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Joshua J. Turner
Mississippi State University

W. Trevor Brooks

Donald E. Arwood

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Joshua J. Turner* W. Trevor Brooks Donald E. Arwood

Abstract This study examines the influence of selected structural conditions on the county-level net-migration trends of North Dakota and South Dakota. Key principles from Lee's Theory of Migration (1966) and Wallerstein's World Systems model (1974) were integrated to explain how geographic context, economic dependency, and pace of economic development combine to serve as the main catalysts behind the migration patterns in these two states. Results indicate that commuting patterns, the percentage of workers employed in extractive industries, the percentage of workers employed in manufacturing, and job change rates were significant predictors of county migration patterns.

INTRODUCTION

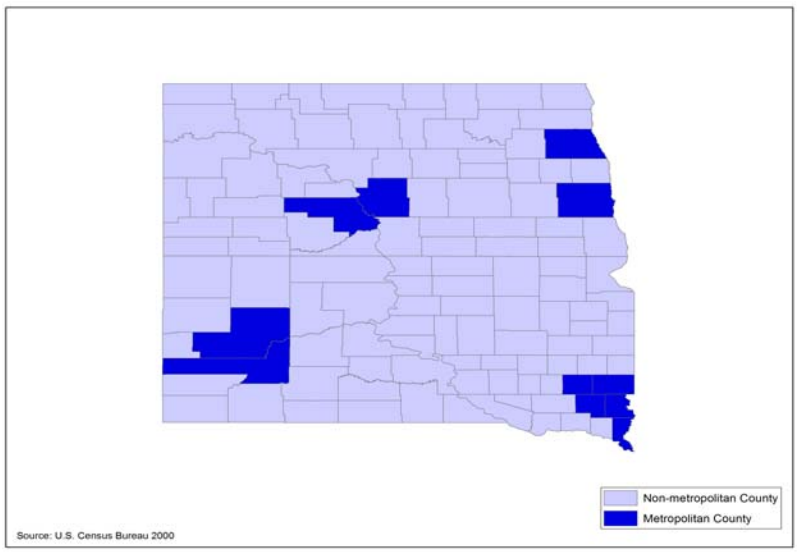
Migration is not a random occurrence, it is a selective process influenced by a variety of factors. One set of factors that cannot be ignored includes structural conditions like natural amenities (Cromartie 1998; Johnson and Beale 2002), interstate access (Lichter and Fuguitt 1980), and adjacency to metropolitan areas. These conditions play a crucial role in determining whether an area is likely to attract new populations or lose existing ones.

The purpose of this study is to explore the relationship between structural conditions and the county-level net-migration rates of North Dakota and South Dakota. Net-migration is an indicator of the movement of populations (both domestic and international) into or out of an area. For a county to have experienced a positive rate of net-migration more people would

* Joshua J. Turner, Mississippi State University, 203 Robert Louis Jones Circle, Mississippi State, MS 39762; e-mail: jturner@ nsparc.msstate.edu

have moved into it rather than moved out. Conversely, a negative rate of net-migration is the result of the number of out-migrants exceeding the number of in-migrants (Weeks 2008).

Figure 1 Distribution of Non-Metropolitan vs. Metropolitan Counties in North Dakota and South Dakota, 1990-2000



The counties of these two states were selected for several reasons. First, they comprise a sparsely populated region, heavily isolated from the major urban centers of the country. Non-metropolitan counties account for over 90 percent of the counties in these states (U.S. Census Bureau 2000; see Figure 1). This provides researchers with a setting to test the possibility of a core-periphery relationship, a concept that will be defined later in the study. Second, the pattern of net-migration among these non-metropolitan counties runs counter to national trends between 1990 and 2000, a period in which 71 percent of non-metropolitan counties recorded positive population change (Johnson 1999). During this same decennial census period, over 80 percent of the non-metropolitan counties in North Dakota and South Dakota recorded negative

rates of net-migration (U.S. Census 2000 Bureau; see Figure 1). Finally, this study presents an opportunity to add to the limited amount of research on the migration patterns of these two states. Up to this point, much of the research focusing on county-level migration in Great Plains states has been largely descriptive (Albrecht 1993; Kulcsar and Bolender 2006; Rathge 2005; 2008). Less emphasis has been placed on the possible theoretical frameworks that could help explain the role that certain structural conditions play in influencing migration rates in this region. Adding a theoretical approach to the literature will help researchers better understand the role that structural conditions, such as commuting patterns and job growth, have played in influencing the migration patterns of the Dakotas.

