A Spatial Decomposition of County Population Growth in the United States:

Population Redistribution in the Rural-to-Urban Continuum*

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Abstract

A significant theme in demographic studies has been the population redistribution patterns among metropolitan centers, non-metropolitan areas surrounding them, and the so-called hinterlands beyond. Virtually all of this research has used the metropolitan vs. non-metropolitan classification scheme. However, this classification system has a number of inherent flaws concerning the identification of true rural and urban areas. This study aims to partially alleviate the problem through the implementation of a new geography, the Non-Place Territory (NPT) combined with a spatial decomposition method for combining county and place-level data. The NPT is simply the balance of the county not designated as a census place or the local expression of "out in the county". Through the use of this geography and population data from the U.S. Census Bureau, we spatially decompose population growth in the U.S at the sub-county level. We use 1990 and 2000 census population data at both the county and place level and apply it to a unified place vs. non-place territory GIS coverage. Through the application of the spatial decomposition model visualized through GIS and exploratory spatial data analysis procedures, we identify sub-county patterns of population distribution and redistribution over the two decades of interest. We then model these changes with a county through the use of HLM regression procedures using measures of natural amenities, net migration, natural increase, and institutional-organizational diversity as predictors. The results identify significant pockets of growth, stability, and decline *within* counties across metropolitan and non-metropolitan localities. In order to explain these differences, multi-level regression models are employed. This approach and these results pave the way for a more contextual understanding of population redistribution in the U.S.

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Introduction

A significant theme in demographic studies has been the population redistribution patterns among metropolitan centers, non-metropolitan areas surrounding them, and the so-called hinterlands beyond. Demographers, in particular, have spent a great deal of effort toward understanding the trends, patterns, and reasons for population dynamics in rural and urban areas of the U.S. (Brown and Wardwell 1980; Frey 1987; Swanson and Brown 1993; Brown et al. 1993). For example, the attention given to the rural population turnaround during the 1970s (Brown and Wardwell 1980) and how it tended to subsequently turn "back around" to decline in the 1980s (Johnson 1993; Frey 1993; Frey and Speare, 1992), only to reverse itself somewhat again during the early 1990s (Johnson and Beale 1994), gives witness to the importance of rural-urban population dynamics by demographers and others. We also note that virtually all of this research has used the metropolitan vs. non-metropolitan classification scheme, whether the data source is the Current Population Survey or county population data (Lichter 1993). This choice, however convenient, has implications for the findings of this body of research, as noted below.

The causes of these patterns of rural-urban population redistribution have been described by three competing perspectives (Frey and Speare 1992; Lichter 1993). The period-effects, regional restructuring, and deconcentration (Frey and Speare 1992) perspectives are slightly overlapping, yet complementary, views but they have not

yielded fully adequate understandings of these population dynamics. For instance, Johnson and Beale (1994: 665) state that these theoretical explanations of future population change in rural areas are "perilous" and are "likely to be more volatile than in the past," after studying change using population estimates through the first portion of the 1990s. On the other hand, Frey and Speare (1992: 144) suggest that a "continued preference among residents to live and work within large metropolitan areas" is evident from the last half of the 1980s. While these conclusions are not completely contradictory, they illustrate the clear need for additional theoretical development. Given these contrasting perspectives, Johnson and Beale (1994: 666) also suggest that "careful monitoring of future nonmetro demographic trends" is vital for informing both theory and policy-making in the United States.

In a 1992 follow-up, Frey examined the metro/non-metro population trends in the 1980's. In this article he introduces a third perspective called the Period Explanations Perspective, which saw the 1970 shift as a distortion in the 'normal' traditional trend of urbanization. This perspective believed that the population decline in the metro areas of the 1970's was directly related to a number of unique economic and demographic circumstances (Frey 1992). First, there was the deindustrialization and energy crisis at the time that forced many out of the Northeast and into the South and West where the energy crisis had stimulated natural resource exploration. In addition, the large baby boomer cohort was coming of age and increased many small college town populations during this time period. They then were forced to the South and West as they were unable to find jobs in the over-saturated labor market of the North (Frey 1992). Again, these factors are seen as directly relating to the distortion in the traditional population

trend and therefore the trend should regress to its normal trajectory as these unique issues disappear.

At the same time, there has been a considerable long-term debate over the conceptual definition of rural locales and, more recently, concern over the definition of metropolitan statistical areas themselves (Dahmann and Fitzsimmons 1995; Federal Register 1999). The struggle for conceptual refinements of the rural-urban continuum is relevant for the population redistribution phenomenon. As Lichter (1993: 19-20) put it, "What do[es]…population redistribution mean in an increasingly urban society? Current redistribution and migration trends clearly challenge us to rethink the conceptual and methodological tools at our disposal…One consequence…is that the significance of population redistribution research may increasingly reside in analyses of population shifts *within* rather than *between* conventional units of analysis." A reliance on county-level data, for instance, to study population redistribution represents a clear example of this criticism: the county (and its equivalents) may be too internally heterogeneous to adequately capture these types of population shifts. There is thus a need to continue to monitor population redistribution patterns in the U.S. but with approaches sensitive to capturing current types of dynamics in the rural-urban continuum.

With the release of Census 2000 population data at various levels of geography, coupled with alternative concepts and methods, we extend previous research on population redistribution in the U.S. through the full decade of the 1990s. Our study uses a multi-level geography design which allows sub-county population data to be used to characterize the county. We offer a new sub-county geography, the *non-place territory*, to complement incorporated (and Census-designated) places, as a step toward reducing

the internal heterogeneity of counties as the unit-of-analysis. We combine this new geography with a method to spatially decompose county and place-level data using GIS procedures. These methods also allow for the visualization of population redistribution dynamics over the two decades of 1980-2000. Finally, the spatial decomposition procedures facilitate the estimation of regression models with factors associated with population redistribution. These results update and extend the earlier work by Lichter and Fuguitt (1982) but use new concepts and methods with contemporary population data.

