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Southeastern Geographer, Volume 54, Number 2, Summer 2014, pp. 97-117 (Article)

Published by The University of North Carolina Press
DOI: 10.1353/sgo.2014.0016

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The Geography of Non-Earned Income in the Piedmont Megapolitan Cluster

KEITH G. DEBBAGE
University of North Carolina at Greensboro

BRADLEY BERЕITSCHAFT
University of Nebraska at Omaha

EDWARD BEAVER
University of North Carolina at Greensboro

In this article we identified factors that may have contributed to spatial and temporal trends in non-earned income (NEI) within the 121-county Piedmont Megapolitan Cluster (PMC). We also assessed the impacts of the Great Recession on NEI, focusing on differences in NEI among metropolitan and non-metropolitan counties between 2007 and 2011. NEI exhibited a strong core-periphery relationship, with core urban counties, and those with research universities, exhibiting a higher proportion of NEI from dividends, interest and rent (DIR), and a lower proportion of NEI from public transfer payments (TP). The percent of the population with a bachelor’s degree was the dominant predictor of high ratios of DIR to TP at the county level. The Great Recession resulted in a reduction in DIR and an increase in TP among most PMC counties; however metropolitan counties experienced the most significant gains in TP.

Key words: non-earned income, unearned income, economic base theory, Piedmont megapolitan

Palabras clave: ingresos no devengados, ingresos no derivados del trabajo, teoría de base económica, Piedemonte megapolitano

INTRODUCTION

In addition to employment and wage/salary income, an important yet frequently overlooked metric of local economic performance is non-earned income (NEI) (Harrah
NEI can play a significant role in shaping local economic geographies, despite operating largely independent of fluctuations in the local economy. Sources of NEI include private revenue derived from dividends, interest and rent (DIR), and public transfer payments (TP). Income from DIR is also referred to as investment income and/or property income. Most TP are transferred from the government to individuals in the form of retirement and medical benefits (e.g., social security and medicare), and to non-profit organizations. Therefore, TP may be used to assess the degree to which local economies depend on government assistance programs.

In 2009, NEI accounted for 35 percent of total personal income in the United States (totaling more than $4 trillion), compared to just over one-quarter of total personal income in 1979 (U.S. Bureau of Economic Analysis 2010). Despite its economic significance, the spatial distribution of NEI has been under-studied by geographers, with a few notable exceptions (Briggs and Rees 1982; Forward 1982, 1990; Manson and Groop 1988, 1990; Campbell 2003; Nelson 2005, 2008; Mulligan and Vias 2006). In this article, we begin to address the paucity of geographic literature on NEI by examining the county-level spatial variation in NEI across the Piedmont Megapolitan Cluster (PMC), a 121-county region defined by Nelson and Lang (2011) that extends along the I-85 corridor from Atlanta, Georgia to Raleigh, North Carolina. Using correlation and regression analyses, we argue that the geography of DIR and TP within the PMC may have been shaped by a limited set of socio-economic and demographic variables. Furthermore, by examining changes in DIR and TP during the latest economic downturn, we aim to assess the degree to which the Great Recession differentially impacted NEI across the megapolitan landscape, from central, urban, metropolitan counties to peripheral, rural, and non-metropolitan counties.

THEORETICAL CONTEXT AND BACKGROUND

When evaluating local economies, the focus is often on employment and earned income. Economic base theory has proven to be an enduring and widely used theoretical framework for understanding such economies (Campbell 1990, Klosterman 1990). Economic base theory is grounded in the assumption that the local economy can be divided into basic (or non-local) and non-basic (or local) sectors. The basic sector includes firms that export goods and services out of a local economy (e.g., manufacturing, wholesale trade) while the non-basic sector mainly serves local needs (e.g., dry cleaners, restaurants). Economic base theory suggests that the basic sector is the engine, or economic base, of the local economy because it includes propulsive manufacturing industries and producer services with export propensities and substantive employment and income multipliers (North 1955; Williamson 1975; McLean and Voytek 1992).

Economic base theory, however, has been criticized for being too deterministic and simplistic, failing to account for the growing localness of modern economies (Jung and Marshall 1985; Markusen 2007; Rutland and O’Hagan 2007). It also remains unclear how NEI fits into economic base theory given that such income is not directly linked to employment. Although Tiebout (1962) recognized

2011).
non-employment income as basic more than five decades ago, it was not explicitly identified as a component of the income stream (Nelson and Beyers, 1998). Manson and Groop (1988, 1990) suggested that it was not until the early 1980s that NEI was fully incorporated into economic base analyses. More recently, Nelson (2008, p 2150) has argued that “non-earnings income can be seen as bringing ‘new money’ into a local economy in the same way as does exporting manufactured goods or raw materials. In this light, such income can be seen as contributing to the economic base of a region.” Forward (1990, p 120) has suggested that incorporating NEI into the economic base model is crucial because “post-industrial economy cities are being supported increasingly by income of non-employment origin.” Among the first geographers to systematically examine the spatial variation of NEI, Manson and Groop (1988, 1990) observed that areas where non-employment income comprised a disproportionately high share of total personal income included amenity-rich retirement areas in Florida and Arizona, rural, aging in place regions of the Great Plains, and areas where government transfer programs provided aid-related income such as Appalachia and the Rio Grande Valley.

