A Spatial Examination of Political Geographies in the 2016 Presidential Election

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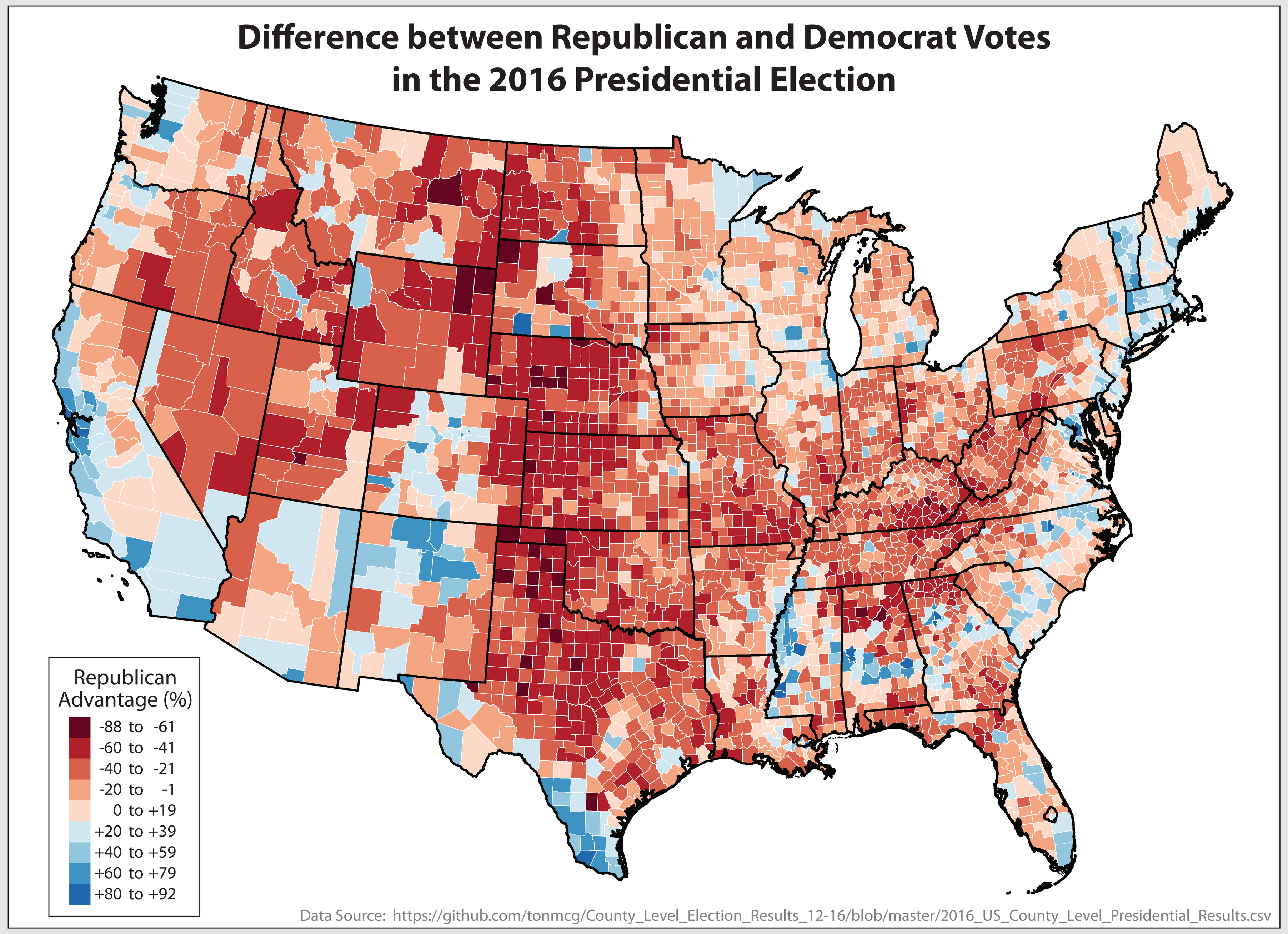


Overview

The unexpected results of the 2016 presidential election raise questions about patterns and changes in the political geography of the United States. This series of maps was developed for a spatial statistics class at the University of Colorado Denver to provide students with a demonstration of the ability of basic statistical and mapping manipulation to reveal spatial patterns.

These maps provide some insight to the questions around voting behavior across space through ecological analysis. Specifically, these maps address (1) what are the spatial patterns of voting behavior in the US presidential election, (2) what county-level variables can be used to explain variation across space; (3) how do these associations themselves vary across space; and (4) are there detectable spatial patterns in voting behavior change across multiple elections?

Data Sources

Boundary files: US Census

2012 Election Data: Originally distributed by the US Federal Election Commission and available for download at data.gov.

2016 Election Data:
These were compiled by scraping various media and government sites, compiled by Matt Hodges https://github.com/tonmcg/County_Level_Election_Results_12-16/blob/master/2016_US_County_Level_Presidential_Results.csv

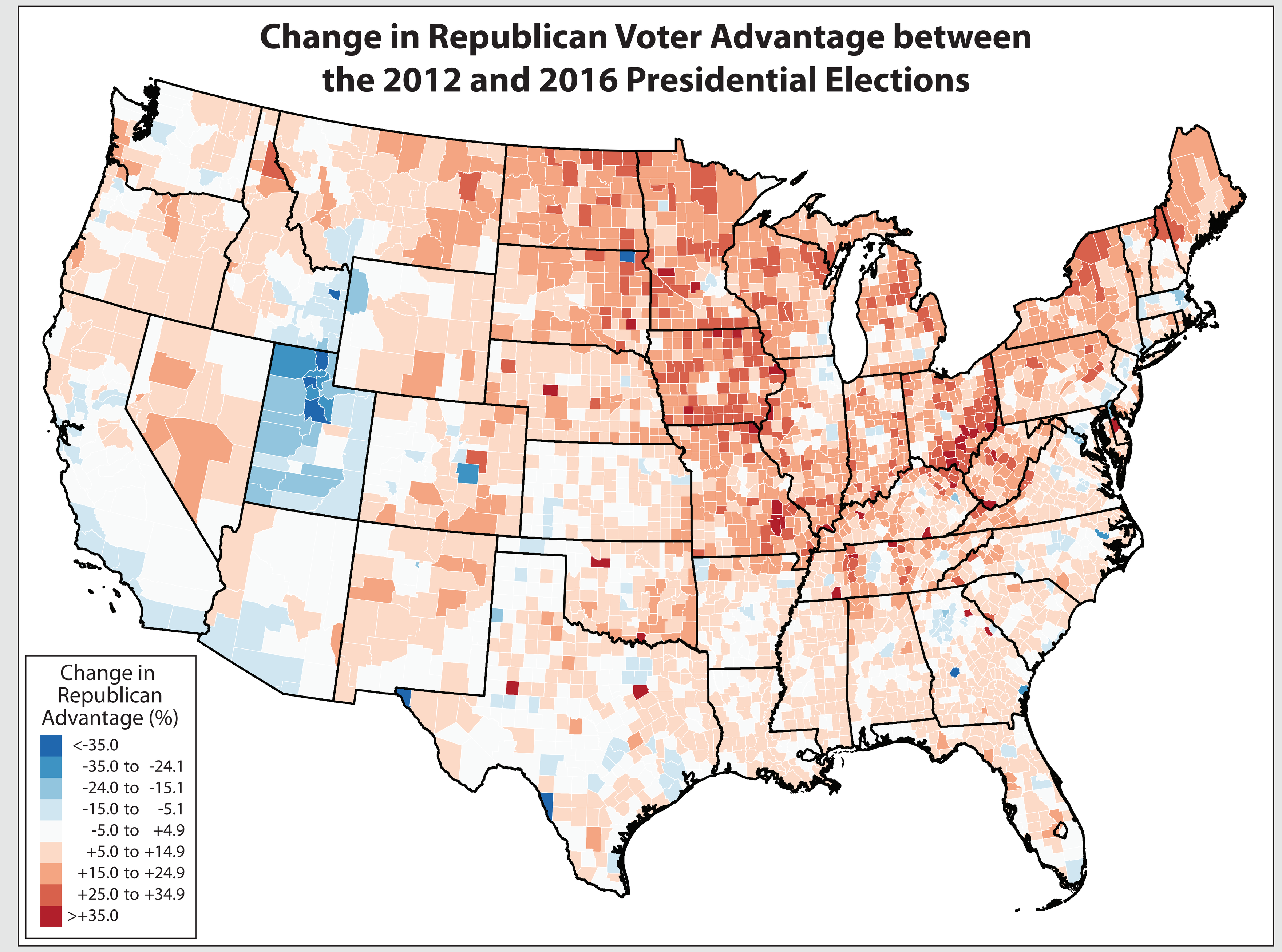
Covariate Data (Poverty, Education, Urban Population, Minority Population): United States Census Bureau, from both the 2010 Decennial Census and the 2015 American Community Survey.