Purpose

The objectives of this study are: (a) to identify place vs. non-place population concentrations during the past two decades and where county population growth has been driven by non-place territories (i.e., counties where non-place territory growth exceeds place-based growth); and (b) explore factors related to non-place territory growth in the U.S. using multiple regression models relating growth to measures of natural amenities, net migration, natural increase, and institutional-organizational diversity.

Relevant Literature

Two main themes in the extant literature are briefly reviewed, those involving non-metropolitan population change and those defining rural areas in the United States, followed by a delineation of the non-place territory concept.

Non-metropolitan Population Change

There has been much work published by demographers on population change in non-metropolitan areas of the U.S., especially in relation to their proximity to MSA's and factors that drive such change (Brown and Wardwell 1980; Lichter 1993; Brown and Zuiches 1993). This line of research has examined various perspectives regarding rural population change: *historical period effects* (Johnson 1989; Lichter 1993; Frey 1993), *deconcentration* (Vining and Strauss 1977; Wardwell 1977; Lichter and Fuguitt 1982), and *regional economic restructuring* (Frey 1987; Kasarda and Irwin 1991). Most of this work has used county-level data or, in some cases, micro-data from the Current Population Survey (CPS) data program, to make generalizations about rural populations defined as rural by non-metropolitan standards.

Throughout the latter half of the 19th century demographers and social scientists alike have given a good deal of attention to better understanding and defining the rural/urban dichotomy. Perhaps one of the most often-studied phenomena associated with this complex strain of research is that of suburbanization and its impact on the affected local economy, ecology, and geography of an area. More often than not, the consensus is that the process of suburbanization has made the lines demarcating the lifestyles associated with urban and rural much less obvious. This intertwining of rural and urban has brought traditionally rural activities, such as those associated with agriculture, to what are now defined as metro areas (Thomas, 2003). Likewise, the existence of a number of traditionally urban amenities, such as advanced communication and transportation resources, are now readily available in many areas defined as non-metro (Brown, 1993). Facilitating these changes are a number of factors, two of which are perhaps more important than the others.

First, the migration tendencies of individuals have played a large role in the dispersal of not only people but also ideas. During the 1970's there was turnaround trend towards a deconcentration of the population to non-metro and rural areas. This slowed and slightly reversed through the early 1980's but remained the overall trend (Lichter, 1982; Frey, 1992). Many times this deconcentration is referred to as suburbanization or sprawl because of the associated housing and development booms that often take place in response to the shifting population. Advances in communication and transportation were important in that they allowed individuals to perform the same tasks without the necessity of the same spatial proximity. However, proximity does matter to a degree as not all rural areas saw an increase during this time of deconcentration as regional and proximity biases were still present (Isserman, 2001). Those counties which tended to grow were usually adjacent to metro counties and the fastest growing were usually located in the south or west regions of the U.S (Lichter, 1982).

The second factor, which has lent itself to the "restructuring" of what we think of as urban or rural, literally has restructured what we think of as urban and rural. The Office of Management and Budget (OMB) has itself facilitated the "rurban" phenomena by tweaking the definition of what is metro, the term most often used to separate urban from rural. This "re-definition", coupled with the propensity of the population to deconcentrate has allowed for a number of previously non-metro counties on the fringes of Metropolitan Statistical Areas (MSAs) to be considered part of the MSA based on requirements of social and economic integration (basically commuting patterns).

In a sense rural America was disappearing into metro America in terms of classification attributes for the purpose of the census or OMB, however in reality it may

simply be traditional rural America masked as metro America (Isserman, 2001). It can be assumed then that much of what is thought of as rural America will be present in what we today consider urban or metro America. This would include features such as the traditional small-town lifestyle and associated activities, one of the most dominant and time enduring being the traditional stronghold of agriculture or farming, which is thought of most often-taking place "out in the country".

As Lichter's review of this line of research has suggested, "There have been no clear winners in this debate, in fact, these perspectives often fail to provide mutually exclusive predictions. The reality is that current migration trends continue to reflect both concentrating and deconcentrating tendencies … [these] theories .. provide a useful backdrop to the central question of changing spatial inequality" (1993: 34). Accompanying the early population shifts in the 1970's were a number of theories on why such trends were developing and what external factors were facilitating their development. Frey introduces two such theories in a 1987 article aimed at examining the deconcentration phenomenon.

The first theory introduced by Frey is the Regional Restructuring Perspective, which believed that the largest of the metropolitan areas would continue to grow as it served as the "command base". These areas included cities like New York, Chicago, and Los Angeles. Based on this theory it was the smaller and mid-sized metro areas that were responsible for the 1970's population shift towards non-metro and rural areas. This perspective was grounded in the belief that as part of the newly developing global economy a kind of functional hierarchy would develop in which the largest metropolitan centers would continue to grow as they would serve as the headquarters and centers of

major operation for transnational businesses. Likewise, the smaller and mid-sized metro areas would lose population as they transitioned from local industry sectors deeply rooted in out-dated industry to a more global economic service approach (Frey 1987).

As a result metro areas like Detroit, which were deeply rooted in the automobile industry, would be expected to lose population as the city transitioned to more of a service oriented metro area. According to Frey, the out-migration of these areas then would head towards smaller non-metro and rural areas in which specialized centers and subordinate centers would develop to support the headquarters, including smaller industry and manufacturing plants. These centers could develop in these non-metro regions because they, unlike the smaller and mid-sized metro areas, were not deeply rooted in specialized industry and therefore could easily build plants and centers to support the new industry. Other pull factors for non-metro/rural areas were cheaper expenses, including labor, land, and taxes.

