000728	-0.0000275	-0.000048	***0.0001603	***-0.0001674
County/Regional Employment Share Ratio		***-0.5104278	***-0.2020367	***-0.5410573	***-0.4584551	***-0.4578817	***-0.5511122	***-0.3586349	***-1.061483
High School Graduates	0.0007686	***0.0031222	0.0008543	*0.003444	0.0010614	0.0010131	*0.0015966	0.0002312	-0.0019476
College Graduates	***0.0227094	0.0065101	***0.0315282	-0.000417	***0.0334394	***0.0231314	***0.026581	0.0094423	**0.0166207
Distance to a MSA	***-0.0028526	***-0.0041797	**-0.0012012	-0.0009672	***-0.0028957	***-0.0036324	***-0.0031423	-0.0011893	-0.0002033
(Distance to a MSA)^2	***6.32E-06	**7.62E-06	1.71E-06	-9.00E-06	***7.25E-06	***9.02E-06	***8.45E-06	4.23E-06	1.50E-06
Interstate Dummy	0.0103881	0.0078135	-0.0027527	0.0637432	**0.0739243	0.0245954	0.0199023	0.0768288	0.0757178
Beale 2,3 dummy	***-0.3788915	***-0.5490109	***-0.2601694	***-0.5589096	***-0.4529519	***-0.4309489	***-0.5293822	*-0.2358482	-0.3757878
Beale 4,5 dummy	***-0.4697792	***-0.7251728	***-0.29828	-0.312249	***-0.492128	***-0.5469086	***-0.7561235	***-0.4813337	***-0.5567343
Beale 6,7 dummy	***-0.4870043	***-0.7091153	***-0.3180126	**-0.3619329	***-0.5783597	***-0.5713535	***-0.6582668	***-0.4731805	***-0.4363364
Beale 8,9 dummy	***-0.5904753	***-0.7402665	***-0.3941473	***-0.5355856	***-0.7824229	***-0.6470636	***-0.6910574	***-0.4854636	***-0.3482578
Kansas dummy	**-0.0940142	***-0.2703979	**0.0863135	-0.1844505	***-0.2493316	***-0.1947621	***-0.1823179	-0.0832871	0.0022934
Minnesota dummy	***0.1876879	**0.1567437	***0.1057237	0.129203	***0.193572	***0.2584336	***0.4194076	***0.3177899	***0.241365
Missouri dummy	***0.1632129	***0.2367541	***0.3065133	-0.057851	***0.1595437	***0.167994	***0.262991	***0.398852	***0.239897
Nebraska dummy	0.0492467	-0.0753371	***0.1117868	-0.2072918	-0.0448393	-0.0130593	***0.2303803	***0.2168713	**0.1779741
North Dakota dummy	0.0401899	-0.1136583	-0.0840214	0.2794746	-0.1025257	***0.184539	***0.2368819	0.1912033	***0.3148768
South Dakota dummy	0.0209156	-0.0033357	***-0.1377744	**0.3799713	-0.0325198	*0.1215566	***0.2811087	*0.2062227	0.038653
Intercept	***0.9301651	***2.010482	***0.6255521	***2.122261	***1.712741	***1.749357	***1.217914	0.1845688	***1.813201
Observations	618	448	448	448	448	448	448	448	448
R^2	0.43	0.53	0.61	0.29	0.64	0.58	0.58	0.38	0.49

Table3: OLS and SUR Employment Growth Regression Results – Rural Counties

	Total	Construction	Government	Manufacturing	Retail	Service	FIRE	Transportation	Wholesale
Initial Total Employment	*-8.43E-06	-0.0000739	***-0.0000275	0.0001316	***0.0001039	0.000026	-0.0000522	-0.0001203	-0.0002036
Initial Wage	***0.0280544	***0.0088602	***0.0292281	***-0.0369638	-0.0020014	***0.0174664	***0.0214034	***0.0143249	***0.0115372
Initial Land Value	***-0.0002569	***-0.0004837	***-0.0002161	0.000065	***-0.0005137	***-0.0003299	***-0.0001888	-0.0001471	**0.0002292
Herfindahl-Hirschman	***-0.0000759	-0.0000196	0.0000352	-0.0001315	***-0.000102	-0.0000177	-0.0000457	-0.0000491	***-0.0002616
County/Regional Employment Share Ratio		***-0.4979207	***-0.2057333	***-0.7581513	***-0.4627164	***-0.4451834	***-0.5805882	***-0.6030829	***-1.134186
High School Graduates	0.0006671	***0.0030415	0.0007551	0.0035428	0.0007739	0.0008166	0.0012586	0.0003138	*-0.0024205
College Graduates	***0.0159093	-0.0004295	***0.027335	-0.0079639	***0.0309387	**0.0166493	***0.0235168	0.0036153	0.0060558
Distance to a MSA	***-0.0032906	***-0.0058971	**-0.0015722	-0.0014807	***-0.0038805	***-0.0043299	***-0.0046177	-0.0019073	0.0008273
$(\text{Distance to a MSA})^2$	***7.26E-06	***0.0000125	2.32E-06	-7.70E-06	***0.0000102	***0.0000107	***0.0000131	5.73E-06	-1.27E-06
Interstate Dummy	0.0184201	0.0204204	0.0107922	0.097538	**0.0719713	0.0258393	0.0155448	0.0880702	0.0846282
Beale 8,9 dummy	***-0.1121523	-0.0224028	***-0.0694132	-0.1444858	***-0.1368164	*-0.0643678	-0.0220708	-0.0619547	0.077199
Kansas dummy	**-0.1147737	***-0.3064788	***0.1276729	-0.2064355	***-0.2704514	***-0.211701	**-0.1594482	-0.0614329	0.0243385
Minnesota dummy	***0.1577375	**0.173937	**0.0913567	0.1325428	***0.1745726	***0.2360499	***0.4477009	***0.3098541	**0.2398866
Missouri dummy	***0.1383578	***0.2347879	***0.3455039	-0.037628	**0.1393969	***0.1561756	***0.2882943	***0.3975824	**0.1979704
Nebraska dummy	-0.0073036	**-0.1782249	**0.1035721	-0.2575244	*-0.1004767	-0.0857409	**0.1434352	0.127547	0.1225725
North Dakota dummy	-0.0126199	*-0.2095947	-0.086809	0.2768257	**-0.1705036	*0.1434577	***0.2306101	*0.2109939	**0.3040552
South Dakota dummy	-0.0258977	-0.0536152	**-0.1202713	**0.4095246	-0.079739	0.0861883	***0.2788134	*0.2018987	0.0204654
Intercept	***0.5021317	***1.477475	0.0224748	***1.944914	***1.319747	***1.293717	***0.6951365	***0.5964177	***1.547029
Observations	510	347	347	347	347	347	347	347	347
R^2	0.37	0.51	0.60	0.27	0.56	0.45	0.51	0.42	0.49