In a study of Canadian cities, Forward (1990) found that city size played a significant role in shaping the spatial distribution of NEI. Larger, more populous cities exhibited a higher proportion of income from investments, while smaller cities were more dependent on government transfer income. Forward (1990) recognized that large cities that generated a high proportion of NEI as DIR operated as major financial centers with substantial finance, insurance, and real estate employment. By contrast, smaller cities with a high proportion of NEI income as TP were also typically home to disproportionately large groups of individuals to which government payments frequently accrue, including the elderly, unemployed, and single-mothers with children. Forward (1990) also posited that the positive correlation observed between the elderly population and pension income, while significant, was weaker than anticipated due to a strong trend toward early retirement in some Canadian cities.

Mulligan and Vias (2006) analyzed population and employment change in U.S. micropolitan counties. While controlling for various demographic, economic, and geographic factors including public and private non-earnings based on TP and DIR, they found that public transfer payments always deflated employment-based specialization. Private payments, or DIR, however, had the reverse effect of inflating specialization. Both variables effectively acted in tandem over the 20-year study period. Mulligan and Vias (2006, p 226) concluded that “the effects of two different non-earnings income sources on population or employment growth were shown to be highly significant, but in different ways—transfer payments inhibited growth or were symptomatic of at best slow growth, while interest, rent and dividends promoted growth.” Yet it is still unknown whether this pattern observed for U.S. micropolitan area counties also exists at broader geographic scales, such as megapolitan regions, which often include a wide variety of county topologies (Nelson and Lang 2011).

Campbell (2003) examined NEI and local employment growth in North Carolina. Higher proportions of local income from DIR were found to be associated with
faster annual rates of non-basic employment growth, while dependence on TP were associated with lower rates of employment growth. Others have examined NEI as it relates to life course influences and migration (Nelson 2005, 2008), income inequalities (Austin and Schmidt 1998; Pryor 2007), boom and bust economic cycles (Smith and Harris 1993), and rural and natural resource dependent communities (Nelson and Beyers 1998; Petigara et al. 2012). Left unanswered is the role that NEI plays in America’s new megapolitan geography.

Advances in communication and transportation technologies have given rise to new forms of networks and spatial connectivity, which are reintegrating urban space at a regional scale. Both Lang and Nelson (2007) and Nelson and Lang (2011) have argued that a large-scale metropolitan convergence is underway in which ten megaregions now account for 63 percent of the nation’s population and nearly 70 percent of U.S. gross domestic product (GDP). Lang and Knox (2009) have suggested that this “new metropolis” represents a trans-metropolitan urban structure more extensive than envisioned by either Vance (1964) or Pickard (1962, 1970), and most closely resembles in form and scale the Boston-Washington, D.C. megalopolis typology defined by Gottmann (1961). Although Lang and Knox (2009) have indicated that vast clusters of decentralized employment are a key feature of the polycentric structure of the new metropolis, to our knowledge no study has yet investigated the causes and implications of spatial patterns in NEI at this spatial scale.

In this exploratory case study of NEI in the PMC, we address three primary research questions. First, how does the relative proportion of DIR and TP (calculated using a ratio of DIR to TP) vary by county across the PMC? Given the positive relationship between city size and investment income, and the negative relationship between city size and pension income, observed by Forward (1990), we expect to find a core-periphery relationship with ratios of DIR to TP highest among centrally-located and urban metropolitan counties and lowest among peripheral, rural, and non-metropolitan counties. Second, to what extent are select demographic and socio-economic variables, such as age, income, education, immigration, and population, associated with the relative proportion of DIR and TP by county? Third, to what degree were DIR, TP, and the ratio of DIR to TP affected by the Great Recession, which the National Bureau of Economic Research (NBER 2010) identified as occurring between December 2007 and June 2009. Due to the dramatic reduction in economic activity, employment, and real income during this period, we expect to see a decrease in DIR and an increase in TP among all PMC counties, with the greatest losses in DIR among fast-growing metropolitan counties. Furthermore, we anticipate that the proportion of NEI gained through DIR will have fallen relative to TP between 2007 and 2009. It is reasonable to expect that this trend will continue into 2011 (and beyond) given the severity of the economic downturn and the relatively slow recovery of the U.S. labor market (Cynamon et al. 2012).

STUDY AREA

The study area consists of 121 counties spread over five states in the southeastern U.S.: Alabama, Georgia, Tennessee, South Carolina, and North Carolina (Figure 1).
Described by Nelson and Lang (2011) as the Piedmont megapolitan cluster (PMC), the region is composed of two adjacent megapolitan areas (of which there are 23 in the U.S.): the Carolina Piedmont to the north and east, and the Georgia Piedmont to the south and west. Megapolitan areas are defined by Nelson and Lang (2011, p 24) as “those [regions] with projected populations of more than four million people, anchored by at least one megapolitan area of more than one million people that is connected by current or projected commuting patterns with at least two and often several other metropolitan areas of more than about a quarter million people.” Megapolitan clusters consist of two or more megapolitan areas whose major metropolitan centers are no more than 500 miles apart. Within its borders, the PMC contains 20 census-defined metropolitan statistical areas (MSAs), three of which (Atlanta, Charlotte, and Raleigh) were home to one million or more people in 2010. In all, 82 of the region’s 121 counties (68 percent) are within the bounds of a MSA, and are considered metropolitan counties. The I-85 corridor, which passes through the majority of the region’s metropolitan areas, comprises the PMC’s transportation backbone.