The second and contrasting theory put forth by Frey was the Deconcentration Perspective, which stated that there would be a gradual but sustained depopulation of larger metro areas (1987). This perspective placed much less importance on the restructuring of the newly developing global economy and more emphasis on the technological advancements and human preferences. These advancements allowed workers and employers to follow, what Frey called, their natural preferences towards lower density residential and workplace locations, with lower crime rates, and better education districts; this led to what is sometimes called the “rural renaissance”. This perspective suggests that new production locations will be picked increasingly based on residential location preferences. Clearly stated, as technological advancements allow the

workers and consumers to move further from the densely populated metro areas the employers will follow as the competition for well-educated, skilled, and professional personnel rises (Frey 1987).

As a result the two perspectives expect and predict different growth tendencies in large metro areas as the Deconcentration Perspective expects all metro areas to sustain population reduction and the Regional Restructuring Perspective predicts metro areas would grow or not grow in a polarized fashion based on their size and ability to support and serve as the "command center" or headquarters of newly developing global and domestic businesses. Ultimately Frey's analysis came to accept the Deconcentration Perspective as his examination showed two developing trends. First, the post 1970 migration pattern showed depopulation in the largest metro areas of the North and secondly non-metro areas primarily in the South showed the largest net gain in population (1987). So here you not only had a metro to non-metro shift in population gains but you also had a North to South population shifts, both of which clearly support the Deconcentration Perspective. However, across all regions non-metro counties grew faster than metro counties during this time period. Other studies went on to examine the late 1970's and found that "population deconcentration or suburbanization has not reversed, and there is no evidence of faster growth than in the suburbs" (Edmonston 1984). However, Frey ended his study by admitting that in the early 1980's these trends began to slow down and stated that "it remains to be seen whether or no these deconcentration tendencies will lead to continuing depopulation of the metropolis" (1987).

A modest array of studies have used geographies at the sub-county level, such as Brunner (1928), Johansen and Fuguitt (1984), and Luloff (1990). These studies have focused on the smallest size population settlements, villages, and, owing largely to the technical labor involved, included only a sample of all such settlements in the U.S. Luloff's (1990) study was focused on the changing number of small towns and larger places as well as their resident populations. His emphasis was on the linkage of place-based population change to the presence of natural resources and extractive industries.

A very few studies have included all incorporated places of 2,500 population and above and coupled them with the counties in which they are located (Lichter and Fuguitt 1982; Fuguitt and Lichter 1989). These latter two efforts inform us of population dynamics within counties in non-metropolitan areas. Their foci largely point toward the population "deconcentration" hypothesis and do not include data beyond the 1984 population estimates (Fuguitt and Lichter 1989). However, the approach taken by Lichter and Fuguitt serves as a point of departure for our study of population dynamics in the rural-urban continuum.

Lichter and Fuguitt (1982) combine both non-metropolitan county and incorporated place-level population data, for incorporated places 2,500 and over, into a consolidated framework for analyzing change within counties. Their temporal coverage included 1950, 1960, and 1970 data from Census files with 1975 population estimates. Fuguitt and Lichter (1989) used 1960, 1970, 1980 Census data with 1984 population estimates. Using counties in the conterminous U.S. as their unit of analysis, these two studies configure county populations into two segments: (a) *urban population,* the sum of persons residing in all places of 2,500 or more; and (b) *rural population,* the remainder of

the county population taken as a residual. Unincorporated places of 2,500 and above were not included. Annualized growth rates were calculated for the urban and rural population segments and a measure of "deconcentration" was computed by subtracting the urban rate from the rural rate. The procedures updating these results through 1984 are virtually identical. Lichter and Fuguitt (1982) reported that post-1970 trends showed a marked deconcentration within non-metropolitan counties and, based upon a regression model's results, that this pattern of deconcentration was increasingly less related to a set of traditional ecological, economic, and demographic variables. However, the clear findings in both studies was that non-metropolitan areas experienced marked patterns of population deconcentration. Fuguitt and Lichter (1989: 95) concluded, "It seems remarkable that in the 1970-1980 period more than one-half of the more rural nonadjacent counties experienced faster rural than urban growth." Their results for the early 1980s (through 1984) showed that some concentration was observed in counties with a city of 10,000 or more population. These results tended to be observed in all four regions of the U.S.

Defining Rural, Urban, and Community

Many scholars have debated a definition of "rural" America (e.g., Willits and Bealer 1967) and this debate has largely involved a parallel concern with definitions of rural "communities" (Wilkinson 1991). Whitaker (1982) reports that the term rural was first used by the Bureau of the Census in 1874 with a definition of a *residence outside of cities or towns with 8,000 or more residents*. We emphasize this original definition by the Census Bureau for reasons we point out below. Ricketts et al. (1998) provide a

comprehensive review of the various definitions for determining rural areas in the U.S. while Wilkinson's book (1991) grapples with similar variations for identifying social communities in rural areas. Using the "field theory" approach to community that he developed with Harold F. Kaufman, Wilkinson argues that to confuse the rural-urban continuum with a "past-present" continuum, a type of "cultural lag" domain assumption, has been part of the problem. The connection between "rural" and "community" is an intimate one:

> "Rural…is a territorial concept. This is a most important consideration..because the community..has a territorial base. The study of rural life and community, therefore, is the study of the associations between one essential element of the community (i.e., the territorial element) and other essential elements of the community. The territorial concept of rural needs further specification and refinement to be useful in sociology. The land itself is not the point of sociological interest. What is of interest is the arrangement of people and activities on the land. Rural, as a sociological variable, refers to the extent of dispersion of people in a local ecology. Dispersion is of sociological importance because of its presumed effects on the interactions of people." (1991: 57).

Thus, according to this line of reasoning, we can expect that rural locales may be ecologically-definable but that they may not contain singular communities per se.