This article begins with a review of past research identifying the relationships between migration, geographic context, and economic development. Key principles from Lee's Theory of Migration (1966) and Wallerstein's World Systems model (1974) are used to explain these relationships. From these theoretical frameworks, hypotheses are developed and tested in an attempt to show the viability of these theories in explaining the county-level net-migration in the Dakotas.

REVIEW OF LITERATURE

Historically, the non-metropolitan counties of the Great Plains have been susceptible to out-migration, even in times of overall growth for non-metropolitan counties on a national scale (Albrecht 1993). In the Dakotas, over 80 percent of non-metropolitan counties recorded negative rates of net migration between 1990 and 2000 (U.S. Census Bureau 2000). This runs counter to the "rural rebound" of the 1990s, a period in which 71 percent of non-metropolitan counties recorded gains in population (Johnson 1999).

Geographic context has long been effective in predicting a region's potential for

population growth and economic development (Lee 1966). Isolation from core areas or areas possessing greater concentrations of capital and higher levels of economic development has left many non-metropolitan-or peripheral-areas in a state of uneven development relative to their metropolitan counterparts (O'Hare and Mather 2008). Lack of development brings with it a lack of economic diversity and opportunity, as well as increased levels of social isolation for areas already dealing with high levels of geographic isolation (O'Hare and Mather 2008; Tickamyer and Duncan 1990).

In addition to being isolated, the Great Plains is heavily dependent on extractive industries, particularly agriculture (White 1998). Data on the county typology of North and South Dakota show that 70 percent of counties are classified as being farming or mining dependent[1]. The average net-migration rate for these counties was recorded at - 6.04 migrants/1,000 population between 1990 and 2000 (U.S. Census Bureau 2000; USDA-Economic Research Service 2004).

The reduced demand for labor due to technological advancements in agriculture has resulted in a decrease in occupational opportunity in agriculturally-dependent counties that have failed to develop employment opportunities in alternative industries (Rowley 1998). This situation has contributed to the redistribution of population in states located in the Great Plains (Albrecht 1993; Bowers 1998; Cromartie 1998; Davidson 1996; Rathge 2005; Rathge and Highman 1998). In this situation, metropolitan counties located in Great Plains states are likely to receive in-migrants from their non-metropolitan counterparts (White 1998). Indeed, between 1990 and 2000, metropolitan counties in the states of North and South Dakota

[1] A county is classified as farming-dependent when farm earnings account for at least 15 percent or more of total county earnings or when farming occupations account for 15 percent or more of all occupations in a county's workforce. Similarly, a county is classified as mining-dependent when at least 15 percent of total county earnings are derived from mining related occupations (USDA-ERS 2004).

averaged a net-migration rate of 8.82 migrants/1,000 population compared to a negative average of - 5.56 migrants/1,000 population for non-metropolitan counties (U.S. Census Bureau 2000; USDA-Economic Research Service 2004).

Metropolitan counties provide opportunities in industries that call for specific levels of education and training. They also possess infrastructures that allow them to attract industries associated with amenity-based development such as manufacturing, retail sales, and entertainment and recreation services (Nord and Cromartie 2000). The migrants that do move to disadvantaged counties tend to work in unskilled labor and have lower educational attainment (Domina 2006; Nord 1998).

Access and proximity to urban centers through commuting has influenced in-migration to some non-metropolitan counties (Johnson and Beale 1994). The ability to commute to work attracts younger adults with families who are allowed access to urban centers while being able to raise children in a more rural environment (Johnson and Fuguitt 2000). These smaller communities adjacent to more metropolitan areas are attractive to those who desire less expensive housing and the possibilities of maintaining family ties (Nitschke 2004).