The PMC is one of the fastest growing megapolitan clusters in the U.S., and is the second largest by land area covering some 127,000 km² (Lang and Dhavale 2005; Lang and Nelson 2007). The population of the PMC is expected to increase by 43.8 percent from 15.8 million in 2010 to 22.7 million in 2040 (Nelson and Lang 2011). Only the Texas Triangle (including the cities of Dallas, Houston, Austin, and San Antonio) and Mountain (including the cities of Denver and Colorado Springs) megapolitan clusters are expected to grow at a faster rate. Employment growth within the PMC has been similarly robust. Between 2000 and 2010, the number of jobs in the region grew by 15 percent,
compared with just 7.9 percent nationally (Table 1). Despite this growth, however, the PMC suffered from higher than average unemployment during and following the Great Recession. In 2009, at the height of the recession, 87 of the region’s 121 counties experienced unemployment rates greater than 9 percent, the national average. Counties with the highest unemployment were generally located in rural portions of the PMC, however a few metropolitan counties, including Clayton County and DeKalb County, Georgia (both part of the Atlanta metro) experienced unemployment rates of 13 percent or higher.

Economically, the PMC exhibits an urban-rural dichotomy typical of most megapolitan and large metropolitan regions. Outside the PMC’s large urban centers, basic economic sectors such as manufacturing and federal and state government employment tend to dominate (Nelson and Lang 2011). Within the PMC, however, other significant basic sectors such as mining and agriculture are relatively limited, with only two rural counties (Franklin and Jackson, Georgia) classified by the U.S. Department of Agriculture (USDA; 2012) as farming dependent (i.e., ≥15 percent of employed residents worked in farm occupations in 2000). As is typical of most megopolitan clusters, no county within the PMC was identified by the USDA as mining dependent. Manufacturing, however, remains a dominant sector among the region’s rural counties, with over 30 counties classified as manufacturing dependent (USDA 2012). Within the PMC’s metropolitan areas, and particularly within core urban counties, service sectors such as retail, finance, insurance, and real estate dominate the economy. With robust economic and population growth prior to the Great Recession, and a relatively balanced mix of urban and rural, as well as basic sector- and non-basic sector-dependent, counties, the PMC provides a near-ideal case study in which to assess the differential county-level impacts of the recession on NEI across a diverse, yet economically-integrated, region. Also of significance, in July 2013, as part of the state’s plan to repay $2.5 billion in federal debt, North Carolina became the first state in the nation to be disqualified from a federal compensation program for the long-term unemployed (Dalesio 2013). In respect to economic resilience, the results of this study may have important implications for the propagation of such strict austerity measures.