The various definitions of rural locales reviewed recently by Ricketts et al. (1998), for instance, show that governmental agencies and researchers define rural areas in widely divergent ways, begging the question of what is the phenomenon being classified in each rural-urban taxonomy. Attempts to extend the metropolitan vs. non-metropolitan dichotomy at the county-level are reflected in the long-standing work by Beale and his colleagues at USDA who effectively added non-metropolitan county adjacency to MSAs with the rural-urban continuum classification for counties (Butler and Beale 1994). This classification has been periodically updated and recently

complemented by the urban influence taxonomy (Ghelfi and Parker 1997). The urban influence classification system essentially refines the Beale codes by segmenting the MSAs differently by size and adding a distinction among non-metropolitan counties of the presence of a city size of 10,000 persons or more. These two county-based taxonomies have facilitated a better understanding of population and other dynamics in non-metropolitan counties through a greater classification precision of a rural-urban continuum. Nonetheless, they are limited to the county-level and suffer from the varying geographic sizes of these administrative boundaries for many research purposes (e.g., Lichter 1993; Morrill et al. 1999).

Again, a number of sub-county geographies can be used in order to examine the phenomenon being studied in this project. However, there are a number of problems with each of them. Some, such as census tracts and block groups have a definite urban bias towards them and do not easily translate to rural communities. Others such as zip code areas are far too unstable with a frequently high change rate. This study introduces a new sub-county geography (Non-Place Territory "NPT") for the purpose of identifying population dynamics along the urban/rural continuum. This geography is both easily understood and applicable, as it is consistent on census definitions and change over time.

Concept of Non-Place Territory

The approach taken in this study is consistent with both Wilkinson's (1991: 57) call for further "specification and refinement" of the territorial conceptualization of rural locales as well as Tickamyer's urging of attention to the measurement of space in rural studies. We examine rural-urban population dynamics during the 1980-1998 period, but

integrate both county and place-level data into a multi-level spatial framework. Using a decomposition of county population data into its constituent "place" and "non-place" parts, we operationalize a new territorial concept for rural locales, the *non-place territory*. We use geographic information systems (GIS) procedures to assist in the construction of the requisite data as well as to visualize some of the results. Through the multi-level linkage of place and county data, we examine trends in the growth rates of counties, their constituent places, and the segment of their population residing "non-places". The result, illustrated in Figure 1, is an operational definition of a territorially-based concept of diverse types of rural areas in the U.S. that can be implemented backward through several Decennial Censuses and forward through future ones (see Bureau of the Census 1994).

[Figure 1 about here]

It is important to note that, as with other sub-national geographies, places dynamically change over time. At times places annex other non-place land or are established in areas where no place existed before. Also, there are cases where places cease to exist in physical space as they once did. This is due to a combination of phenomena, including being swallowed into larger places or, on the other end of the spectrum, being abandoned. Table 1 presents a count of existing places, place births, and place deaths using data obtained from the U.S. Census Bureau. From the table one can see that place deaths are much less likely to occur than are place births and that both are minimal in comparison to the total number of places during the two periods. For the purpose of the current analysis, only places that existed at the beginning of the two periods (1980 & 1990) will be used, as they ensure the ability of comparison over the two time periods.

[Table 1 about here]

Research Methods

Source of Data and Variables

Population data for this study were obtained from the decennial census for 1980, 1990, and 2000 (http://www.census.gov/). Data concerning agricultural production were obtained from the U.S. Censuses of Agriculture for 1982, 1992, and 2002 (http://www.agcensus.usda.gov/). Migration data were obtained from the *County to County, State to State, and County Income Study Files* (available via ICPSR, Study # 2937) and the Census Population Estimates (www.census.gov/popest/estimates.php). Data concerning the number of retail merchandise, eating and drinking, and hotel and lodging establishments were retrieved from the Census Bureau's County Business Patterns database obtained through the National Historical Geographic Information System (NHGIS) website. Lastly, land-use, land-cover (LULC) data were obtained from the United States Geological Survey (USGS) for the conterminous 48 states circa 1980, circa 1990, and circa 2000.

Tabulations were performed in ArcGIS 9.2 using the Spatial Analyst tool (Ormsby et al. 2001) in order to calculate the number of square miles of each of the five LULC classification types within the boundaries of each county in 1980, 1990 and 2000 using the year respective county boundaries from the U.S. Census Bureau for that year.[i] The LULC classification employed in this analysis was tabulated in the number of square miles for a characterization (e.g., urban built-up), which were converted into percentages of land-use for the county's total square miles of land mass.

Spatial-demographic controls for metropolitan status and U.S. Region were obtained from the Census Bureau. Metropolitan classification was based on the respective OMB definitions for 1980, 1990, and 2000. A GIS approach was taken to determine non-metropolitan counties that were spatially adjacent to metro counties, yielding a three-category classification system, for each county fit: metropolitan, adjacent but non-metropolitan, and non-adjacent and non-metropolitan. U.S Region simply identifies each unit as being situated in the Northeast, Midwest, South, or West.

Dependent Variable

The primary dependent variables concern place and non-place level population characteristics. Since we are dealing with sub-county units of analysis, we are interesting in identifying the population shifts that took place over two ten-year periods. Particularly, we are interested in the annualized growth rates of the individual unit's population change and, for standardization purposes, in the share of the encompassing county's total population. *Population Measures*

Various population measures were computed and are used as indicators of natural population change and migration. Total population and population density were both measured at 1980, 1990, and 2000. Furthermore, both were measured as the percent change in each from 1980-1990 and 1990-2000. Migration was measured as the annual net-migration rate, in percentage form, for each period: 1985-1990, and 1995-2000. Lastly, annualized natural increase/decrease was computed as the annualized population change net the annualized migration change.