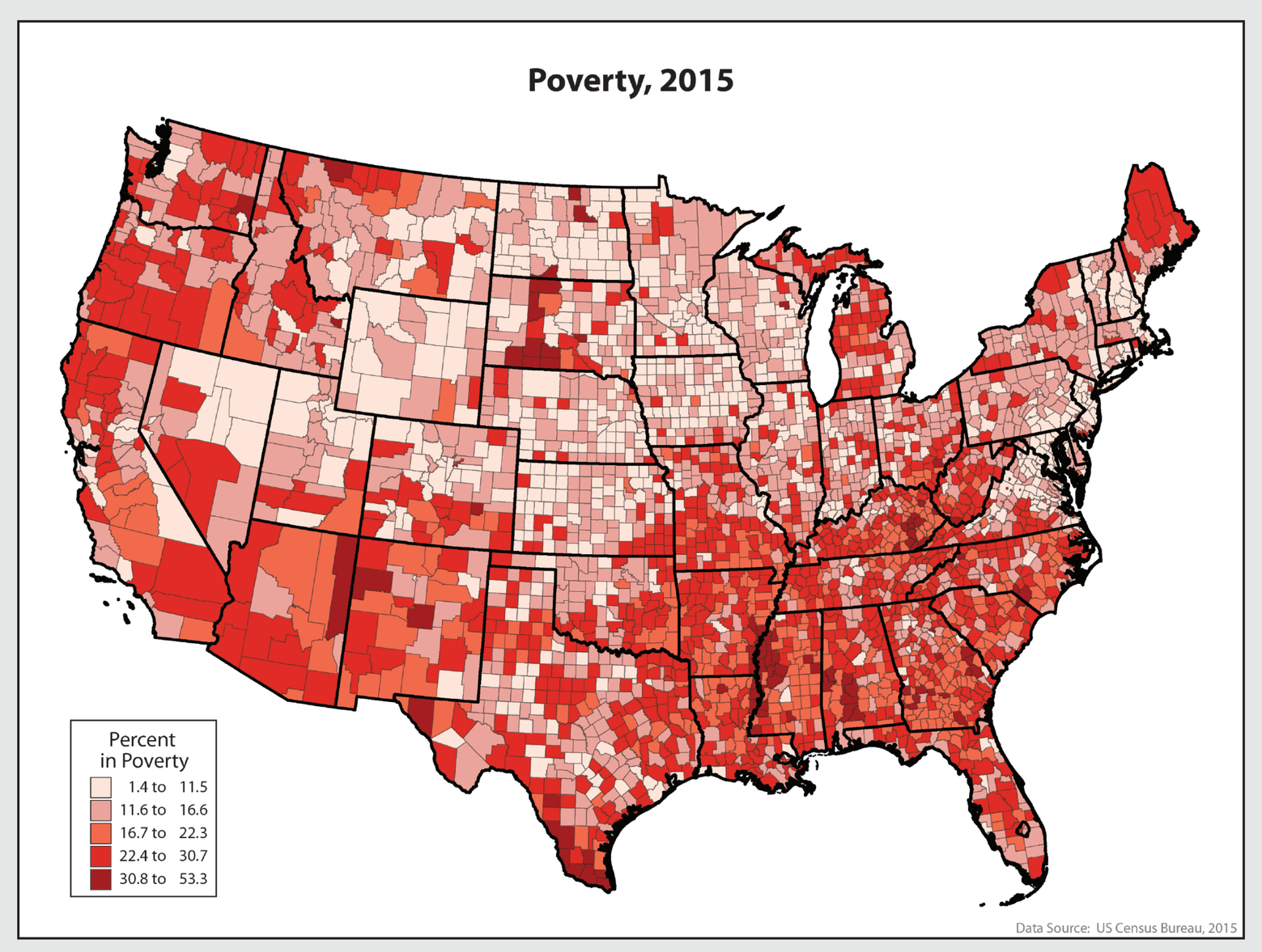
Trends in Voting Behavior

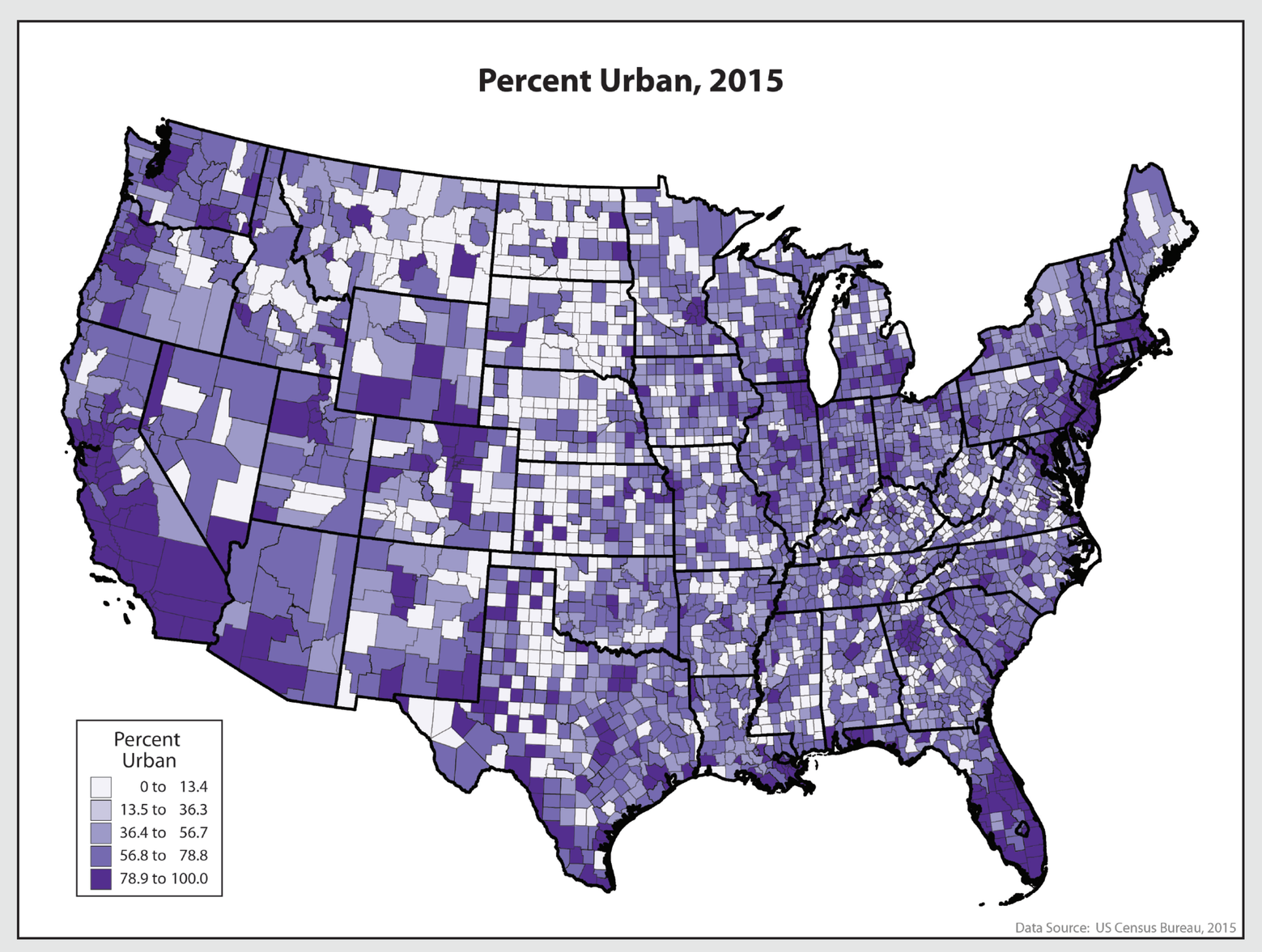
This map reveals striking patterns in changes in voter preference between the 2012 and 2016 elections.

