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Assessing Domestic Migration at the County Level in the 4-Corners Region

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Introduction

The influence of migration patterns on economic growth or decline across geographic locations has served as a focus for research across the United States for several decades. The ability to successfully model changes in migration provides a useful tool for community leaders and for economic developers who are charged with attracting new jobs and furthering economic development in a region. This paper examines the relationship between net migration flows in the 1995 and 2000 period in the 4-Corners Region of the U.S. and a set of economic and amenity-based variables.

The region of study was limited to the 93 counties in Arizona, Colorado, New Mexico, and Utah which contained a minimum of 10,000 permanent residents in 1995. Counties with populations of less than 10,000 residents were not included in the analysis for two reasons. Many of the variables used in this study rely on percent changes over periods of time. These changes may appear quite sizeable when the base numbers are very small, thereby producing large percentage changes when in fact, the absolute size and resulting impact are quite small. Furthermore, the sampling process to obtain the migration flow data can result in numbers too small to be statistically significant for these counties.

Predicting migratory flows is often accomplished by reliance on empirical relationships that have been identified over time. Occasionally this procedure is complicated by migration turnarounds that have been observed since the 1970's (Fuguitt and Beale 1978; and Fuguitt and Tordella 1980) in works that confirmed a reversal of long-time migration trends in many rural counties across the nation.

Economic opportunity was often credited with providing a pull-factor that counties could count on to attract new residents into an area. However, many studies have demonstrated that quality of life and the role of amenities in particular locations have also played an important role in the decision to migrate (McGranahan 1999; Green 2001; Deller et al., 2001; Gunderson and Ng 2006.) Earlier, Graves (1973, 1979, 1980) concluded that generalized increased levels of income and wealth are related to location-specific amenities and leisure activities, which in turn could influence migration into a region. Johnson and Stewart (2005) used urban proximity to demonstrate the relationship between second-home ownership and eventual migration to areas influenced by recreation and amenities in southeastern Wisconsin. Porell (1982) addressed tradeoffs between economic and amenity factors to explain migration occurring in metropolitan regions between 1965 and 1970.

At the same time, Roback (1982) argued that positive quality-of-life factors in many locations will not only influence levels of wages and rents, but individuals are also willing to trade off higher wages and pay higher rents so that they might live in these communities. Blanchflower and Oswald (1994) built upon Roback's work and found that individuals are frequently willing to accept higher levels of unemployment in order to live in high-amenity locations. Barkley et al. (1998) and Dorf and Emerson (1978) employed factor analysis techniques to generate underlying dimensions that explain manufacturing plant location in nonmetropolitan regions and examined the role for local school quality in assessing the growth of employment and population. Cebula and Alexander (2006) found the presence of hazardous waste sites and toxic chemical releases were negatively related to net state in-migration in the 2000-2004 period. Thus, an increasingly diverse amount of research supports the hypothesis that both economic factors and life-style amenities (both positive and negative) each play a role in the decision to migrate.

Measuring the effects of amenity-related variables on migration is complicated by how these attributes link to economic performance in each county. In selected cases, it is quite apparent that the presence of amenities contributes to a healthy economy and generates increased permanent migration into the region. While in others, recreation and entertainment amenities may attract large numbers of visitors and contribute to a healthy economy, yet the added employment opportunities do not, in turn, induce additional migration into these areas.

DATA

Ninety-three counties from Arizona, Colorado, New Mexico and Utah were included in this analysis constituting all counties with 10,000 or more permanent residents in these states. In the initial phase of the research for this paper, separate analyses for the rural versus urban-based counties were conducted; however, the interpretations of the separate models did not improve based upon the unique treatment of the two county types.

Data were collected from numerous sources commencing with 1990 and 2000 information collected in the decennial U.S. Census of Population and Housing for these periods. Additional information for 1995 was

obtained from the Bureau of Economic Analysis Regional Economic Accounts. Data were also selected from the National Outdoor Recreation Supply Information System (NORSIS) data set prepared and maintained by the USDA Forest Services' Wilderness Assessment Unit, Southern Research Station, Athens, Georgia. The NORSIS data set contains several hundred variables ranging from population density, land use, access to water and recreation activities, climate and numerous additional items designed to identify amenities that may contribute to increased migration into a region.

Empirical Results

The criterion variable used for this study was the domestic five-year net migration rate for each county between 1995 and 2000. This information is available from the Census 2000 long form question on residence. The Census Bureau calculates the net migration rate as the ratio of the difference between in migration and out migration for each county to the intercensal 1995 census estimate of population for each county, and then multiplied by 1000.

Five predictor variables were selected from a larger set of variables that focuses on economic as well as lifestyle and amenity characteristics in the counties. Many of the variables initially investigated were found to be ineffective in predicting net migration. Consequently, the five variables included in the equation were:

- per capita wages and salaries as a percent of overall per capita personal income;
- the percentage change in total county employment;
- the percent of county employment attributed to manufacturing;
- the percent of local municipality tax revenues derived from property taxes; and
- the average January temperature in each county.