**METHODOLOGY**

To examine spatial and temporal patterns in NEI across the PMC, a ratio of DIR to TP was calculated for each of the region’s 121 counties for the years 2007, 2009, and 2011. A similar methodology was employed by Forward (1990). A DIR/TP ratio greater than one indicates that a disproportionate share of a county’s NEI was from investments; a ratio of less than one suggests that a county was more reliant on government entitlement and assistance programs. A Getis-Ord Gi* hotspot analysis (Getis and Ord 1992) was then employed to address the hypothesis that NEI exhibits a distinct core-periphery relationship in which counties that exhibit the highest DIR/TP ratios are located in distinct clusters corresponding to the region’s most populous urban centers (e.g., Atlanta, Charlotte, and Raleigh). The Getis-Ord Gi* statistic identifies adjacent
Table 1. Descriptive statistics and Pearson correlations of potential predictor variables with the ratio of DIR to TP (2009) in the Piedmont megapolitan cluster (PMC) by county.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Variable</th>
<th>PMC Mean*</th>
<th>PMC sd</th>
<th>U.S. Mean</th>
<th>Correlation with DIR/TP&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic</td>
<td>% African American</td>
<td>19</td>
<td>15</td>
<td>13</td>
<td>−0.054</td>
</tr>
<tr>
<td></td>
<td>% Hispanic</td>
<td>6.7</td>
<td>4.8</td>
<td>16</td>
<td>0.296**</td>
</tr>
<tr>
<td></td>
<td>% White</td>
<td>77</td>
<td>16</td>
<td>74</td>
<td>−0.054</td>
</tr>
<tr>
<td></td>
<td>% Non-native born citizens</td>
<td>5.7</td>
<td>4.5</td>
<td>13</td>
<td>0.584**</td>
</tr>
<tr>
<td></td>
<td>% Elderly (age ≥ 62)</td>
<td>16</td>
<td>3.4</td>
<td>16</td>
<td>−0.389**</td>
</tr>
<tr>
<td></td>
<td>% Young adults (age 25–34)</td>
<td>12</td>
<td>1.8</td>
<td>13</td>
<td>0.224*</td>
</tr>
<tr>
<td></td>
<td>Median age</td>
<td>38</td>
<td>3.3</td>
<td>37</td>
<td>−0.317**</td>
</tr>
<tr>
<td>Economic</td>
<td>% Employment change 2000–2010</td>
<td>15</td>
<td>18</td>
<td>7.9</td>
<td>0.345*</td>
</tr>
<tr>
<td></td>
<td>% Unemployed</td>
<td>11</td>
<td>2.5</td>
<td>9.0</td>
<td>−0.553**</td>
</tr>
<tr>
<td></td>
<td>% Population in workforce</td>
<td>62</td>
<td>5.0</td>
<td>65</td>
<td>0.524**</td>
</tr>
<tr>
<td></td>
<td>Median household income ($)</td>
<td>44k</td>
<td>10k</td>
<td>51k</td>
<td>0.702**</td>
</tr>
<tr>
<td></td>
<td>% Employment producer services</td>
<td>34</td>
<td>5.9</td>
<td>36</td>
<td>0.700**</td>
</tr>
<tr>
<td></td>
<td>% Employment manufacturing</td>
<td>17</td>
<td>6.7</td>
<td>11</td>
<td>0.558**</td>
</tr>
<tr>
<td></td>
<td>% Below poverty</td>
<td>16</td>
<td>4.6</td>
<td>14</td>
<td>−0.391**</td>
</tr>
<tr>
<td>Education</td>
<td>% High school drop-out</td>
<td>19</td>
<td>5.6</td>
<td>8.5</td>
<td>−0.713**</td>
</tr>
<tr>
<td></td>
<td>% University enrollment</td>
<td>23</td>
<td>9.9</td>
<td>27</td>
<td>0.323**</td>
</tr>
<tr>
<td></td>
<td>% Bachelor’s degree attainment (age ≥ 25)</td>
<td>20</td>
<td>10</td>
<td>18</td>
<td>0.921**</td>
</tr>
<tr>
<td>Housing</td>
<td>Median home value ($)</td>
<td>142k</td>
<td>42k</td>
<td>187k</td>
<td>0.908**</td>
</tr>
<tr>
<td></td>
<td>% Renters</td>
<td>28</td>
<td>7.0</td>
<td>34</td>
<td>0.090</td>
</tr>
<tr>
<td></td>
<td>% New residents in past year</td>
<td>6.2</td>
<td>2.3</td>
<td>5.5</td>
<td>0.342*</td>
</tr>
<tr>
<td>Population</td>
<td>Population 2010 (avg. county)</td>
<td>135k</td>
<td>188k</td>
<td>97k</td>
<td>0.536**</td>
</tr>
<tr>
<td></td>
<td>% Population change 2000–2010</td>
<td>18</td>
<td>17</td>
<td>13</td>
<td>0.362**</td>
</tr>
<tr>
<td></td>
<td>Population density (persons/km&lt;sup&gt;2&lt;/sup&gt;)</td>
<td>116</td>
<td>174</td>
<td>33</td>
<td>0.501**</td>
</tr>
<tr>
<td></td>
<td>% Urban population 2010 (avg. county)</td>
<td>50</td>
<td>28</td>
<td>42</td>
<td>0.458**</td>
</tr>
<tr>
<td></td>
<td>Metropolitan county (yes/no)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>0.261*</td>
</tr>
<tr>
<td>Social</td>
<td>% Divorced</td>
<td>11</td>
<td>1.7</td>
<td>12</td>
<td>−0.446**</td>
</tr>
<tr>
<td></td>
<td>% One-parent households</td>
<td>9.7</td>
<td>2.4</td>
<td>9.6</td>
<td>−0.240*</td>
</tr>
<tr>
<td></td>
<td>% Veterans</td>
<td>9.9</td>
<td>1.8</td>
<td>9.6</td>
<td>−0.147</td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.05 level (2-tailed)
**Correlation is significant at the 0.01 level (2-tailed)
N = 108 because American Community Survey data was not available for 13 counties.
*Means are calculated based on 3-year (2008–2010) averages, unless otherwise specified.
Reported correlations (r) are between the 28 independent variables listed in the table and the ratio of DIR to TP by county within the PMC.
counties with higher or lower DIR/TP ratios than would be expected by random chance, and assigns each county a z score in which values greater than 1.96 and less than −1.96 are statistically significant (i.e., indicate clusters of high and low values, respectively).

Correlation and linear regression analyses were performed to identify variables that may help explain the observed spatial and temporal variations in DIR/TP across the PMC. We initially identified 28 potential independent variables (Table 1) expected to exhibit some relationship with DIR/TP at the county level. The selection of this initial cohort of variables was based primarily on previous research (Forward 1982, 1990; Manson and Groop 1988, 1990; Kendall and Pigozzi 1994; Moore et al. 2000; Campbell 2003; Petigara et al. 2012), which hypothesized and/or established connections between various sources of personal income and such local variables as city size/population, unemployment rates, proportion of elderly residents, type and proportion of basic employment, income and affluence of residents, dependency on primary and secondary sectors (i.e., resource extraction, farming, and manufacturing), and degree of urbanization, among others. Additional variables were selected on the basis of: 1) having some similarity or logical connection to previously investigated variables, or 2) having some logical connection to either DIR or TP. For example, given the positive associations between educational attainment and productivity (Glaeser and Saiz 2003), participation in knowledge and creative occupations (Florida et al. 2008), income (Aghion et al. 2009), innovation and knowledge spillovers (Kantor and Whalley 2009), population growth (Glaeser et al. 1995), and other variables indicative of economic expansion, counties with higher levels of education (i.e., more human capital) are expected to exhibit higher ratios of DIR/TP. We have therefore included in our analyses three variables to represent education at the county level: percent high school drop-outs, percent enrolled in university, and the percent of residents aged 25 and over with a bachelor’s degree (Table 1).