More convenient access to interstate highways has helped to increase the ability of people to commute and gain access to urban centers (Lichter and Fuguitt 1980). Access to interstate highways has also been viewed as a potential force behind population gain, population redistribution patterns, and job increase (Lichter and Fuguitt 1980; Smith 1971; Voss and Chi 2006). Some support can be found for these statements when looking at the migration trends of the Dakotas. Metropolitan counties with interstate access were among the fastest growing counties in the Great Plains region. For example, Lincoln County, South Dakota, was one of the top 60 fastest-growing counties in the nation, with a population change rate of 56.4 percent between 1990 and 2000 (U.S. Census Bureau 2001). The Sioux Falls metropolitan

statistical area- of which Lincoln County is a part and where South Dakota's two interstate highways intersect- was also among the fastest growing small metropolitan areas during this period (U.S. Census Bureau 2001).

THEORETICAL FRAMEWORK

This study integrates key principles from Lee's Theory of Migration (1966) and Wallerstein's World Systems model (1974) to explain the migration patterns of North and South Dakota. The consolidation of these two frameworks serves as an example of theory integration. This occurs when relevant parts from at least two theories are integrated to more effectively explain what neither theory can sufficiently do alone (Wagner and Berger 1985).

Lee (1966) argues that populations can be influenced to leave a place of origin if more favorable opportunities are perceived to exist in a new destination. In Lee's model, negative features influencing out-migration are seen as "push" factors, while positive features influencing in-migration are seen as "pull" factors. Many of Lee's key theoretical statements are appropriate for explaining the migration trends of the Dakotas.

For instance, Lee (1966:52) highlights how new and more diverse opportunities can affect volumes of migration by arguing, "The volume of migration within a given territory varies with the degree of diversity of areas included in that territory," and, "new opportunities are continually created in places to which workers must be drawn, and old enterprises are ruthlessly abandoned when they are no longer profitable."

In another set of statements, Lee (1966:54) points to the role that economic development can play in the migration process by stating, "The volume and rate of migration vary with the state of progress in a country or area," and "higher rates of progress can lead to the creation of populations that respond quickly to new opportunities and react swiftly to diminishing opportunities."

These statements made by Lee relate well to the migration trends observed in the Dakotas, where economic opportunities are more abundant in counties with access to a core city. Conversely, North and South Dakota's most remote counties continue to lose economic activity or fail to attract new development, which may push existing residents to migrate. According to Lee both of these situations can contribute to out-migration.

The addition of Wallerstein's model (1974) helps explain why origins and destinations exist. This model is often used to explain the exploitive relationship between less developed countries and the multinational corporations of core countries (Massey, Arango, Hugo, Kouaouci, Pellingro, and Taylor 1993). However, it is also useful in explaining the exploitive relationship between the economic centers and peripheral hinterlands within countries (Galtung 1971). In this scheme, the penetration of capitalist economic relations into the rural hinterland displaces workers, creating a mobile population that is prone to migrate to centers of more diverse economic activity (Rogers, Korsching, and Donnemeyer 1988).

A World Systems perspective puts metropolitan counties in the core areas and centers of diverse economic activity, while placing the non-metropolitan, agriculturally dependent counties, into the periphery (Krugman 1991; White 1998). This industrial dominance leads to the further dependence and spatial inequality of non-metropolitan counties that lack access to basic amenities and the necessary networks for competing with urban economies.

Here the justification of integrating key ideas from both Lee and Wallerstein is reinforced, as parallels can be drawn between their explanations of migration patterns. While Lee describes the characteristics of areas most likely to lose or gain population through migration, the addition of Wallerstein's concepts of "core" and "periphery" places the counties of the Dakotas into an appropriate geographic context to show the interdependent relationship that exists between the metropolitan and non-metropolitan counties of the two states. The

map in Figure 1 illustrates the spatial concentration of metropolitan counties in these two states, while also displaying the lack of access some non-metropolitan counties have to metropolitan areas.