Data from 1995 were used to measure wages and salaries per capita as a percent of overall personal income per capita (abbreviated as WSP.) This variable measures the portion of overall personal income originating from wage and salary sources. Wages and salaries represent one of several components of overall personal income which also includes proprietors' income, dividends, retirement income and transfer payments such as social security income, veteran's benefits and various welfare payments to the unemployed or disabled. The hypothesis here is complex. Two scenarios are possible. One hypothesis emerges when wages and salaries represent a high percentage of total income. This could be an indication of economic prosperity and consequently a stimulus for migration into the county; thus, the need for fewer transfer payments which would generate a higher ratio. The second scenario might apply to high-retirement counties where individuals who possess significant wealth and receive dividends and retirement income but little if any earnings, move into a community for the various lifestyle amenities. In this scenario, the wages and salaries portion of overall personal income will be lower compared to the results in the initial scenario. An inverse relationship between wages and salaries as a percent of income will appear at the same time as new net in migration. Therefore, we are unable to predict how these two influences will interact prior to analyzing the data, thus the sign on this coefficient could be either positive or negative.

The percentage change in total employment from 1989 to 1999 (abbreviated as EMP CHANGE) reflects the measurement of the change in the percentage of the county population that was employed in each of the two years. The hypothesis is that if this rate increased, for example from 45 percent to 55 percent, this would serve as an attraction for people to migrate to the county. On the other hand, if the rate declined, out migration would be the more likely outcome. Therefore, we project a positive sign on this coefficient.

The percent of employment originating in the manufacturing sector is also expected to influence the net migration rate since high levels of manufacturing employment in many counties may serve as an indicator of economic health. Thus, additional manufacturing jobs would provide an attraction for individuals to migrate into the county as well as provide a source of resistance for persons to move out. Therefore, a positive sign is expected for this variable.

The percent of local municipality (cities, towns, county governments, etc.) revenue generated from property taxes (abbreviated as PROPERTY) was obtained from the NORSIS data set for the year 1986-87. Our hypothesis is that when property tax as a percent of total revenue increases, a portion of the increase in revenues may be driven by greater numbers of new residents who are driving the increased development. Thus, we expect a positive relationship between net migration and PROPERTY.

Finally, the mean average January temperature in each county was used a proxy for climate conditions that could impact the decision to migrate into or out of a region. The terrain in the 4-Corners region varies considerably and January temperatures range from moderate in the desert climates in portions of the region, to

frigid in the more mountainous areas. We expect a positive sign on this coefficient to indicate people are more likely to migrate on a permanent basis to warmer climates. This is consistent with numerous findings in the literature (Cebula and Alexander 2006; Conway and Houtenville 1998.)

Prior to developing the regression equation, two variable plots between the criterion variable, the domestic five-year net migration rate for each county between 1995-2000, and each of the predictor variables were analyzed. Each of the relationships was approximately linear with simple positive correlations ranging from 0.37 to 0.76. All but the JAN TEMP variable were found to have statistically significant relationships with net migration at the .01 level or less.

A stepwise regression model utilizing SPSS 15.0 for Windows[®] was used to narrow a field of potential predictor variables. This approach introduces predictor variables into the model as long as there is a positive contribution to the coefficient of multiple determination.

The equation relating migration to the five predictor variables possesses an F value of 45.189 with a significance level of less than 0.001. Each of the regression coefficients was significantly different from zero at the 0.05 level or less, and the constant was also found to be significant. The coefficient of multiple determination for the five variable model was 0.722 with an adjusted R Square of 0.706. The results of the multiple linear regression model are found in Table 1. The standardized coefficients indicate how one decides which of the independent variables is most important for determining the response variable. The explanatory variables are arranged in Table 1 from the most important (EMP CHANGE) to least important (JAN TEMP.)

Table 1. Multiple Linear Regression

R Sq = 0.722 Adj. R Sq = 0.706 n = 93
Breusch-Pagan = 0.0678

Predictor	Coefficients	Standardized Coefficients	t Stat	P-value	VIF
CONSTANT	-0.13428		-2.73	0.0073	
EMP CHANGE	0.16579	0.634	9.36	<.0001	1.433
WSP	-0.14307	-0.215	-3.17	0.0021	1.432
MFGR	0.00323	0.191	3.22	0.0018	1.100
PROPERTY	0.00136	0.188	3.16	0.0021	1.106
JAN TEMP	0.00137	0.128	2.12	0.0369	1.140

Discussion

Several important factors emerge from the results presented from this analysis. First, employment change over the period from 1989 to 1999 is responsible for the majority of the predictive power of the equation. Another significant and interesting point is the negative sign on the wage and salary variable. What this suggests is the importance of households with high levels of wealth and income but not necessarily high levels of wage and salary income, on the rate of net migration. This confirms the idea that high income households may dominate the flow of migrants into some of these counties and thus account for the negative sign. The migration flows observed in many high-amenity, recreation-oriented counties in the region follow this pattern. Several counties are identified where quality-of-life factors positively influence the migration rate and where the WSP variable was below the average found across the region. As examples, these include Mohave and Yavapai counties in Arizona, Douglas and La Plata counties in Colorado, Santa Fe and Valencia counties in New Mexico and Summit and Wasatch counties in Utah. Representative communities within these counties such as Lake Havasu City, Park City and Santa Fe, have experienced rapid growth as a result of recreation or resort-oriented activities that have flourished in recent years.