Data for all independent variables were obtained from the U.S. Census Bureau’s (2010) American Community Survey, with three year (2008–2010) estimates used unless otherwise specified in Table 1. NEI data were gathered from the Bureau of Economic Analysis for the years 2007, 2009, and 2011 (U.S. BEA 2012). Because the 2008–2010 ACS estimates are available only for counties with a population of ≥20,000, 13 of the PMC’s 121 counties were not included in the correlation and regression analyses.

A two-tailed Pearson correlation analysis was completed using all variables prior to performing linear regression to 1) assess whether statistically significant relationships exist between the ratio of DIR/TP in 2009 and each independent variable separately, and 2) reduce the potential for collinearity in the regression analysis by identifying statistically significant correlations between independent variables. R values for each correlation are provided in the final column of Table 1. Eight of the 28 potential independent variables (percent Hispanic, percent white, median age, percent employment change (2000–2010), percent employed in producer services, percent high school drop-out, median home value, population density) were
change in DIR/TP between 2007 and 2011 was calculated for each county (Figure 4), and an analysis of variance (ANOVA) was used to determine whether statistically significant changes in DIR/TP occurred over the four year period. Finally, a t-test was used to test whether changes in the DIR/TP ratio differed significantly among metropolitan and non-metropolitan counties between 2007 and 2011.

RESULTS AND DISCUSSION

Core-Periphery Relationship

In 2009, total NEI in the PMC varied from a high of $15.6 billion in Fulton County, Georgia to a low of $105.4 million in Twiggs County, Georgia, with a mean of $1.5 billion across all 121 counties. Three counties in the heart of the region’s largest metropolitan areas, including Fulton County, Georgia ($15.6 billion; Atlanta), Mecklenburg County, North Carolina ($11.4 billion; Charlotte), and Wake County, North Carolina ($10.4 billion; Charlotte), ultimately eliminated due to a high degree of correlation (i.e., \( r \geq 0.80 \) or \( r \leq -0.80 \)) with one or more additional independent variables. Among each pair of variables with a high degree of correlation, the one least correlated with the dependent variable (DIR/TP) was chosen for elimination. Linear regression analysis was then performed using the step-wise procedure to identify the most powerful predictors of DIR/TP among the remaining 20 independent variables.

In our third and final analysis, we sought to characterize the impact of the Great Recession (2007–2009) on the ratio of DIR to TP for each county in the PMC. To do so, we calculated the DIR/TP ratio for each county for the years 2007 (when the recession started), 2009 (the year the recession officially ended), and 2011 (Figures 1, 2, and 3), which represents a post-recession measure although it is probable that any change in DIR/TP due to the recession will remain evident. Total

Figure 2. Ratio of DIR to TP by county in 2009 within the PMC.
Examples include Fannin County, Georgia (50.5 percent), Rutherford County, North Carolina (49.8 percent), and Anson County, North Carolina (49.0 percent). Many rural counties within the PMC contain *aging in place* communities. Young, college-educated workers are incentivized to leave these communities to pursue more lucrative employment opportunities in the larger and more diversified urban centers in the region (Feser and Sweeney 1999; Domina 2006a, 2006b; Eggert et al. 2007).

A simple way to get a handle on the relative importance of investment income compared to public institutional transfer payments across the PMC is to map the ratio of DIR to TP by county. In 2009, the DIR/TP ratio varied from a high of 2.22 in Fulton County, Georgia to a low of 0.30 in Twiggs County, Georgia, with an average of 0.73. Only 35 counties in 2007, and 22 counties in 2009, generated a DIR/TP ratio greater than one, suggesting that the...
or 3) relatively urban, predominately black and poor counties (e.g., Edgecombe, North Carolina—0.41, Clayton, Georgia—0.41). In general, it appears that a distinct core-periphery relationship existed in which core urban counties tended to generate DIR as the primary source of NEI, while the more peripheral counties exhibited greater dependence on TP. Notable exceptions to this rule included predominately rural college town counties like Clarke County, Georgia (host to the University of Georgia) and Watauga County, North Carolina (home of Appalachian State University).