The general proposition of this study focuses on the influence of selected structural conditions on the migration patterns of North and South Dakota. From this general proposition several hypotheses can be deduced. These hypotheses, which are listed below, relate well to the arguments of Lee and Wallerstein and to the main goal of this study for a number of reasons. First, they test the very "push" and "pull" factors that Lee argues influence the migration process. Second, using levels of rurality and commuting patterns as independent variables strengthens the possibility of displaying a core- periphery relationship described by Wallerstein. Finally, a focus on a county's share of employment in specific industries and rates of job change is an effective way to test the frameworks of the two selected theorists, as both approaches place an emphasis on the relationship between economic development and migration. From these general propositions this study proposes the following hypotheses:

H_1: There is a negative relationship between higher levels of rurality and net-migration.

H_2: There is a positive relationship between the percentage of workers commuting out of their home county for work and net-migration.

H_3: There is a positive relationship between interstate access and net- migration.

H_4: There is a negative relationship between the percentage of workers employed in extractive industries and net-migration.

H_5: There is a positive relationship between the percentage of workers employed in manufacturing and net-migration.

H_6: There is a positive relationship between the percentage of workers employed in retail services and net-migration.

H_7: There is a positive relationship between job change rate and net-migration.

METHODOLOGY

Data and Units of Analysis

Data were collected from the U.S. Census Bureau, the U.S. Department of Agriculture's Economic Research Service, the U.S. Department of Transportation, and the Bureau of Economic Analysis. Counties were selected over other possible units of analysis because they have defined political boundaries in which decisions are made (Lichter and Johnson 2006). All counties (n=119) were included in the sample, regardless of total population, and combined into one analysis.

Operationalization of Concepts

Net-migration rates. The dependent variable for this study was the county-level net-migration rates recorded between the years of 1990 and 2000. These rates measure the number of in- and out- migrants (both domestic and international) per 1,000 population (Tarver 1961). The mean net-migration rate for all counties was recorded at - 4.23; that is, for every 1,000 people living in a county, 4.23 more people migrated out between the years of 1990 and 2000 (U.S. Census Bureau 2000).

Geographic context. Three variables were used to measure a county's geographic context: (1) Rural-Urban Continuum Codes, (2) the percentage of residents commuting outside of their home county for work, and (3) interstate access. Rural-Urban Continuum Codes classify counties based on population size, adjacency to metropolitan areas, and levels of rurality (USDA-Economic Research Service 2004). These codes range from "1" to "9." Counties assigned codes ranging from "1" to "3" are classified as metropolitan while those coded "4" through "9" are classified as non-metropolitan. A total of eleven counties (9.2 percent) were classified as metropolitan counties. These counties were all assigned a code of "3," meaning they were located in metropolitan areas of fewer than 250,000 residents. The majority of

counties (53.7 percent) were assigned a Rural-Urban Continuum Code of "9." These counties are classified as being non-adjacent to metropolitan areas and either completely rural or home to an urban population of fewer than 2,500 residents (USDA-Economic Research Service 2004).

The second geographic context variable focused on the relationship between commuting and net-migration. This was achieved by utilizing U.S. Census Bureau data that measured the percentage of workers commuting outside of their home county for work. In 2000, the average percentage of workers commuting outside of their home county for work in North and South Dakota was recorded at 20.27 percent (U.S Census Bureau 2000; See Table 1).

Table 1 Correlation Values for Independent Variables and Net-Migration Rates

Independent Variables	N	County Mean	r-Value
Rural-Urban Continuum Code	119	--	-.474***
Percentage Commuting Out of County for Work, 2000	119	20.27	.388***
Interstate Runs Through County (0=no, 1=yes)†	119	--	.301***
Percentage Employed in Extractive Industries, 2000	119	18.02	-.578***
Percentage Employed in Manufacturing, 2000	119	7.30	.420***
Percentage Employed in Retail, 2000	119	10.22	.342***
Job Change Rate, 1990-2000	119	13.36	.569***

*p= .05; **p= < .01; ***p= < .001
† Eta utilized for this variable

Presence of an interstate highway was the third variable used to measure the relationship between geographic context and net-migration. These counties were identified using data from the U.S. Department of Transportation (2007). To measure this relationship a dummy variable was created. Counties with an interstate highway running within its boundaries were assigned a code of "1" (n= 36) while those without an interstate highway were assigned a code of "0" (n= 83).