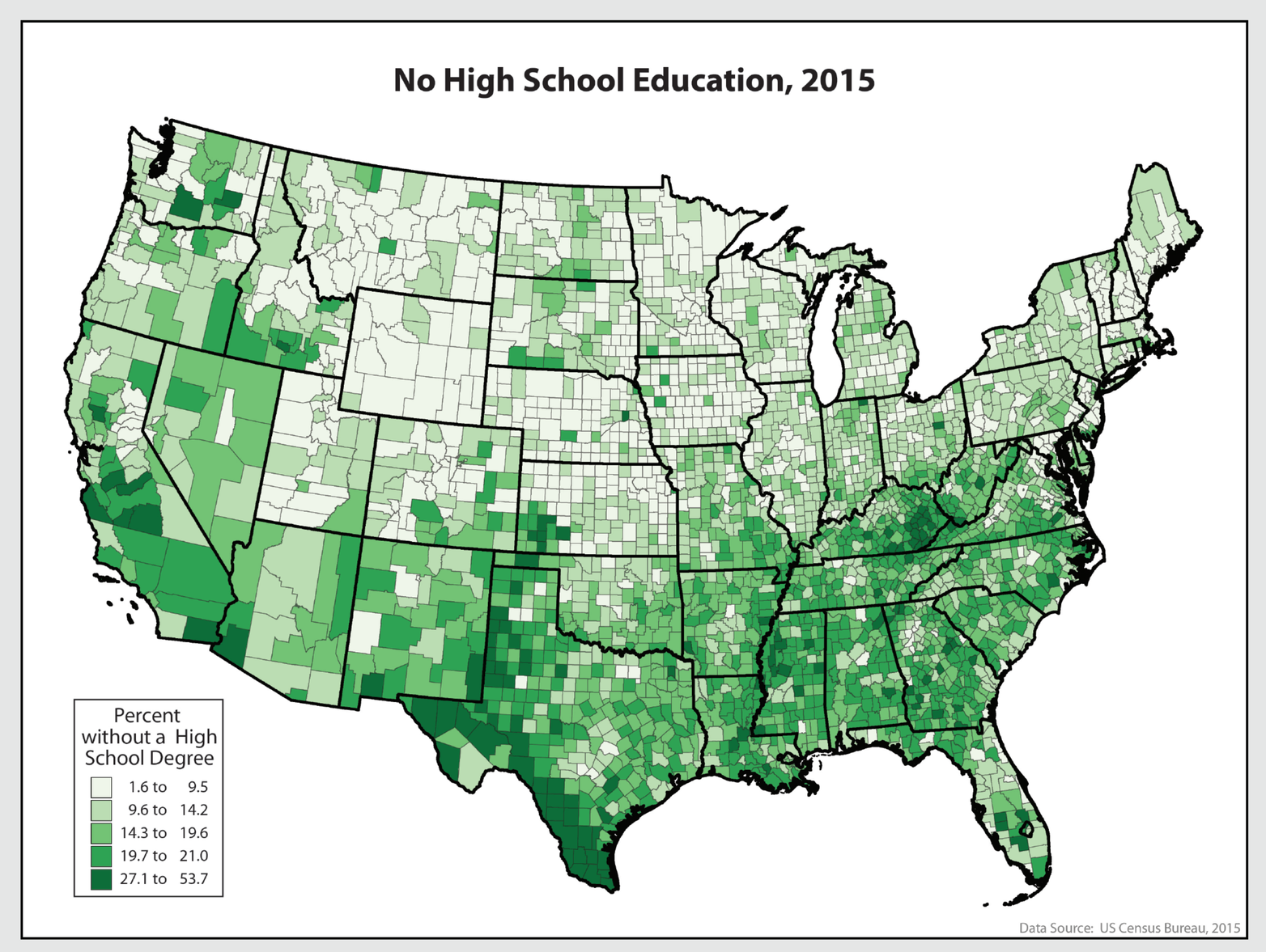
In order to standardize for changes in the national mood and to enable comparisons with other time periods, this map shows difference in vote preference for the republican candidate between the 2012 and 2016 elections. The proportion of votes for the democratic candidate was subtracted from the proportion of votes for the republican candidate in each election year. The map was produced by subtracting the results of this calculation for 2012 from the same calculation in 2016. Extreme changes in some counties (some exhibiting a 35 percent or greater shift) occur in places with low populations, where a small change in the number of votes can have a high impact on this figure (some counties reported only one or two hundred votes).