To identify clusters or hotspots of counties with especially high or low ratios of DIR/TP, and to assess quantitatively the strength of the observed core-periphery relationship, a Getis-Ord Gi* statistic was performed. The statistic revealed that, in 2009, there existed two clusters of counties with a high DIR/TP ratio: one centered on Atlanta, the other associated

**Figure 4. Percent change in the ratio of DIR to TP between 2007 and 2011 by county within the PMC.**

The majority of PMC counties relied on transfer payments as their primary source of NEI. Most counties in 2009 with a high DIR/TP ratio could be characterized as: 1) urban cores (e.g., Fulton—2.22, Wake—1.47, Mecklenburg—1.38), 2) highly affluent bedroom suburbs of a major urban area (e.g., Forsyth, Georgia—1.86, Oconee, Georgia—1.81, Fayette, Georgia—1.70, Chatham, North Carolina—1.66), or 3) counties that are home to one or more institutions of higher education (e.g., Orange County, North Carolina—2.03, Watauga, North Carolina—1.34). By contrast, counties with a low DIR/TP ratio included 1) relatively isolated, sparsely populated and poor communities, particularly between Charlotte and Spartanburg (e.g., Chester, South Carolina—0.33, Union, South Carolina—0.33, Cherokee, South Carolina—0.42), 2) sparsely populated, poor, white mountain communities (e.g., Chattooga, Georgia—0.36, Marion, Tennessee—0.39, Murray, Georgia—0.41),
Charlotte exhibited the highest population density, percent urban population, and percent of workers employed in producer services (40 percent versus 37 percent in Raleigh and 35 percent in Atlanta), but also exhibited the lowest median home values ($156,000 versus $167,000 in Raleigh and $172,000 in Atlanta), percentage of adults aged 25 and over with a bachelor’s degree (24 percent versus 27 percent in Raleigh and 25 percent in Atlanta), median annual household income ($49,000 versus $52,000 in Raleigh and $54,000 in Atlanta), and population and employment change between 2000 and 2010, though these two latter metrics for Charlotte were still among the most robust in the nation at 31 and 30 percent, respectively. Though the relationships between DIR/TP and select demographic and socio-economic variables are more

with the western counties of the Piedmont Triangle area (generally described as the urban agglomeration formed by the cities of Raleigh, Durham, and Chapel Hill, North Carolina), though not including Wake County (Raleigh) (Figure 5). A total of 12 counties in the Atlanta area, and 4 counties in the Triangle area exhibited z scores of 1.96 or higher, indicating that the clusters are robust with less than a five percent probability ($p<0.05$) of occurring by random chance alone.

Interestingly, the counties constituting the region’s second largest metropolitan area, Charlotte, did not form a separate hotspot of high DIR/TP. This pattern is similar for 2007 and 2011 as well, with Charlotte counties generally exhibiting DIR/TP ratios less than those of either Atlanta or the Triangle. Among the big three metropolitan areas within the PMC, Charlotte exhibited the highest population density, percent urban population, and percent of workers employed in producer services (40 percent versus 37 percent in Raleigh and 35 percent in Atlanta), but also exhibited the lowest median home values ($156,000 versus $167,000 in Raleigh and $172,000 in Atlanta), percentage of adults aged 25 and over with a bachelor’s degree (24 percent versus 27 percent in Raleigh and 25 percent in Atlanta), median annual household income ($49,000 versus $52,000 in Raleigh and $54,000 in Atlanta), and population and employment change between 2000 and 2010, though these two latter metrics for Charlotte were still among the most robust in the nation at 31 and 30 percent, respectively. Though the relationships between DIR/TP and select demographic and socio-economic variables are more

![Figure 5. Hot spot analysis of the ratio of DIR to TP using the Getis-Ord Gi* statistic. Higher positive Z scores (darker gray) indicate more intense clustering of high values (i.e. counties with high DIR/TP); lower negative Z scores (denser horizontal lines) indicate more intense clustering of low values (i.e. counties with low DIR/TP).](image-url)
Identifying Predictors of NEI

A step-wise linear regression analysis was performed to assess quantitatively the potential relationships between the ratio of DIR to TP (in 2009) and select socio-economic and demographic variables by county. Diagnostic tests indicated that the resultant five regression models (Table 2) exhibited low multicollinearity among independent variables (VIF < 3, CI < 20), and met assumptions of linearity, normality, and homoscedasticity. All models and all independent variables were significant at the p<0.05 level. In the final regression model (i.e., model 1, Table 2), 84.7 percent of the variation in the DIR/TP ratio by county was accounted for by one variable: the percent of the population aged 25 and over with a bachelor’s degree (% BA). The predictive capability of each successive model (adding one independent variable at a time), was minimal, with only a 0.048 gain in \( r^2 \) between model 1 with one independent variable (% BA), and model 5 with five independent variables. The results of the regression analysis strongly suggest that % BA is the dominant predictor of DIR/TP among the 20 variables chosen for analysis. A separate set of regression models were run using DIR/TP data for years 2007 and 2011, however, % BA remained the dominant independent variable with similar predictive power.

As indicated by the variable’s b coefficient, the relationship between % BA and NEI is such that a one percent increase in % BA is expected to result in a 0.034 increase in the ratio of DIR to TP. The counties with the highest % BA included Orange County, North Carolina (54.7 percent), Wake County, North Carolina (47.8 percent), and Fulton County, Georgia (47.6 percent). The average % BA for all
Table 2. Regression models indicating associations between demographic and socioeconomic variables, and the ratio of DIR to TP by county within the PMC.