Table 4: OLS and SUR Employment Growth Regression Results – Urban Counties

	Total	Construction	Government	Manufacturing	Retail	Service	FIRE	Transportation	Wholesale
Initial Total Employment	***-1.97E-06	***-0.0000345	**-6.21E-06	-2.88E-06	***-7.81E-06	***-5.02E-06	-5.90E-06	*-0.0000147	-0.0000129
Initial Wage	0.0092433	0.0035034	-0.0150074	-0.0037379	***0.033533	***0.0243331	**0.0229024	***0.0314695	0.0022928
Initial Land Value	-0.0001272	***-0.0003538	*-0.0001175	***-0.0004449	***-0.0002871	***-0.0001846	***-0.0003065	-0.0000572	-0.0001533
Herfindahl-Hirschman	***-0.0001233	-0.0000409	-0.0000578	-0.0000581	-0.0000366	*-0.0000656	-0.0000427	***0.0002786	-0.0000414
County/Regional Employment Share Ratio		***-0.4815321	-0.1692459	***-0.3132812	***-0.3306927	***-0.5417792	***-0.4348438	***-0.2844063	***-0.840956
High School Graduates	0.0073421	**0.0132468	0.0022893	0.0139788	***0.0190438	***0.0171854	***0.0201216	***0.023643	***0.0279832
College Graduates	**0.0238022	0.0029669	***0.0295413	0.0067036	0.012305	0.0092463	0.0110415	-0.0067986	-0.0025981
Distance to a MSA	-0.0013298	0.001702	0.0005702	0.0032403	0.0016217	0.0007933	0.00263	**0.0052049	-0.0011934
(Distance to a MSA)^2	5.85E-06	-5.53E-06	-1.00E-06	-0.0000134	-4.30E-06	-2.22E-07	-7.57E-06	-0.0000122	2.35E-06
Interstate Dummy	-0.0348419	-0.0475078	-0.0166314	-0.179571	0.0374796	-0.0034559	-0.0137625	-0.0221705	0.0108205
Beale 2,3 dummy	***-0.3848298	***-0.7091879	-0.2780573	***-0.6349507	***-0.4592316	***-0.4745873	***-0.6708533	**-0.2681262	***-0.6049218
Beale 4,5 dummy	***-0.577235	***-1.13375	-0.384326	***-0.7948465	***-0.680006	**-0.7791151	***-1.091161	***-0.8004473	***-0.6933404
Kansas dummy	-0.0044147	-0.1919139	0.006099	-0.0244301	**-0.1998713	***-0.1742962	-0.1876981	-0.1938357	-0.0994569
Minnesota dummy	***0.2849567	0.0473172	0.0938454	0.2067111	**0.2383478	0.2662312	***0.3995017	*0.2680243	**0.3714446
Missouri dummy	**0.2407757	0.1194039	0.1465062	0.1102303	*0.1845296	0.1495703	*0.2480181	**0.3750468	***0.5703029
Nebraska dummy	**0.2213256	0.1791986	0.1021146	0.1472951	0.0969058	*0.1448877	***0.5268462	*0.353422	**0.4259385
North Dakota dummy	0.1034542	-0.0126788	-0.0536136	0.0064306	0.0022167	0.0512757	0.1238326	-0.1131836	0.4601075
South Dakota dummy	0.1781211	0.1597975	-0.1932044	0.1435329	0.0468548	0.1233732	*0.3434848	-0.0096017	*0.5312969
Intercept	*0.541063	***1.474735	0.8758664	*0.9903927	0.0842097	***0.8966441	0.2106969	***-1.611352	0.428567
Observations	108	101	101	101	101	101	101	101	101
R^2	0.58	0.65	0.59	0.48	0.68	0.75	0.67	0.55	0.63

Appendix A

1993 Beale Code Definitions:

Code	Metropolitan Counties (0-3)
0	Central counties of metropolitan areas of 1 million population or more
1	Fringe counties of metropolitan areas of 1 million population or more
2	Counties in metropolitan areas of 250,000 B 1,000,000 population 3 or more
3	Counties in metropolitan areas of less than 250,000.

Code	Non-metropolitan Counties (4-9)
4	Urban population of 20,000 or more, adjacent to a metropolitan area
5	Urban population of 20,000 or more, not adjacent to a metropolitan area
6	Urban population of 2,500-19,999, adjacent to a metropolitan area
7	Urban population of 2,500-19,999, not adjacent to a metropolitan area
8	Completely rural (no places with a population of 2,500 or more) adjacent to a metropolitan area
9	Completely rural (no places with a population of 2,500 or more) not adjacent to a metropolitan area