Economic dependency. Three variables were used to examine the relationship between economic dependency and net-migration. These variables were the percentage of workers employed in industries related to resource extraction (most notably agriculture), manufacturing, and retail services. Figures in Table 1 show that on average 18.01 percent of workers in these counties were employed in extractive industries in 2000, compared to 7.30 percent in manufacturing and 10.22 percent in retail services (U.S. Census Bureau 2000). Though these variables only test the relationship between economic dependency and net-migration at one point in time, they are effective in displaying how a county's share of employment in a specific industry can help to predict migration trends and whether certain industries are associated with a positive or negative rate of net-migration.

Economic development. Job change rates provided by the Bureau of Economic Analysis (2000) were used to examine the relationship between county-level economic development and rates of net-migration. These rates measure the percent change in total employment, while also serving as an indicator of job creation, a chief indicator of economic development. The average job change rate for the counties under analysis was recorded at 13.36 percent between the years of 1990 and 2000. This was lower than the nation as a whole, which recorded a job change rate of 19.54 percent (Bureau of Economic Analysis 2000; See Table 1).

Modeling Strategy

Hypotheses were tested through bivariate correlations and an Ordinary Least Squares (OLS) regression analysis. Bivariate correlations were used initially to display individual relationships between the selected independent variables and net-migration. An Ordinary Least Squares regression model was then utilized to illustrate the combined influence these variables have on the strength and direction of county-level net-migration and as the deciding factor in accepting or rejecting the research hypotheses.

RESULTS

Results from the bivariate correlations show initial empirical support for all research hypotheses. The percentage of workers employed in extractive industries ($r = -.578$; $p \leq .001$) and job change rates ($r = .569$; $p \leq .001$) show the strongest relationships with net-migration rates. All other independent variables are moderately associated with the dependent variable (See Table 1).

When combined into one regression model the seven independent variables account for 61.1 percent of the variance in the dependent variable. Support is found for four of the original seven research hypotheses, while three are found to be statistically insignificant. The results of the bivariate analysis and the regression model as they relate to the hypotheses are discussed in greater detail in the following sections.

H_1: *There is a negative relationship between higher levels of rurality and net-migration.* Rural-Urban Continuum Codes and rates of net-migration were utilized to test the association between rurality and net-migration. As seen in Table 1, the strength of the bivariate relationship is negative, moderate ($r = -.474$), and statistically significant ($p \leq .001$).[1] Results from the regression analysis (see Table 2) reveal that the strength of the relationship between Rural-Urban Continuum Codes and rates of net-migration becomes statistically insignificant when other variables are controlled for ($\beta = -.072$; $p \leq .374$).

[1] Although there is no consensus on the verbal interpretation of values of r, this study applies the following scale: .01 to .25 = weak; .26 to .50 = moderate; .51 to .75 = strong; .76 to 1.00 = very strong.

Table 2 OLS Regression Analysis of Net Migration Rates for the Counties of North and South Dakota, 1990-2000 (N= 119).

	b	S.E.	Beta	t-Value	p-Value
Constant	-10.776	5.602	-10.776	-1.924	.0570
Rural-Urban Continuum Code	-.384	.431	-.072	-.893	.3740
Percentage Commuting Out of County for Work, 2000	.274	.047	.371	5.882	<.0001
Interstate Runs Through County (0=no, 1=yes)	-1.409	1.471	-.066	-.958	.3400
Percentage Employed in Extractive Industries, 2000	-.293	.091	-.295	-3.220	.0020
Percentage Employed in Manufacturing, 2000	.242	.109	.146	2.225	.0280
Percentage Employed in Retail, 2000	.560	.284	.146	1.973	.0510
Job Change Rate, 1990-2000	.163	.039	.300	4.164	< .0001

R^2 = .611

H_2: There is a positive relationship between the percentage of workers commuting out of their home county for work and net-migration. This relationship is moderate, positive (r = .388) and statistically significant ($p \leq .001$) in the bivariate analysis. The relationship remains statistically significant when included in the regression analysis ($\beta = .371$; $p \leq .0001$) and it is also the strongest relationship in the analysis.