<table>
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<tr>
<th>Model</th>
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<th>Model r²</th>
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<th>SE b</th>
<th>β</th>
<th>p-value</th>
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<td></td>
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<tr>
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<td>-.205</td>
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PMC counties was 20.8 percent. Highly educated (and highly skilled) labor pools in the Atlanta and Raleigh-Durham areas appear to book-end the PMC. We suspect that communities with a substantial share of adults with college degrees are more likely to be competitive in the contemporary knowledge economy and, thus, more likely to accumulate wealth through DIR.

The dominance of the % BA variable in our regression models was also evident in models 2 through 5, in which two independent variables exhibited unanticipated associations with DIR/TP (Table 2). The percent of county residents in urbanized areas (% Urban) and percent enrolled in university (% Enrolled uni.) were both expected to exhibit a positive association with DIR/TP based on the preceding correlation analysis, but instead were negative. The results imply that the observed correlations between DIR/TP and % Urban and % Enrolled uni. are actually quite weak when controlling for attainment of higher education, and that a high DIR/TP ratio is probable among both suburban and rural counties, as well as those with low university enrollments, provided that a large proportion of their populations are college-educated. Tellingly, among the counties with both high DIR/TP and % BA, a large portion fell within one of three groups: 1) highly urbanized, central metropolitan counties with modest university
enrollments by percent, but large university enrollments in absolute terms (e.g., Fulton County, Georgia; Cobb County, Georgia; Wake County, North Carolina), 2) predominately rural counties with low university enrollments, but are located adjacent to counties with large universities (e.g., Chatham County, North Carolina; Oconee County, Georgia), or 3) predominately suburban or rural counties that host major regional or national universities (e.g., Orange County, North Carolina, home to The University of North Carolina at Chapel Hill; Watauga County, North Carolina, home to Appalachian State University; and Clarke County, Georgia, home to the University of Georgia). Campbell (2003) and Forward (1990) argued that faster growing, more densely populated and affluent counties attract more investment and property income and less TP (Forward 1990; Campbell 2003). While likely an accurate assessment, our results suggest that higher education is at the root of wealth accumulation via NEI, and that even fast growing cities, counties, and metropolitan areas (e.g., Charlotte) are at a distinct disadvantage without leading research universities that attract talent and spark innovation. As Glaeser (2005, p 596) observed, “skilled people are the key to urban success.”

Impacts of the Great Recession

In absolute terms, DIR in the PMC declined during the recession years from $89.8 billion in 2007, to $88.4 billion in 2009 (−1.6 percent), and $82 billion in 2011 (a further −7.2 percent). Meanwhile, total TP jumped from $72 billion in 2007, to $93 billion in 2009 (up 29 percent), and $102 billion in 2011 (up 9.7 percent). As a percent of total income, DIR in the PMC decreased from 16.6 percent in 2007, to 14.5 percent in 2009, and 14.2 percent in 2011, while TP rose from 13.4 percent in 2007, to 17.7 percent in 2009, and 17.8 percent in 2011. The nation as a whole exhibited similar trends in response to the recession, with DIR decreasing from 18.5 percent of total income in 2007 to 16.2 percent in 2011, and TP increasing from 14.4 percent of total income in 2007 to 18 percent of total income in 2011. While the Great Recession prompted a rapid increase in TP, and a more modest decrease in DIR, a look at percent TP and DIR over the past four decades reveals that, as a percent of total income, DIR began to plateau, then slowly decline, around the early 1990s (potentially due to an increase in capital gains and earned income as a proportion of total income), while TP began to rise in the early 2000s (Figure 6). Thus, the recession appears to have amplified existing trends in NEI that began up to 20 years earlier.

Due to the increase in TP and decrease in DIR, the ratio of DIR to TP decreased in all PMC counties between 2007 and 2011 (Figure 4). An ANOVA further indicated that the average ratio of DIR to TP by county was significantly (p<0.001) lower in both 2009 and 2011 relative to 2007. The average percent change in DIR/TP per county between 2007 and 2011 was −32 percent, with the most significant declines having occurred in Fulton County, Georgia (down 46 percent), Davie County, North Carolina (down 44 percent), and Forsyth County, Georgia (down 40 percent). Both Fulton County and Forsyth County are within the Atlanta metropolitan area. Counties with the least change in DIR/TP included Chattooga County, Georgia (down 14.6 percent), Franklin County, Georgia (down 16.4 percent), and Marion
County, Tennessee (down 16.5 percent). In general, more populous urban counties exhibited among the most severe declines, while less populated rural counties tended to exhibit among the least declines in DIR/TP. A significant negative correlation ($r^2 = -0.371$, $p<0.001$) between county population and decline in DIR/TP confirmed the relationship. Furthermore, a t-test indicated that metropolitan (N=78) counties exhibited significantly ($p=0.030$) greater declines in DIR/TP than non-metropolitan counties (N=43) within the PMC between 2007 and 2011. Examining DIR and TP separately, there was no significant difference in decline in DIR, in absolute terms, among metropolitan and non-metropolitan counties, however metropolitan counties exhibited a significantly ($p<0.001$) greater increase in TP over the four-year period. Thus, in regard to NEI, it appears that metropolitan counties were hardest hit by the recession, though primarily due to a surge in TP rather than a steep decline in DIR as we predicted. This is likely due in part to a substantial increase in unemployment. Forward (1990) observed a marked increase in pensions and unemployment insurance benefits following the recession of 1981. Despite the significant associations observed between urbanity and NEI, it is important to consider that the aforementioned spatial patterns were not universal. Some urban counties exhibited steep declines in DIR, while some rural counties experienced significant gains in TP.