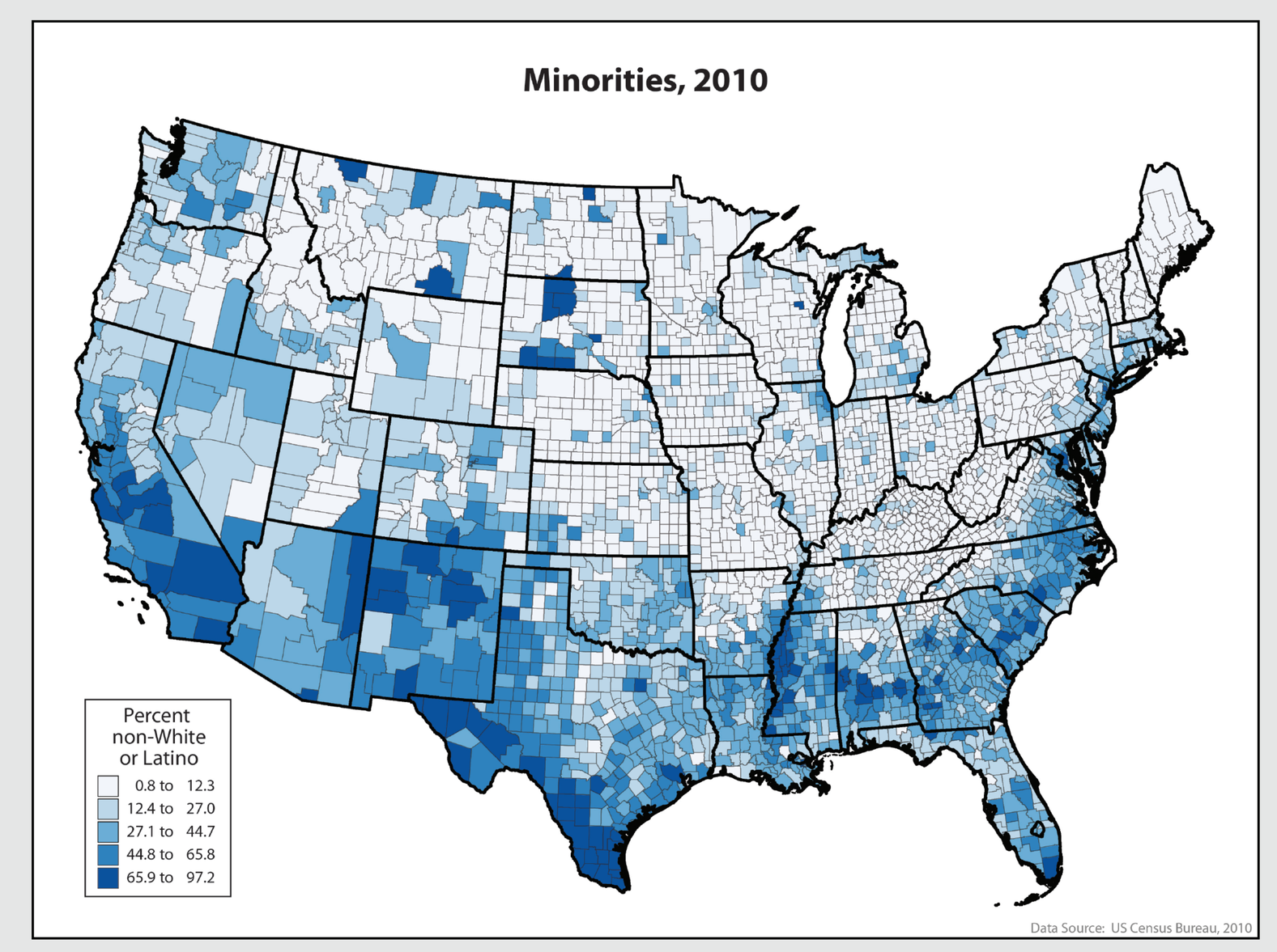
These simple manipulations highlight some patterns. There appears to be a general shift to republican voting in parts of the Midwest and the Rust Belt, including parts of Iowa, Wisconsin, Ohio, and upstate New York. These areas are in some key states that were largely expected to vote for the democratic candidate, Hilary Clinton. The apparent shift to the democratic part in Utah and the mountain region is likely due to the combination a strong preference for the 2012 republican candidate, Mitt Romney, as well as a low support for Donald Trump among Mormons in the 2016 election. Notably, there was relatively little change in much of the rest of the country, with the South and most of the West experiencing relatively little change.