Land-Use Characterization

The two land categories of interest for this examination (urban/built-up and forest) were computed as the percent of the county's total land mass along with the percent difference as a way of examining the change in land-use over the decade. The LULC data source for all years used a modified Anderson Level II Classification system[1] (Homer and Gallant 2000). This allowed for the potential comparison of a six category classification system implemented in Luloff and Befort's (1989) article, in which we collapsed the categories into a five category classification scheme: agriculture, urban, forest, other, and water. Again, the primary characterizations of interest in this paper pertains to urban built-up land and forest land, especially in adjacent non-metropolitan counties where there are a number of opposing viewpoints as to the pull-factors associated with non-place population growth, urbanization versus natural amenities.

Institutional/Organizational Economic Diversity

As a measure of urban-like business amenities, the number of retail merchandise establishments in a county, were measured as the rate per 1,000 individuals. The same procedure was used for eating/drinking and hotel/lodging establishments, obtaining their rate per 1,000 of the population. These data involved the appropriate County Business Patterns establishment counts combined with the population count for the years of 1980, 1990, and 2000.

In contrast to the urban business amenities, variables were also constructed to measure the importance of agricultural productivity at the county level. These included the number of farms per 1,000 residents, total farm sales, and total farm acres, all from

[1] It is important to note that the LULC data for 2000 was originally in 30 meter resolution while the original data for the other years was at a 1 kilometer resolution. However, post-processing analysis showed the square mile tabulations for each classification type to by highly correlated across all years (r >.850 in every case).

the U.S. Census of Agriculture for the years 1982, 1992 and 2002. These years most closely matched the respective decennial Census period. From these variables, the percent of farm acreage, the number of farms per square mile, and the total sales per farm were computed. Change variables were also computed concerning the change in the number of farms and the change in farm acres.

Lastly, in order to understand the relative share of urban versus rural business amenities, a ratio of the number of farms per 1,000 residents to the number of retail and eating/drink establishments per 1,000 was computed for 1980, 1990, and 2000. Following this computation the change in the ratio over the two decades were computed for 1980-1990 and 1990-2000.

Spatial-Demographic Controls

Metropolitan status is initially measured as a hierarchical three category variable. The variable is recoded into three dummy variables, one each for metropolitan, adjacent to metropolitan, and non-adjacent to metropolitan. U.S. Census Region was also dummy coded into four dummy variables, one each for Northeast, Midwest, South, and West. . In the following outlined analyses, the metropolitan status referring to being a metropolitan county and the Northeast will be used as reference categories.

Analytical Procedures

The idea of using NPT as a sub-county geography measure can be implemented only when dealing with count variables, such as population counts and population changes. The formula is easily computed as the original geographies total count minus the sum of all sub-geographies. In the case of NPT territory at the county level that

would mean the county total for population minus the sum of the population of all places within that county.

$$NPT = \text{County Total} - \Sigma(\text{Place Totals})$$

From this formula, anything left over is not considered place population by the census therefore through simple process of elimination it is non-place population.

The use of spatial analysis with NPT, involves first the creation of a Non-Place Territory GIS coverage. In order to create this coverage TIGER cartographic boundary files were obtained via the census' web page. Files were obtained for 1980, 1990 and 2000, and they included the respective county and place-part files for each year. Place-parts were used in order to allow for the division of population in each place that crossed county lines. This then allowed for the county specific counts of population.

Next the coverages were matched by year (1980 county with 1980 place-parts) and the places were cut from the county coverage using a clipping technique. The resulting file is a complete county file with holes representing the area in which census defined places lye. This then is your NPT coverage as it represents all of the county that is not accounted for by census defined places. In order to do this analysis these place-parts were then merged back to the clipped NPT coverage resulting in a seamless coverage of places and non-place territory with a fips id structure that included a five digit county fips for the NPT and a nine digit place fips for the places.

Population data obtained via the above formula was then computed for each county and joined along with place population data to the merged coverage. This population data represented a ten year span, 1980-1990 & 1990-2000. In both cases the starting point was used as the coverage that the dataset would be joined to, for example

1980-1990 popualtion change data was matched to the 1980 spatial coverage. This final coverage joined to the appropriate data then allows for further spatial statistical tests to examine county level concentration or deconcentration during the ten year span being studied.

Again, Table 1 illustrates the change dynamics as the coverages resulted in 25,048 places and NPTs in both 1980 and 1990 and 26,507 places and NPTs in both 1990 and 2000. These then are the areas that are in the scope of this study as data was available for them at both time one and time two. There are also a number of "place deaths" and "place births" referring to those places that vanished or were new during the time period respectively. "Place deaths" refers to those that existed in time one but not in time two and "place births" are those that were not in existence in time one but were in time two. The Geographic Areas Reference Manual from the U.S. Census Bureau says that these place "births & deaths" may take place for a number of reasons including consolidation, annexation, or detachment. In any case those places that were not identified as existing in both time one and time two had legitimate missing data based on the matching procedure and there coverage polygons were simply merged with the greater NPT coverage based on the fact that they had no data.

Multivariate Explanatory Modeling

The modeling strategy for this analysis will employ a nested multi-level regression approach to examine the annualized growth rates in population and the share of the counties total population for places, non-places, and all units, in separate analyses. The nested approach will include reduced models to examine the isolated effects of the population measures, natural amenities, and institutional/organizational economic

diversity. Furthermore, a multi-level approach was employed as the redistribution of population is not expected to occur in a random fashion and in some cases the change experienced by places and non-places are directly attributable to county level phenomena, such as metropolitan status or the inundation of rural or urban business amenities. In any sense, the above review of the literature shows that deconcentration from places to non-places did not occur everywhere in the U.S. and instead is both non-random and contextual.

Results

The results suggest interesting, and differing, patterns of population redistribution over the two decades. From Table 2 the annualized rates of population change are displayed broken down by place-level, metropolitan status of larger county, and time period. The table is set up so that the first three columns pertain to the annualized rates of change for places, non-places, and the difference in those rates changes, respectively for the 1980-1990 time period. The final three columns represent the same measurements for the 1990-2000 time period. Finally, along the far-left margin the data are broken up into rows representing the metropolitan status of the larger county.