The EMP CHANGE and MFGR variables are generally considered to be primarily economically-oriented in terms of their impact as opposed to the other three variables which can be considered part of an amenity-related profile that might contribute to positive net migration. The positive coefficients on EMP CHANGE and MFGR would be expected in locations where increasing rates of economic activity, and in particular, the presence of manufacturing activity, serve to attract new migrants into the county. This would very likely appear in the larger populated counties; however, smaller size counties which exhibit healthy growth will also reflect this pattern. Once again, a review of the counties in the Four-Corner States enables us to confirm this relationship in many

areas including Maricopa County in Arizona which includes Phoenix; Utah County which includes Provo-Orem; Douglas, and Larimer counties in Colorado which contain portions of Denver and Ft. Collins; and Sandoval County in New Mexico, the home of Albuquerque.

Logically, the PROPERTY variable should move in concert with the employment variables, and should exhibit a positive sign when net in migration increases. This occurs as a result of the additional influx of new households seeking employment in the county. Alternatively, in instances where positive migration flows can be attributed to high-end homebuyers moving into the county for recreation or retirement purposes, the property values will also increase to reflect the increased demand on land pressures in these locations.

There is a minor but significant impact of January average temperature on migration. Although this was not a significant relationship when the simple correlation between January average temperature and migration rates was investigated, it does add power to the equation through the interaction effect.

Testing the Assumptions of the Model

SAS 9.1 for Windows[®] was used to confirm the SPSS analysis to determine the variance inflation factors (VIF) and to complete the Breusch-Pagan test (Breusch and Pagan 1979).

The VIFs in all the models revealed values less than 10 which indicate the absence of significant multicollinearity among the predictor variables. If a set of explanatory variables is uncorrelated, then the individual VIFs will be equal to one. The VIFs have values between 1 and 2 in this study.

The Breusch-Pagan test is used to test for heteroscedasticity. This test is particularly important when using cross-section data in the models. The Breusch-Pagan test assumes that the error variance varies functionally with a set of regressors. Using this test, the null hypothesis is homoscedasticity; thus, we wish to fail to reject the null hypothesis with large p-values. If the observed level of significance is greater than 0.10, then there is no significant heteroscedasticity in the model without any reasonable doubt. When the p-value is between 0.01 and 0.05 it is important to know the value of alpha in order to make a decision about the null hypothesis. The Breusch-Pagan test shows an observed value of significance of 0.067 indicating that the null hypothesis of homoscedasticity is not rejected at the 5 percent level of significance. Furthermore, the residuals were normally distributed with a mean of zero.

Conclusions

This study has investigated determinants of county net migration for the 4-Corners Region of the U.S. from 1995 to 2000. Fifty-five of the 93 counties in these states whose populations exceeded 10,000 in 1995, experienced positive net migration over this period. During this time, both employment-related and amenity-related factors exerted positive influences on the migration flows.

The net in migration rate is positively impacted by a low wage and salary ratio to overall personal income in these counties. Although this may appear counterintuitive at first glance, this result was confirmed through experiences in several counties where either retirees or high-income residents migrated to these locations. These residents are oftentimes not employed thus they do not contribute to the earnings stream; however, they bring nonwage earnings in the form of dividends and other unearned income, thus lowering the wages and salary to overall income ratio.

Their presence also contributes to an increase in the percentage of local government revenue generated from property taxes which moves in tandem with increased demand for real property under these conditions, and in this way contributes to higher valuations and increased revenues for local governments. Therefore, an influx of wealth and income into recreation-based, high-amenity counties within this region is partially driving the net migration. However, traditional economic variables also continue to influence the flow of migrants into the region. Increases in total county employment exerted the largest force on the migration rate. The relative importance of the manufacturing sector in each county was also highly significant. Therefore, county officials should not disregard the importance of expanding existing industries as well as attracting new industries in their efforts to stimulate local job creation since the time-honored tradition of "people following jobs" remains a significant force in the continued inflow of new residents into these counties.

Further research on this topic is suggested. One approach would be to group the counties based on similarities in the profile for the explanatory variables used in this study. Once groups of similar counties are identified, comparison of net migration rates could be statistically evaluated. Moreover, the natural grouping of counties using various cluster techniques would improve the qualitative explanation of how the variables impact net migration.

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