H_3: There is a positive relationship between interstate access and net-migration. Though found to be positively and significantly associated with net-migration in the bivariate analysis (r = .301; $p \leq .001$), this is not the case in the regression model. In fact, when included with other factors, access to an interstate highway becomes a negative ($\beta = -.066$) and statistically insignificant predictor ($p < .340$) of net-migration.

H_4: There is a negative relationship between the percentage of workers employed in extractive industries and net-migration. Findings from the bivariate analysis support the argument that greater dependence on extractive-related industries is associated with negative

net-migration ($r = -.578$; $p \leq .001$). Indeed, there is a strong, negative association. This relationship remains statistically significant in the regression model ($\beta = -.295$; $p \leq .0020$).

H_5: There is a positive relationship between the percentage of workers employed in manufacturing and net-migration. The bivariate analysis reveals a moderate positive association between the percentage of workers employed in manufacturing and rates of net-migration ($r = .420$; $p \leq .001$). The results from the regression model do not discount this relationship; even when controlling for the relationships between all of the independent variables with net-migration, the relationship between employment in manufacturing and net-migration remains positive ($\beta = .146$) and statistically significant ($p < .028$).

H_6: There is a positive relationship between the percentage of workers employed in retail services and net-migration. Though it displays a moderate statistically significant association in the bivariate analysis ($r = .342$; $p \leq .001$), the percentage of workers employed in retail services does not produce a statistically significant relationship in the regression model ($\beta = .146$; $p < .051$).

H_7: There is a positive relationship between job change rate and net-migration. The relationship between job change rate and rates of net-migration produces the second strongest association of the relationships in the bivariate analyses ($r = .569$; $p \leq .001$). When combined with other variables in the full regression model job change rate remains as the second strongest predictor of county-level net-migration ($\beta = .300$; $p \leq .0001$).

To summarize these tests, the bivariate analyses provided support for all of the hypotheses. However, when put to the strain of statistical control in the regression analyses, higher levels of rurality, interstate access, and the percentage of workers employed in retail trade were found not to be statistically associated with net-migration, leading to the rejection of Hypotheses 1, 3, and 6. Final results show that the percentage of workers commuting out of

their home county for work, the percentage of workers employed in extractive industries, the percentage of workers employed in manufacturing, and job change rates were found to be statistically associated with net-migration, which lead to the acceptance of Hypotheses 2, 4, 5 and 7.

DISCUSSION

Though some of the hypotheses were not supported by the regression analysis, this study reveals a number of findings which support themes from the theories of both Lee (1966) and Wallerstein (1974). When tested individually, all indicators of geographic context, economic dependency, and economic development are significantly associated with net-migration. When controlling for other factors, four variables are found to be statistically significant in the regression analysis: percentage of workers commuting outside of their home county for work, the percentage of workers employed in extractive industries, the percentage of workers employed in manufacturing, and rate of job change.

The percentage of workers commuting out of their home county for work is the strongest predictor of county-level net-migration. The positive association between these two variables supports findings in the literature and suggests that regardless of a county's metropolitan or non-metropolitan status, greater access to labor markets may act as a pull-factor, influencing migration into a county.