[Table 2 about here]

The results from this table show that, from 1980 to 1990, places and non-places within metropolitan counties grew at similar rates. In contrast, places and non-places within non-adjacent counties lost population in a relatively similar manner. During the decade it seems that the most interesting story, in terms of place/non-place population redistribution, took place in the adjacent to metropolitan counties. During the decade, places lost population based on the negative annualized median rate, while the non-places

in the same counties gained population based on the median rate. This last result suggests that patterns uncovered in the previous decade, concerning the rural rebound, continue to persist in the 1980's when examining the data via this place-level geography. As an aggregate group, places lost and non-places gained population based on the median annualized rates of the total groupings in the bottom row.

For the following decade somewhat similar different exist, with universal increases in the median rates of annualized population change for both places and non-places across all metropolitan categories and as an aggregate. However, the same general patterns exist with places growing at slower rates than non-places and adjacent counties containing the largest discrepancy in place/non-place growth rates. Also, of import is the point that the negative change for the overall aggregate rate (-.219) is larger in absolute terms than the negative rate for the previous decade (-.177). This means that while the median statistics report that all groups gained in population over the period, the largest gains were in non-places.

The results from Table 2 are illustrated in graphical form in the bar-chart presented in Figure 2. This chart helps to underscore the dramatic differences in place type by metropolitan status. Of particular importance, in the maroon, the adjacent counties not only contain the most dramatic differences in growth rates, but also the only instance in which the place and non-place median rates trended in opposite directions.

[Figure 2 about here]

In order to better understand the spatial distribution of this trend, Figure 3 illustrates the annualized percent change in place-level population for both time periods. The figure examines the distribution of the variable of interest for the Dallas-Fort Worth

area. The rates are examined in the left panel for the period from 1980 to 1990. From the illustration one can see the two primary counties in the center of the figure, containing Dallas and Fort Worth, have a cluster of smaller places indicating higher population concentrations. Interestingly, a ring of "suburban" counties appears dark brown with the NPT of each having over a five percent increase in population at an annualized rate. In contrast, the majority of the smaller places within each of the counties are lighter colored as they lose population, do not change, or have smaller increases.

[Figure 3 about here]

In the right panel the same variable is examined for the 1990 – 2000 time period. Again, the largest gains in population take place in the "suburban" counties, primarily in the non-places. However, the patterns are not as dramatic as they were in the decade earlier.

This is further illustrated in Figure 4, where the change in the share of the counties total population is presented over the two decades. This figure presents this change as blue (loss), gray (no change), or red (gain) in share of population. In each case the variable refers simply to the proportion of the total county's population that resides in that geographic entity. In the left panel one can see that there was almost a universal increase in NPT population shares. In fact, outside of the four counties containing the two major cities (Dallas and Fort-Worth), there is almost a two-order concentric zone of counties that experienced the majority of their growth in the NPT.

[Figure 4 about here]

However, in the right panel the growth is much more evenly spread among places and non-places. During the 1990's there seems to be a period of re-concentration, in

which a less universal pattern existed in the area and a more directional pattern emerges. For instance, it seems that the NPT growth is more local during this period as it approaches the Southeast and the Northwest continues to deconcentrate.

Multilevel Regression Results

IN PROGRESS……..

Discussion

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Tables and Figures

Table1. Number and Dynamics of Places* and Non-Place Territory

	Study Period	
	1980 - 1990	1990 - 2000
Scope of Study - IN – IN (area existed in both 1980 & 1990)	25,048	26,507
Place Deaths - IN – OUT (area did exist in the beginning of the time period but not in the end)	1,100	623
Place Births - OUT – IN (area did not exist in the beginning of time period but did at the end)	2,559	2,726

* Figures representing places are actual change in place-parts.

Table 2. Annualized Rates of Place-Based and Non-Place Territory Population Change, 1980-2000, By Proximity to Metropolitan Statistical Areas in 1993[a]

County's Proximity to MSA 1993:		Annual Pct Change in Inc Place & CDP, 1980-90	Annual Pct Change in NPT Outside Inc Place & CDP, 1980-90	Difference in Place-NPT Annual Growth Rates, 1980-90[b]	Annual Pct Change in Inc Place & CDP, 1990-00	Annual Pct Change in NPT Outside Inc Place & CDP, 1990-00	Difference in Place-NPT Annual Growth Rates, 1990-2000
Metro	Mean	1.919	1.378	.542	1.769	1.464	.305
	Median	.839	.808	-.045	1.095	1.197	-.176
	Std. Deviation	6.955	2.638	6.776	2.581	3.095	4.052
	N	836	836	836	836	836	836
Adjacent to Metro	Mean	.286	.582	-.295	1.178	1.186	-.008
	Median	-.181	.303	-.408	.550	.989	-.471
	Std. Deviation	2.837	1.781	2.754	3.446	1.914	4.031
	N	1,000	1,000	1,000	1,000	1,000	1,001
Not Adjacent to Metro	Mean	-.104	-.116	.011	.692	.507	.185
	Median	-.527	-.316	-.116	.207	.360	-.098
	Std. Deviation	2.664	1.726	2.893	2.670	2.061	3.338
	N	1,297	1,297	1,297	1,297	1,297	1,298
Total	Mean	.560	.505	.055	1.135	.979	.155
	Median	-.113	.189	-.177	.549	.810	-.219
	Std. Deviation	4.371	2.113	4.269	2.950	2.377	3.766
	N	3133.000	3133.000	3133.000	3133.000	3133.000	3135.000

a. Source: U.S. Bureau of the Census, 1980, 1990, 2000; and author's calculations.

b. Note: Positive number means that annualized rate of growth over the period is higher for Places and CDPs than for the Non-Place Territory within th county.