The data suggest that the Great Recession of 2007–2009 continued to significantly affect NEI for at least two additional years. Although the full extent of the lag between the recession and its effects on NEI will remain unknown until more data is released in the coming years, it is clear that the reliance on government assistance programs, such as unemployment benefits, continued to rise during
the post-recession period. Combined with the losses in DIR, which only became more pronounced after the recession officially ended, there is little doubt that a substantial proportion of PMC residents—and Americans in general—have continued to struggle financially in the years following the worst economic downturn since the Great Depression. As an important economic metric, the ongoing increase in TP and decline in DIR suggest that austerity measures such as the reduction in unemployment benefits instituted by North Carolina in June 2013 may place a substantial financial burden on a population and local economy that has yet to fully recover.

CONCLUSION

Economic base theory has long theorized that NEI can contribute significantly to local and regional economies. Although NEI is a powerful determinant of the economic landscape, it has not received much attention in the economic geography literature. In this study, we uncovered several spatial and temporal trends in NEI across the Piedmont Megapolitan Cluster, a diverse yet functionally integrated region in the southeastern U.S. The spatial distribution of NEI by county exhibited a distinct core-periphery relationship, with the ratio of DIR to TP generally higher among core urban counties and those containing large regional or national universities. A significant relationship between NEI and higher education was confirmed using linear regression analysis; the proportion of residents aged 25 and over with a bachelor degree (% BA) accounted for 84.7 percent of the variation in the ratio of DIR to TP by county. We posit that counties with a more educated population are more competitive in the modern knowledge economy, and are therefore better positioned to accumulate wealth through DIR, while also relying less on government TP. Using the Getis Ord Gi* statistic, central counties within metropolitan Atlanta, Georgia and the Triangle (i.e. Raleigh-Durham-Chapel Hill) in North Carolina were identified as the region’s leading hot spots, with particularly high DIR to TP ratios. Between 2000 and 2010, these two urban areas lead the region in population and economic growth, while also boasting the highest % BA.

Our final analysis revealed substantive impacts of the Great Recession on NEI. Nearly every county in the PMC experienced a decline in DIR and an increase in TP during, and immediately following, the Great Recession. Urban and metropolitan counties experienced particularly large increases in TP, generally resulting in a greater decline in DIR/TP relative to more rural, peripheral counties. Heightened reliance on government assistance programs, such as unemployment benefits, appears to have been the primary cause. With DIR continuing to decline and TP continuing to rise two years post-recession, a reduction in government aid and benefits is likely to have a substantive impact on a wide spectrum of PMC residents.

To further the insights gained in this study, we suggest that future research explore the spatial and temporal trends in NEI among multiple megapolitan areas with different economic, population, and demographic characteristics to see if the trends in the PMC cluster hold for other areas. Furthermore, as new data become available in the coming years, it will be possible to trace the evolution of DIR and TP during the full post-recession period, and more accurately determine the full
extent of the effects of the recession on NEI within the PMC and elsewhere. Over the last several decades, both public and private sources of NEI have become increasingly vital to the fate of local, regional, and national economies. Furthering our understanding of the geography of NEI can provide important insights into the economic health and resiliency of individual communities as well as large, functionally dependent urban regions such as the PMC.

ACKNOWLEDGEMENTS

A special acknowledgement goes to John Rees for planting the seed for this paper way back in the late 1980’s and early 1990’s—without his intellectual guidance this paper would not have been possible. The authors would also like to acknowledge the helpful commentary and contributions of the editors as well as the anonymous reviewers. Any and all mistakes or failings, however, are our own.

NOTES

1. The Bureau of Economic Analysis (BEA) definition of DIR excludes that portion of dividends paid by regulated investment companies (mutual funds) related to capital gains distribution. The BEA excludes capital gains from the National Income and Product Accounts because they are less available to fund expenditures since to spend a capital gain the appreciated asset must first be sold. Therefore, they are highly volatile and subject to wide, unpredictable fluctuations. Capital gains represent changes in the price of already existing assets, and only an expansion of the real stock of assets represents an increase in the wealth of a society.

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Geography of Non-Earned Income

BRADLEY BEREITSCHAFT is an Assistant Professor in the Department of Geography/Geology at the University of Nebraska at Omaha. Email: bbereitschaft@unomaha.edu. His research interests include sustainable development, community planning, urban climate, and urban–environment interactions.

EDWARD BEAVER is a graduate student in the Department of Geography at the University of North Carolina at Greensboro in Greensboro, NC 27402. Email: embeaver@uncg.edu. His research interests include urban geography, urban development and workforce geography.

KEITH G. DEBBAGE is a Professor in the Department of Geography at the University of North Carolina at Greensboro in Greensboro, NC 27402. Email: kgdebbag@uncg.edu. His research interests include urban development, tourism and air transportation.