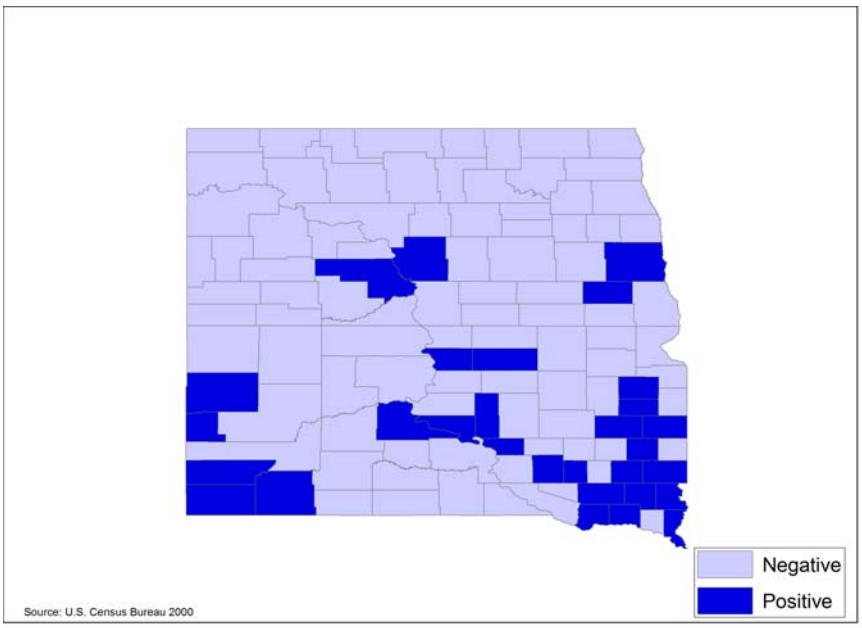
The percentage of workers employed in extractive industries, especially in agriculture, is the only variable to be negatively and statistically related with net-migration. If a relatively high percentage of workers employed in extractive industries is a reflection of a lack of economic diversity, and researchers we reviewed imply that it is (Rogers et al. 1988; Rowley 1998), this negative relationship lends support to the ideas of both Lee (1966) and Wallerstein (1974) who make note of how locations failing to develop industrial diversity face the threat of population

loss through out-migration. More substantial support will come if subsequent research projects find that this negative relationship holds up when changes in employment and net-migration are studied over time.

The percentage of workers employed in manufacturing and job rate change may reflect a more diverse economy; if they do, they serve as examples of how greater economic diversity or a greater pace of economic development can lead to positive net-migration. This is an argument made several times by Lee (1966) and Wallerstein (1974) as well as those who have used the key principles of these theorists to explain migration (Rogers et al. 1988). The rate of job change, (recorded at 13.36 percent for the Dakotas between 1990 and 2000), most likely the better indicator of economic diversity, may represent new economic opportunities, a pull-factor known to spark in-migration.

In general, counties with relatively higher percentages of persons commuting out of the county to work, relatively higher percentages employed in manufacturing but lower percentages employed in extractive industries, and relatively higher rates of job growth experienced relatively higher rates of positive net-migration. As seen in a comparison of maps in Figures 1 and 2, many but certainly not all of these counties are metropolitan or near metropolitan counties. In theoretical terms, and maybe in actual terms, these counties possess greater access to valued resources and opportunities. Conversely, the Dakotas' most isolated counties may lack the assets to attract new development, which may lead to an increased dependency on core and metropolitan areas, leading to further complications for populations that may already be aging, isolated, or economically disadvantaged.

Figure 1 Net-Migration Rates in North Dakota and South Dakota 1990-2000 (Positive vs. Negative)



Having an Interstate highway running through these counties may not be the best way to alleviate these problems. An Interstate may simply make it easier for people and business to pass right through them. Decreasing the dependency of peripheral counties may take a multi-faceted approach. As Whitener and Parker (2007) have noted, addressing these discrepancies may require unique policy options that entail local, state, and national governmental action to stimulate peripheral counties' economies and living conditions by enhancing web-based economic activities, luring economic activities that add value to agricultural products, strengthening schools and other public services, and building up and improving access to recreational activities. Taking these measures may help improve the quality of life in peripheral counties; whether they influence higher levels of in-migration is a potential topic for another study.

CONCLUSION

The objective of this study was to explain the relationship between structural conditions and the county-level migration patterns in North and South Dakota. While past research involving the Dakotas focused more on describing the population issues of the Great Plains region as a whole (Albrecht 1993; Rathge 2005; 2008) this study introduced an alternative for explaining migration patterns in two states where research is limited. Final results indicate that the prevalence of commuting, the percentage of workers employed in extractive industries, the percentage of workers employed in manufacturing, and rate of job change are all statistically significant predictors of county-level net-migration.

In the future, research could be expanded by including more states from the Great Plains region to determine whether results from this study are found to be unique to certain states or consistent across the entire region. It will also be important for future studies to analyze the impact technology has had on the Dakotas, by investigating whether technology has displaced workers in non-metropolitan areas, thus further supporting dependency themes. Finally, it will be vital to look at the impact the current economic decline has had on the peripheral counties of these two states and whether they will continue to experience out-migration influenced by economic hardship and spatial inequality.

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