Mapping the Great Recession by State-level Employment Changes

Robert Jones
Department of Economics
Skidmore College
The First Law of Geography

- The First Law of Geography (Waldo Tobler)
- "Everything is related to everything else, but near things are more related than distant things."
- This presentation applies this law to percentage changes in employment during the recession 2007-2010
- Watch the following slides for similarities among nearby states
No state is declining

Employment Change (Percent)
November 2007
First hints of a slowdown in employment.

Employment Change (Percent)
December 2007
National employment declines for the first month in this recession.

Employment Change (Percent)
March 2008
Employment Change (Percent)
April 2008
Recession now has a strong hold in the southwest and southeast
Recession spreads from southwest and southeast.
Recession spreads north from southwest and southeast

Employment Change (Percent)
August 2008
Employment Change (Percent)
September 2008
Recession deepens in the originating states of the sw and se

Employment Change (Percent)
October 2008
Employment Change (Percent)
November 2008
Two areas of the country are now experiencing sharp declines in employment of between 5 and 14 percent (at annual rates).

Employment Change (Percent)
December 2008
Employment Change (Percent)
February 2009
Significant employment declines in every state for the first time in this recession.

Employment Change (Percent)
April 2009

Map showing employment change in April 2009, with most states in red indicating significant declines, and a few states in green or light colors indicating less impact.
Employment declines begin to slow down in some of the last states to enter the recession. Employment still declines in many of the first states to experience declines.
Employment Change (Percent)
June 2009
Employment begins to increase in a scattering of states.
Employment Change (Percent)
November 2009
The previous maps capture the dynamics of the month-to-month percentage changes in employment.

Several attempts have been made to cluster states into regions using a single map.

The following slides illustrate attempts to describe regions of the US on a single map.
Census Bureau Regions
Created 9 regions in 1880’s along state boundaries
Federal Reserve Districts
Created 12 regions in 1913 based on banking relationships
(along county lines grouped here by state)
Bureau of Economic Analysis
Created 8 regions in 1950’s based on trends in per capita income in the 1929 to 1950 period
Malezia and Ke
Created 11 regions in 1993 based on economic analysis of metropolitan areas
Ted Crone (FRB of Philadelphia) in 2005 created 8 regions based on coincident economic indicator of states cycles since the 1970’s
Jones

Created 7 economic regions based on Unemployment Rates from 1979 to the 2006 cyclical peaks
Mathematical Method for Creating Regions

• Based on a modified version of Crone’s methodology
• Use Excel or similar software
• Create matrix of contiguous states
  – “1” if contiguous
  – “0” if not contiguous
• Insert variables to be mapped
  – In columns by state
• Export as .csv file for statistical software
  – e.g., STATA
  – See example on following slide
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<th>C</th>
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“Cluster Analysis” in STATA

- Same as “Factor Analysis” in some software
- Different from ArcGIS’ “Cluster Analysis”
- Decide on number of regions to create
  - e.g., 4, 5, 6, 7, etc.
- STATA command file to create 4 regions:
  - `insheet using "D:\States_empl\geog1.csv", comma`
  - `cluster kmeans az ar ca co ct de dc fl ga id il in_i a ks ky la me md ma mi mn ms mo mt ne nv nh nj nm ny nc nd oh ok or pa ri sc sd tn tx ut vt va wa wv wi wy gr0710, k(4) name(reg0710)`
  - `outsheet using "D:\States_empl\geog1_reg4.csv", comma`
- Creates an output file (.csv) with a optimal regions into which to dissolve the state.
ArcMap

• Join the STATA-created .csv file to a shape file of the states
• Dissolve the states into the region numbers found using STATA
• Map the resulting regions
Great Recession Employment Changes Using Statistical Software

The regional map of the 2007 to 2010 recession based on statistical software explicitly takes into account the first law of geography.
Great Recession Employment Changes Using Natural Breaks

The regional map of the 2007-2010 recession using only GIS ignores the first law of geography.
Conclusions

• Creating economic regions from state-level data results in different regional clusters depending on the time span or time period and the economic variables being considered.

• Using purely GIS classifications ignore the first rule of geography by ignoring nearness.

• Using statistical software including variables for nearness incorporates the first law of geography.

• Future research
  – Including month-to-month data over many time periods using statistical software may enable a single map to capture the regional nature of the dynamics of economic change.
The Great Recession
Employment Change 2007 to 2010

Two geographic views of the recession’s impact

Thank you