Insert Regression Tables Here

Figure 1. Example of Place/Non-Place Geography,
Dallas-Fort Worth Metro Area

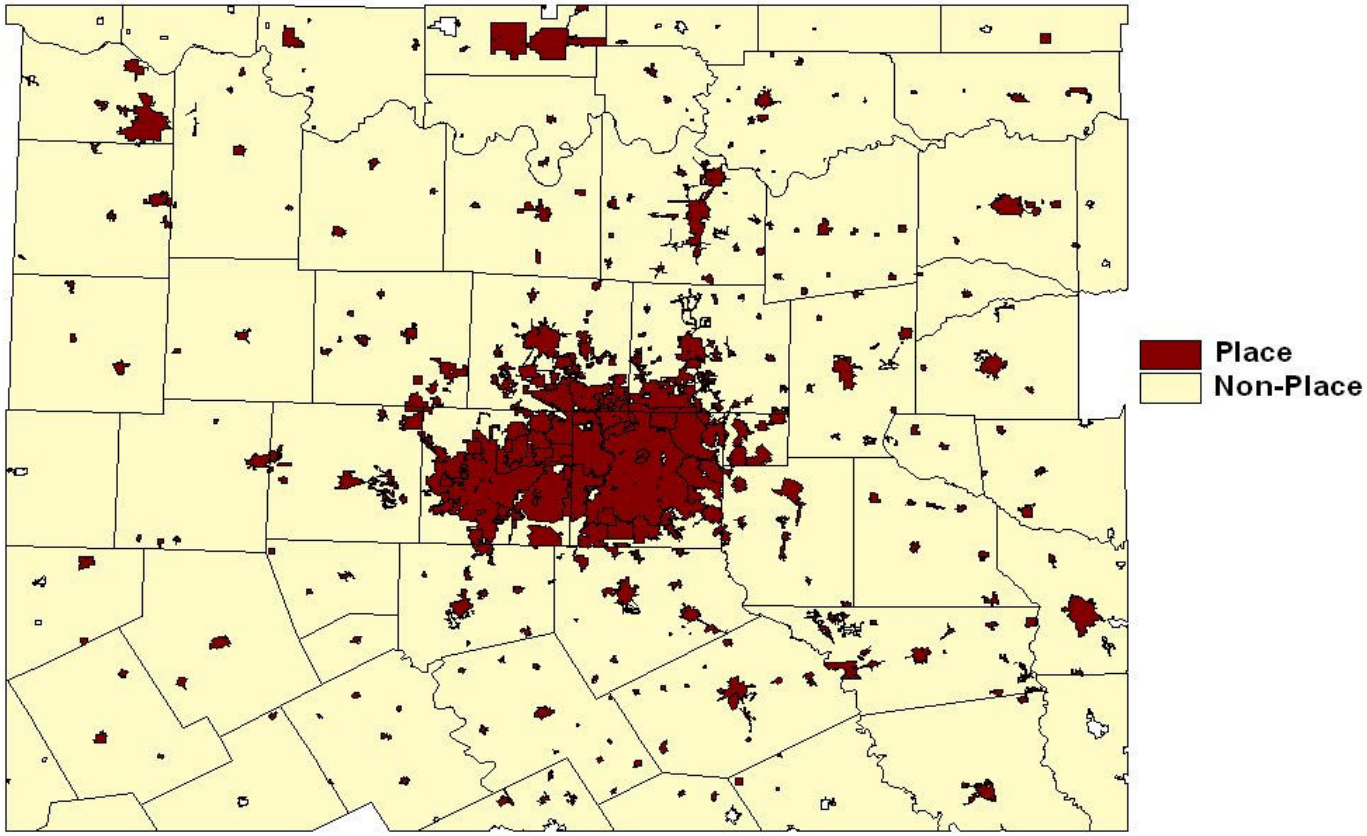

Figure 2. Annualized rates of Place-Level Popualtion Change by Metro Status, 1980-2000