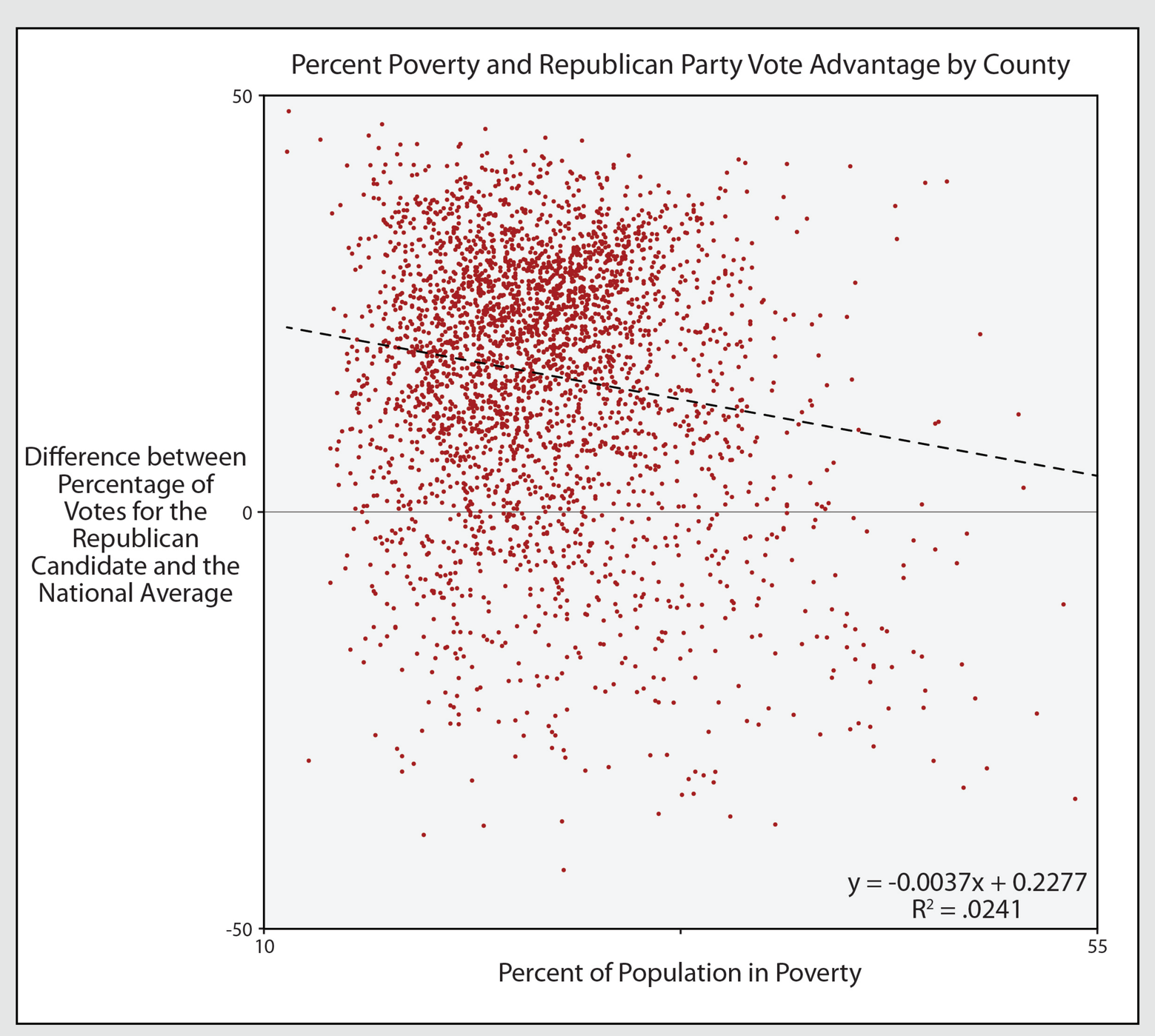


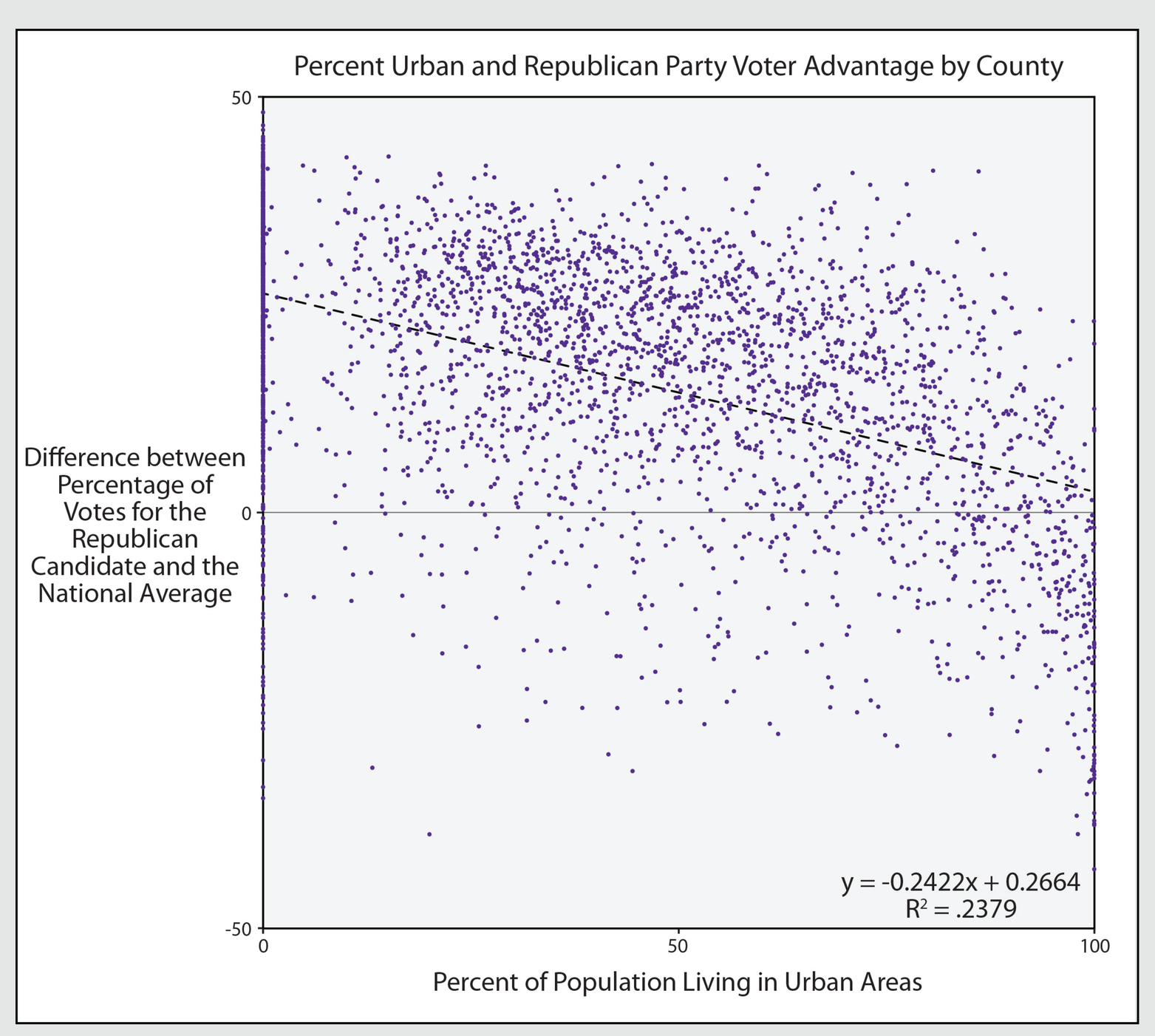


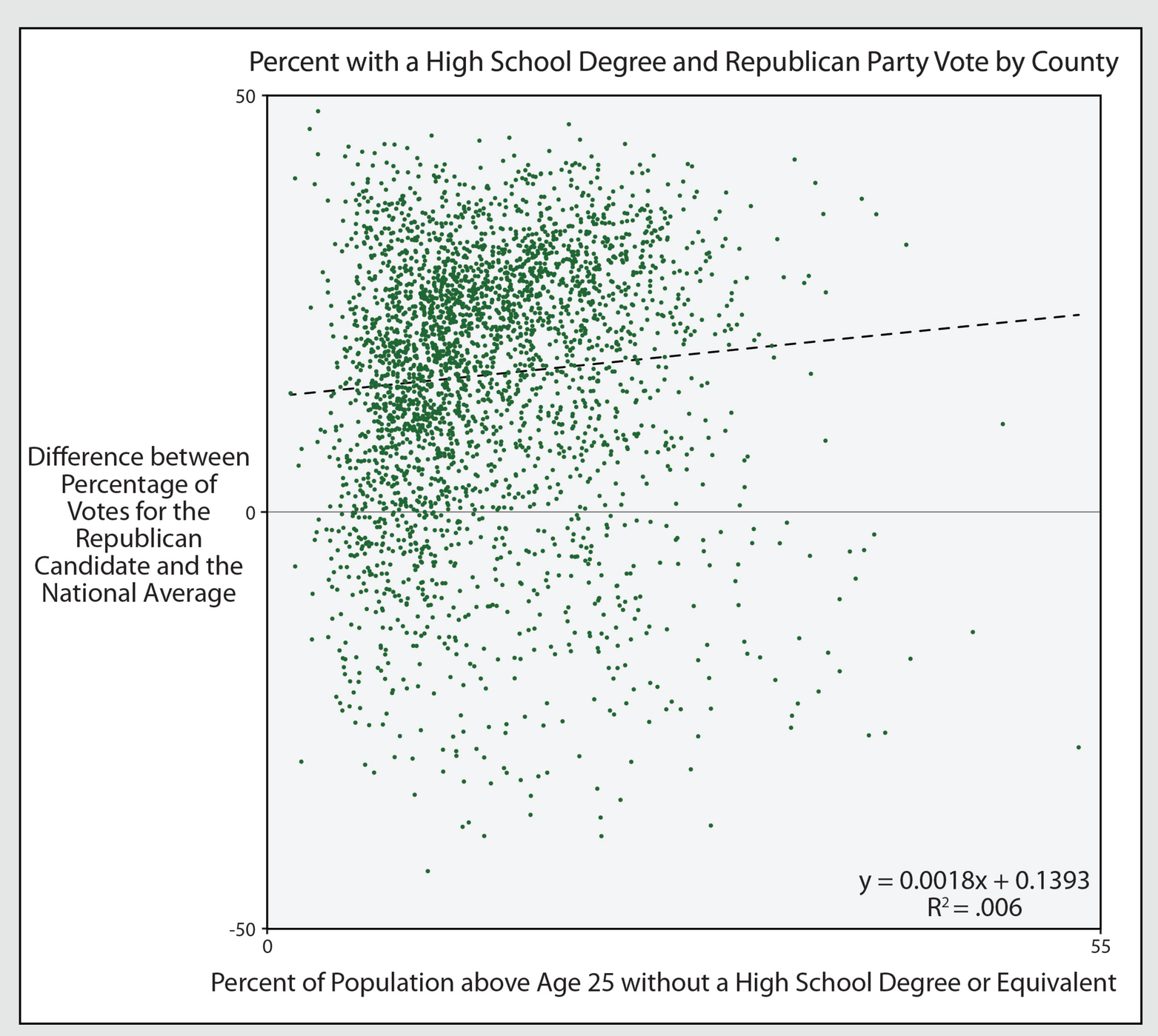


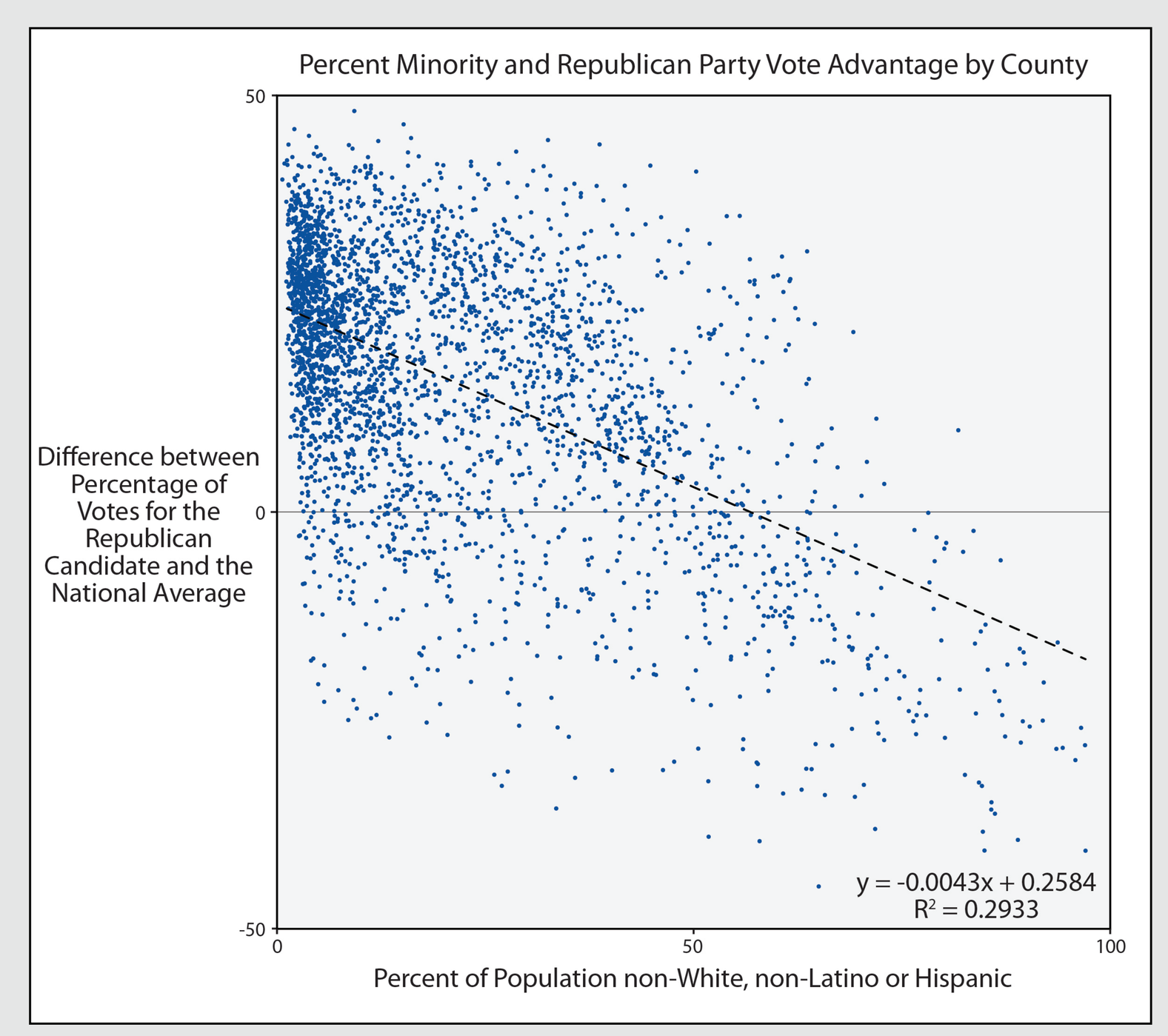


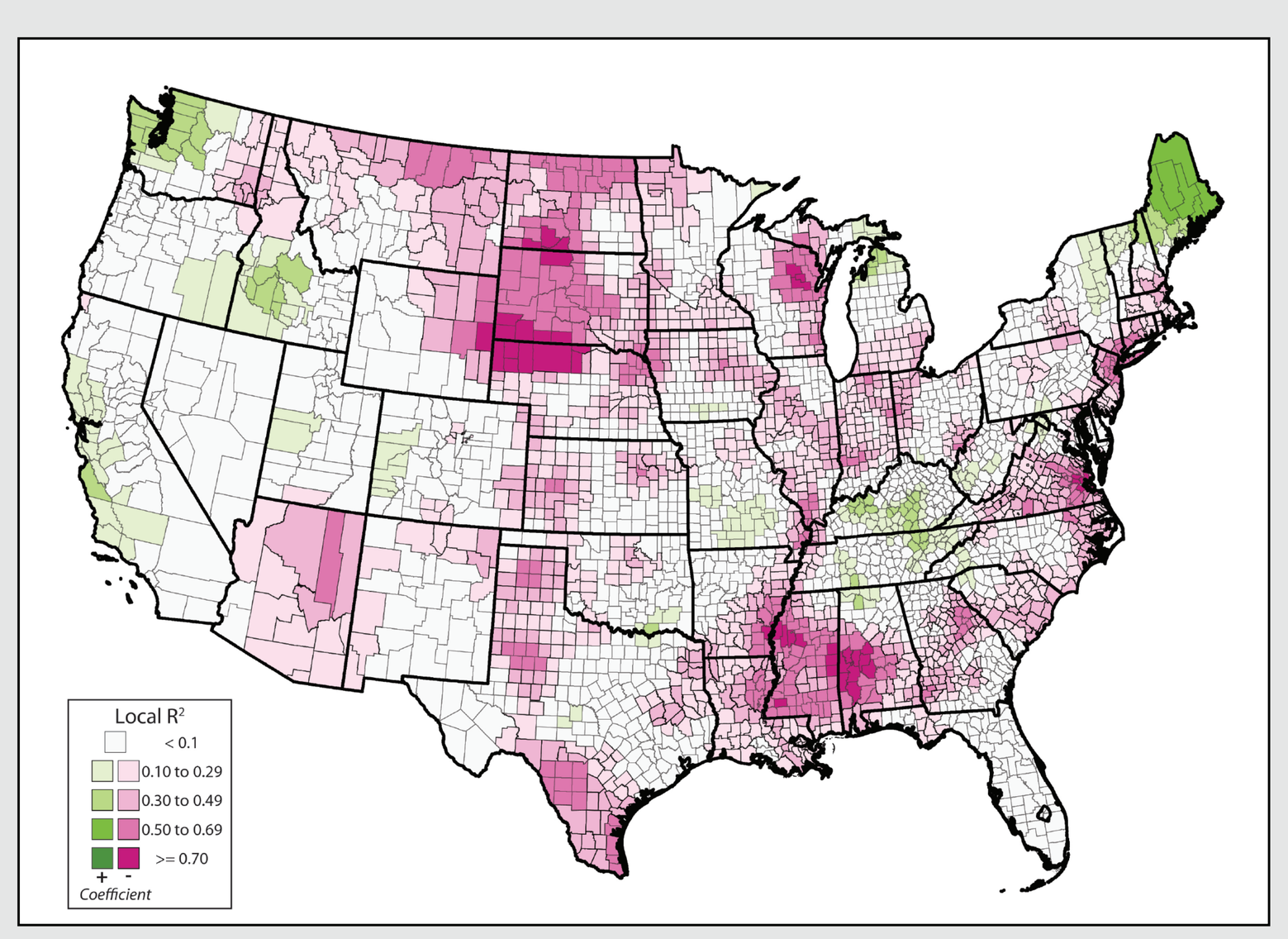


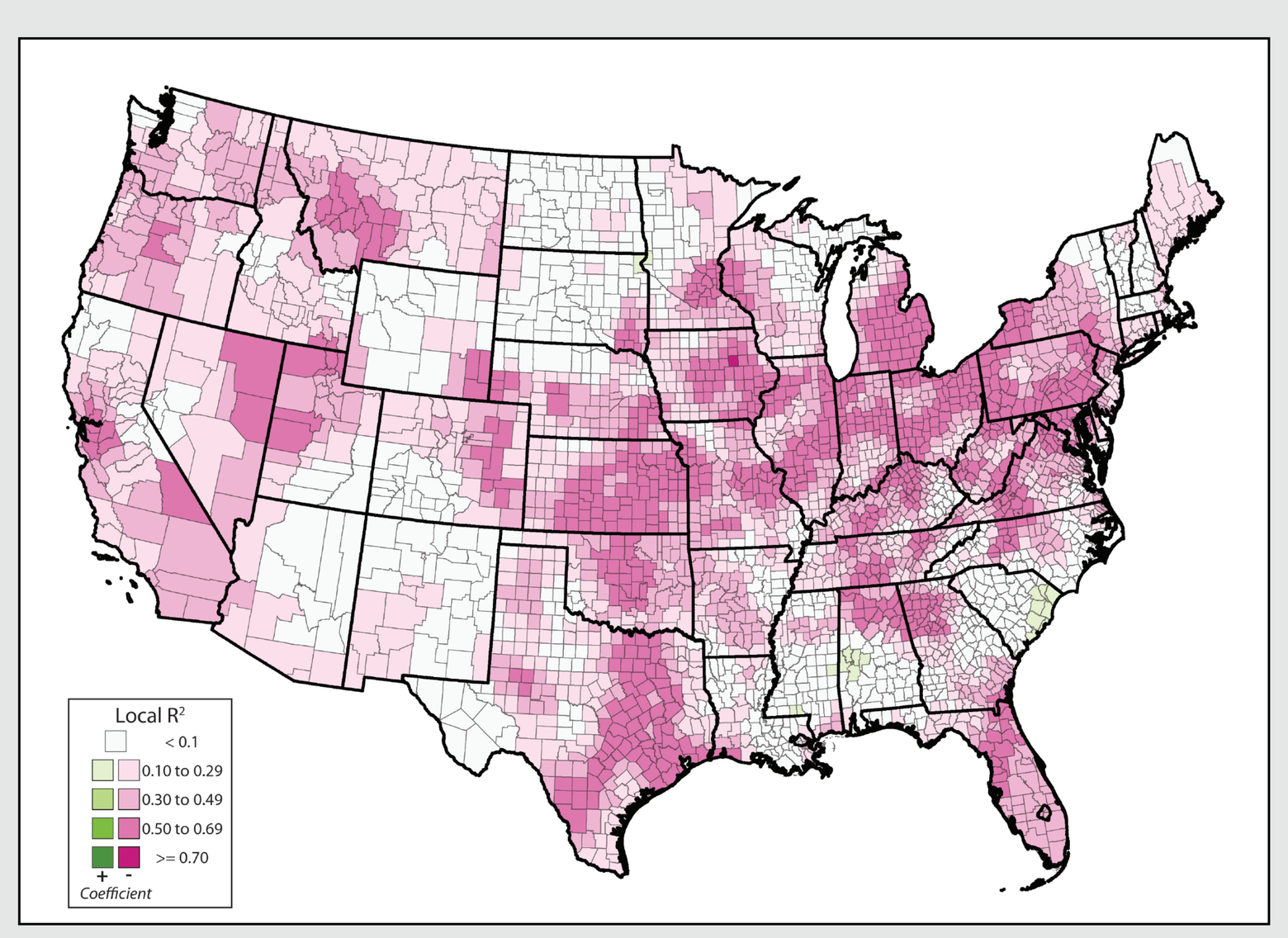


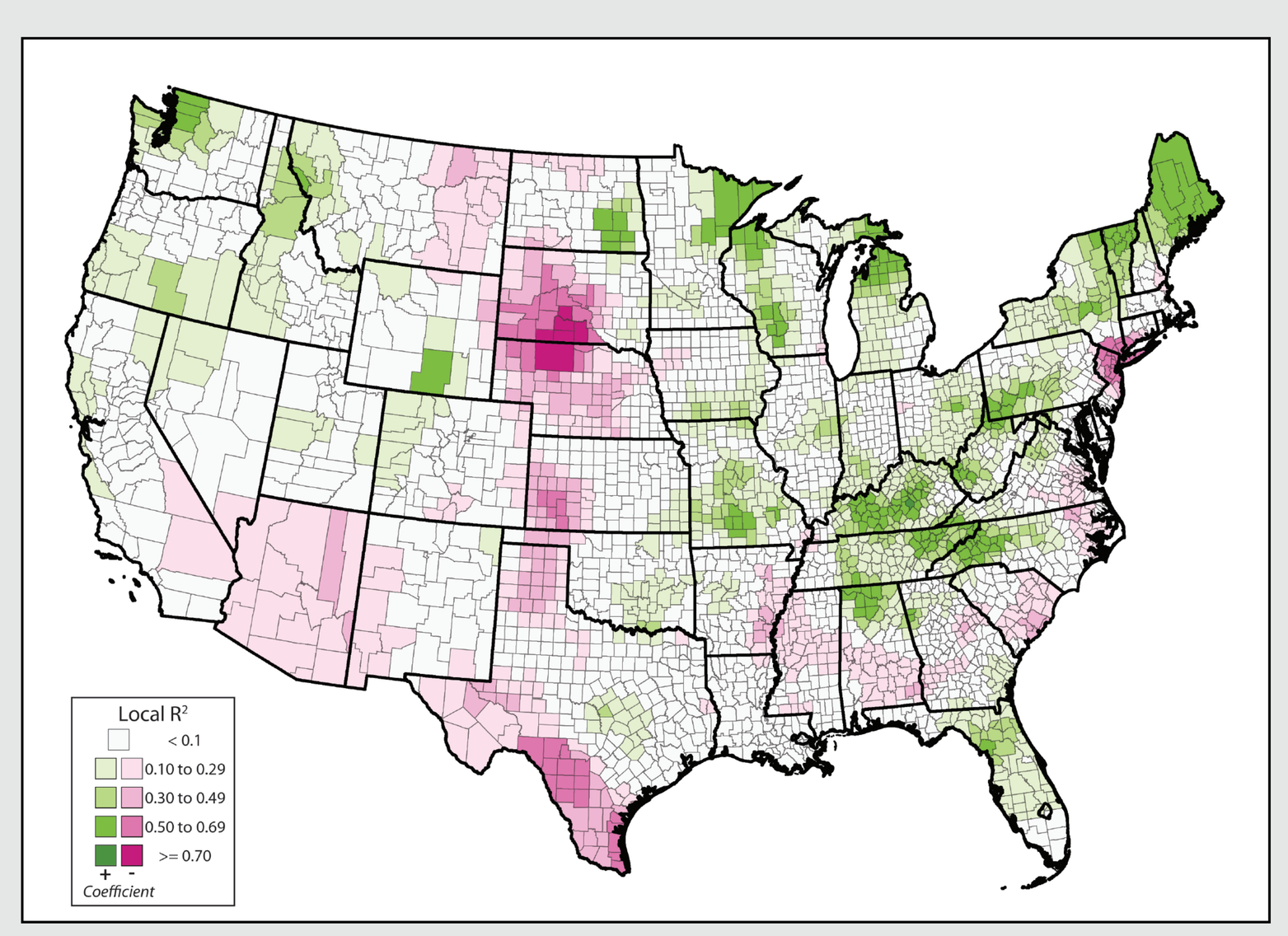


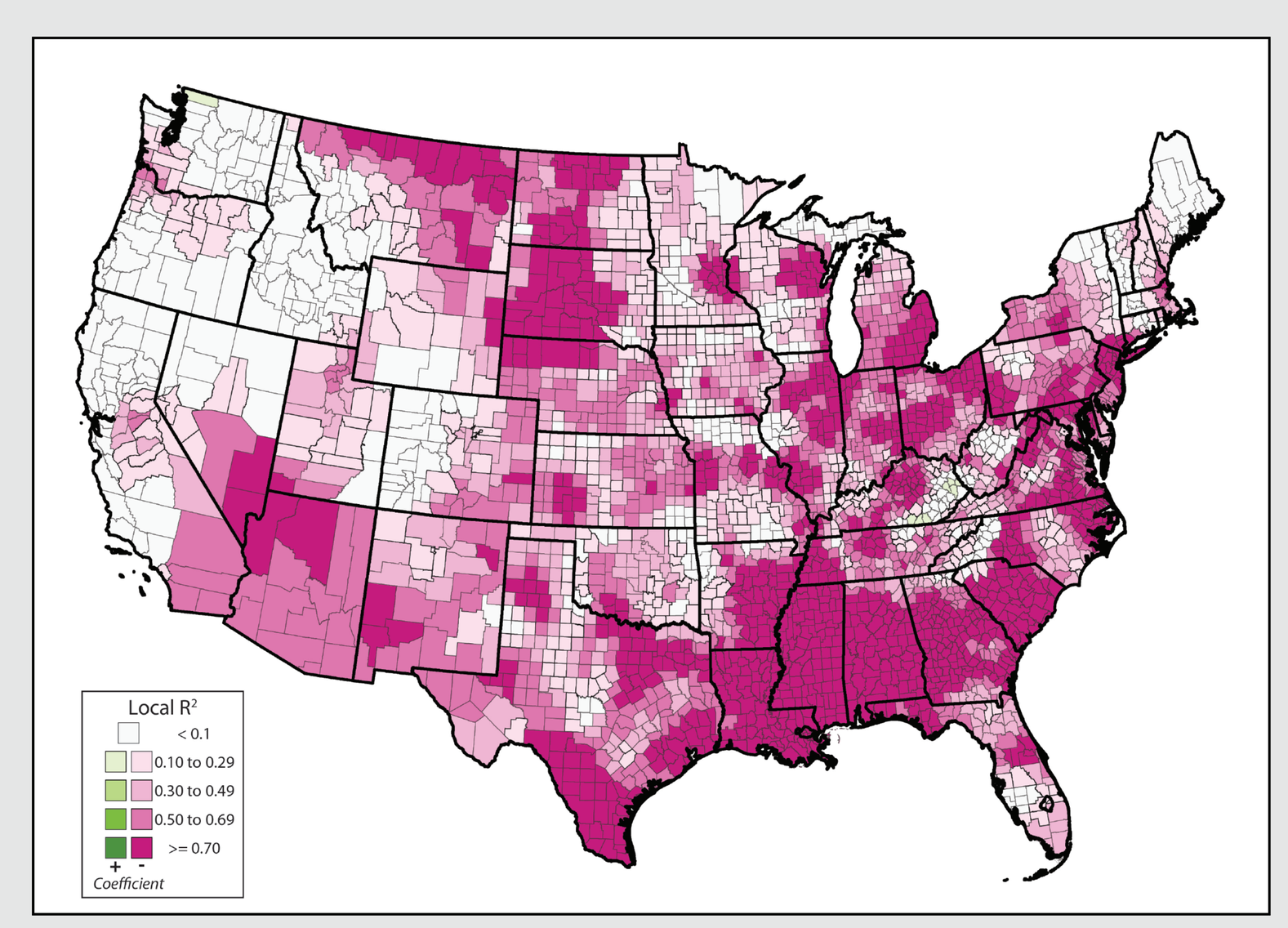


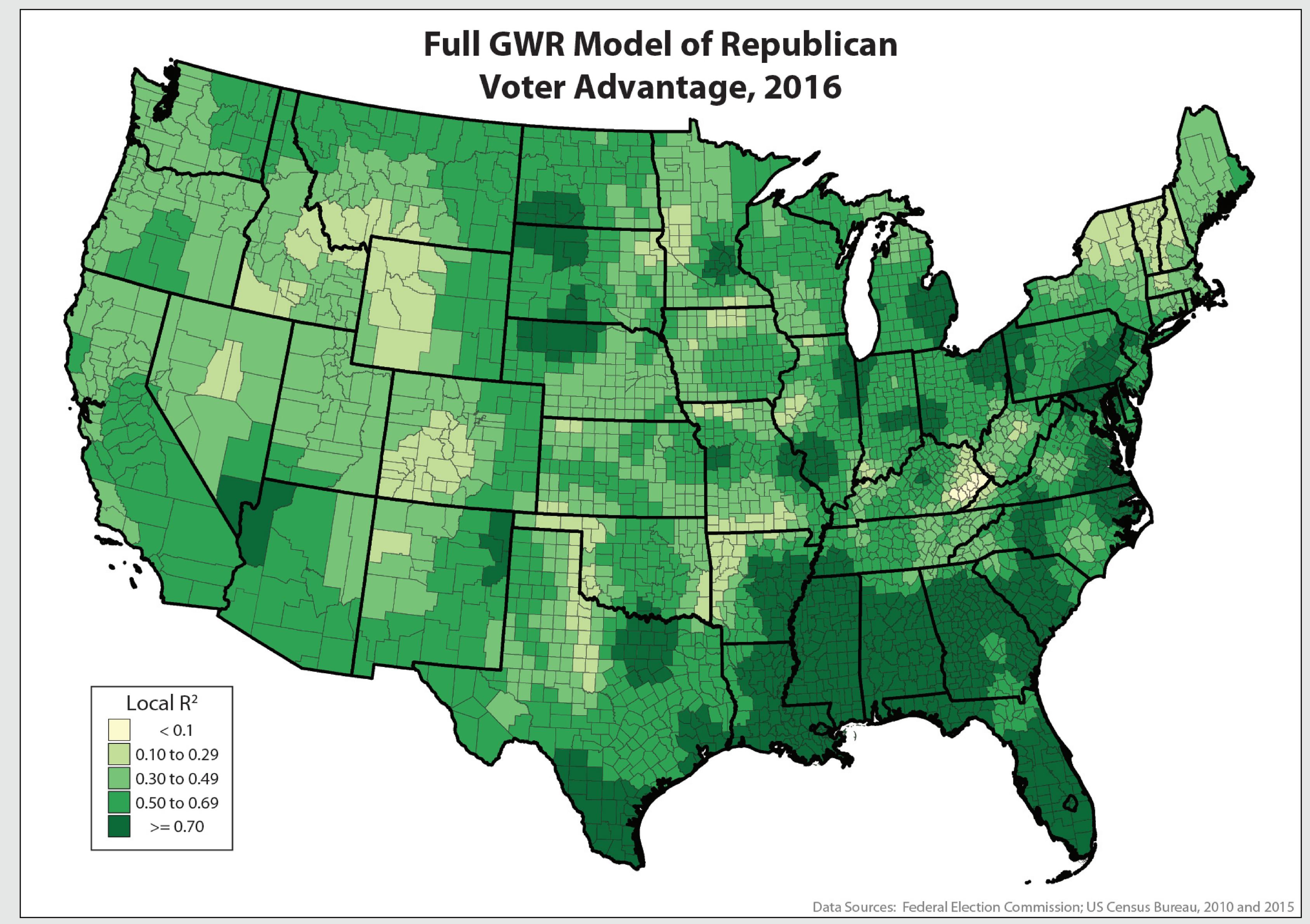












Geographically Weighted Regression of Covariates and Republican Voting

This series of maps and graphics shows several covariates identified to explain spatial variation in voting behavior. We examined **poverty** (percent of the population in poverty), **percent urban** (percent of the population living in an urban area, as defined and reported by the US Census), **education** (percent of the population over the age of 25 with no high school education), and **minority status** (proportion of the population that is non-White, non-Latino or Hispanic). The dependent variable was the difference in proportion of votes for the Republican candidate, Donald Trump, and the national average; therefore, positive values in this dependent variable indicate counties whose populations voted for Trump in higher-than-average proportions.

We performed a geographically weighted regression model (GWR) on each of the four covariates to examine variation in the strength and direction of the association across space. An adaptive kernel method was used in all cases. The bottom row of maps shows both the local adjusted r^2 value and the sign of the local intercept. These maps show substantial variation across space in the performance of these covariates as a predictor of GOP voting behavior, showing some areas of the country where even the direction of the association changes in unexpected ways.

Finally, the four covariates were combined into a multivariate linear regression model, which was also subjected to a geographically weighted regression. The four covariates were entered in the order of the strength of the relation previously determined. The adjusted R^2 of the combined model was 0.88. A map of the local R^2 of this model appears on the right. Overall, the combined model predicted republican voting behavior extremely well, and reasonably consistently across space, and particularly well in the South.