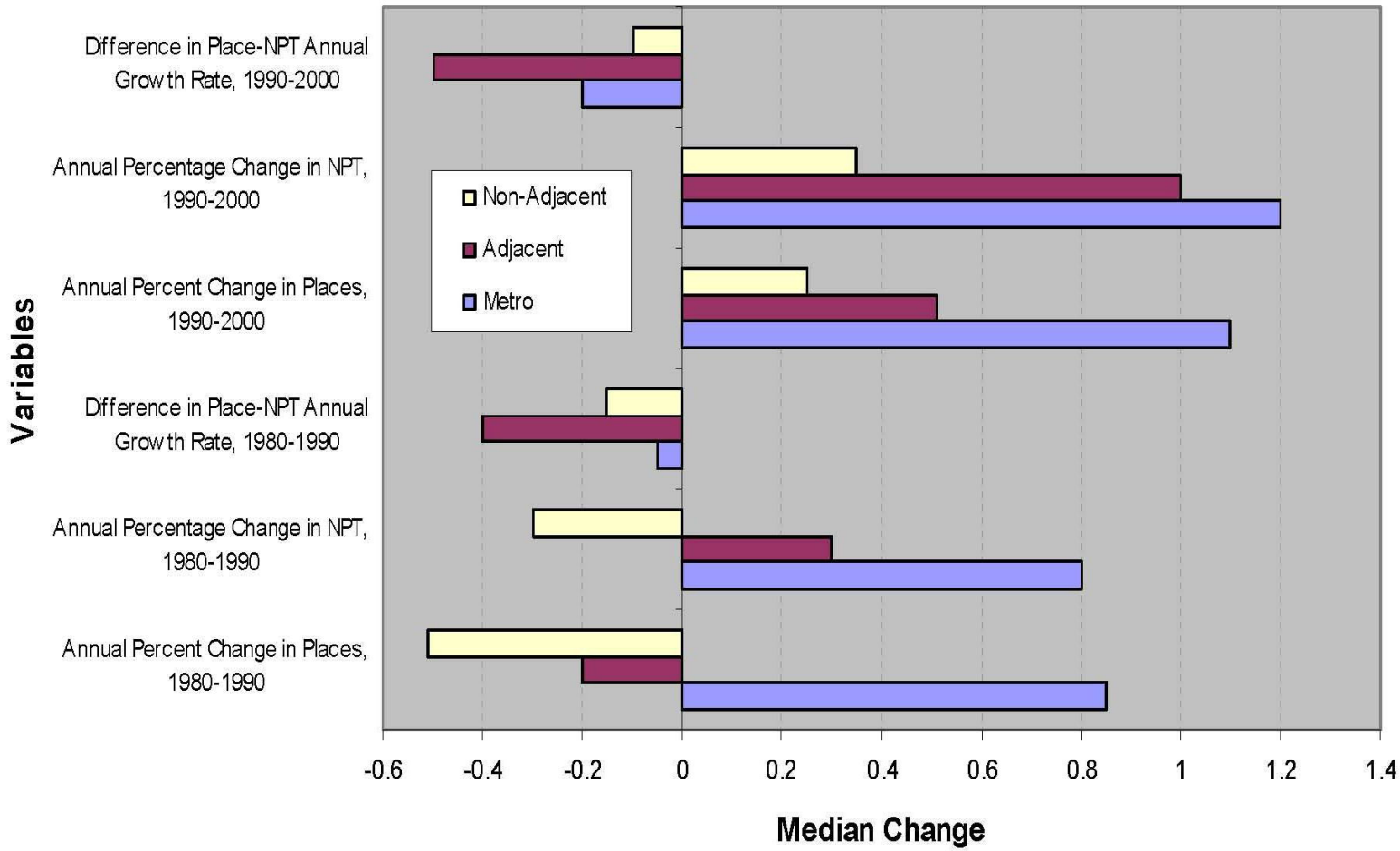

Figure 3. Annualized Percent Change in Place-Level Population, 1980 & 2000

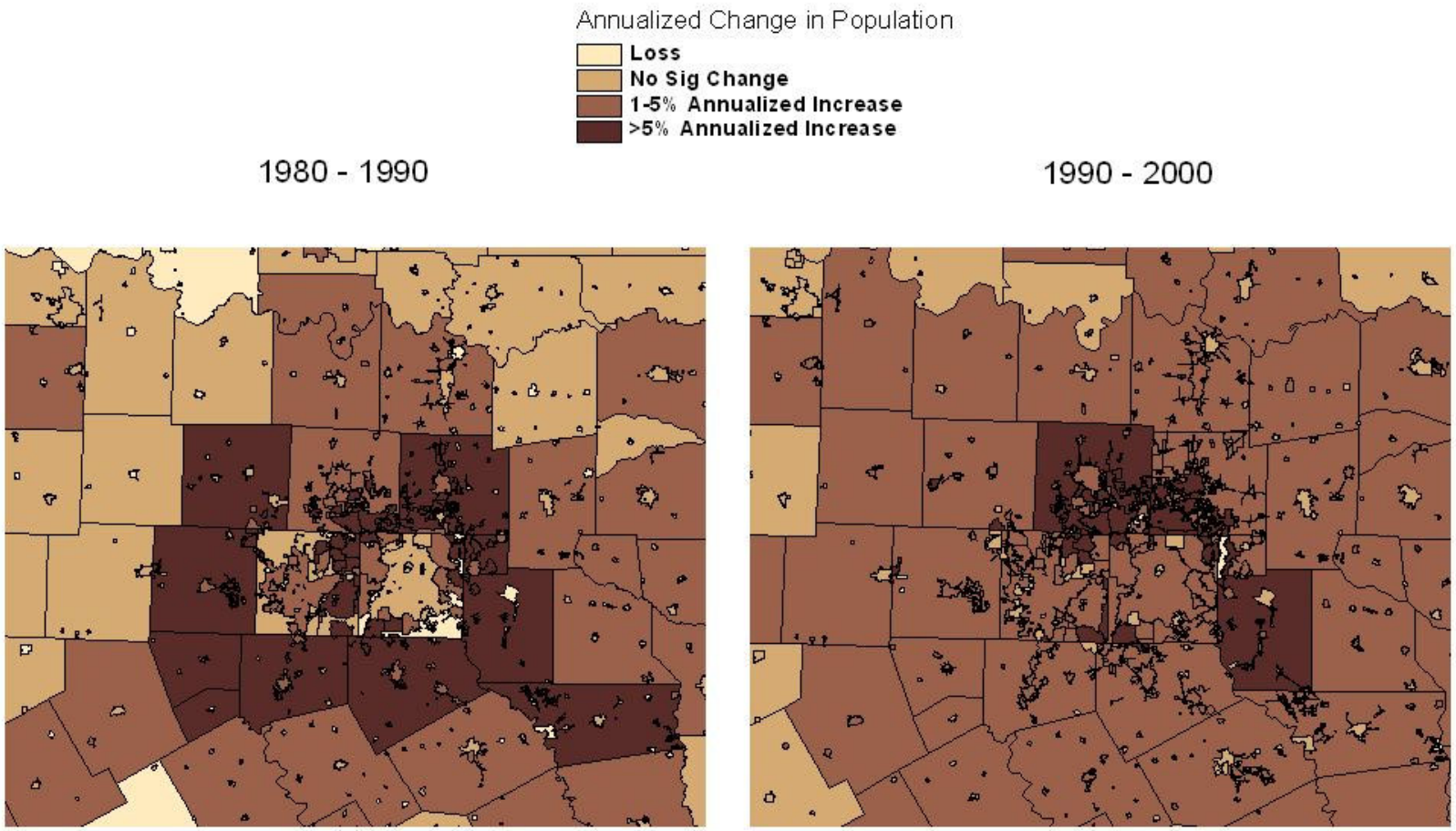

Figure 4. Change in Share of County Population Accounted for by Place-Level Geographies, 1980 - 2000