A Case Study of Regional Dynamics of China

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China has experienced significant socioeconomic dynamics within recent decades. While some regions experienced spatial growth of population and industry, some other regions experienced declining population and industry. Those trends may continue and will have significant impacts on regional development and reshape the future regional landscape in terms of population, economy, politics, culture, and environment.

This talk will present a case study of the regional dynamics of China based on the China Geo-Explorer. It will demonstrate:

- how to identify those counties and cities with growing or declining population from 2000-2010 in China;
- how to identify the difference in the population and industry structure between growing and declining regions;
- how to identify primary changes in the population and industrial/business structure of declining regions.
- What are the further topics for future studies.

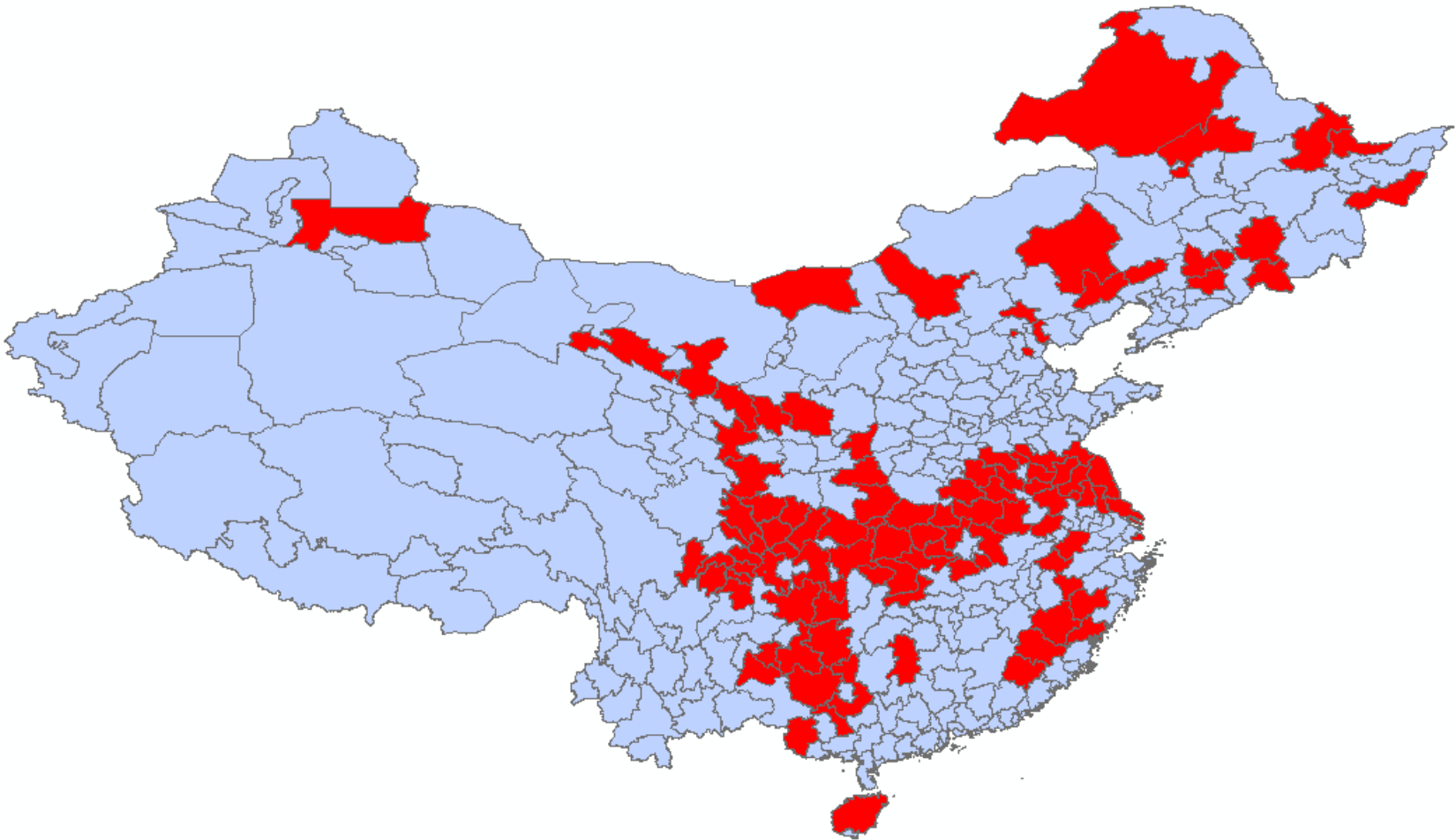# Provinces with Population Loss (%) in China
2000-2010

Among 31 provinces, 4 provinces experienced shrinking population from 2000 to 2010
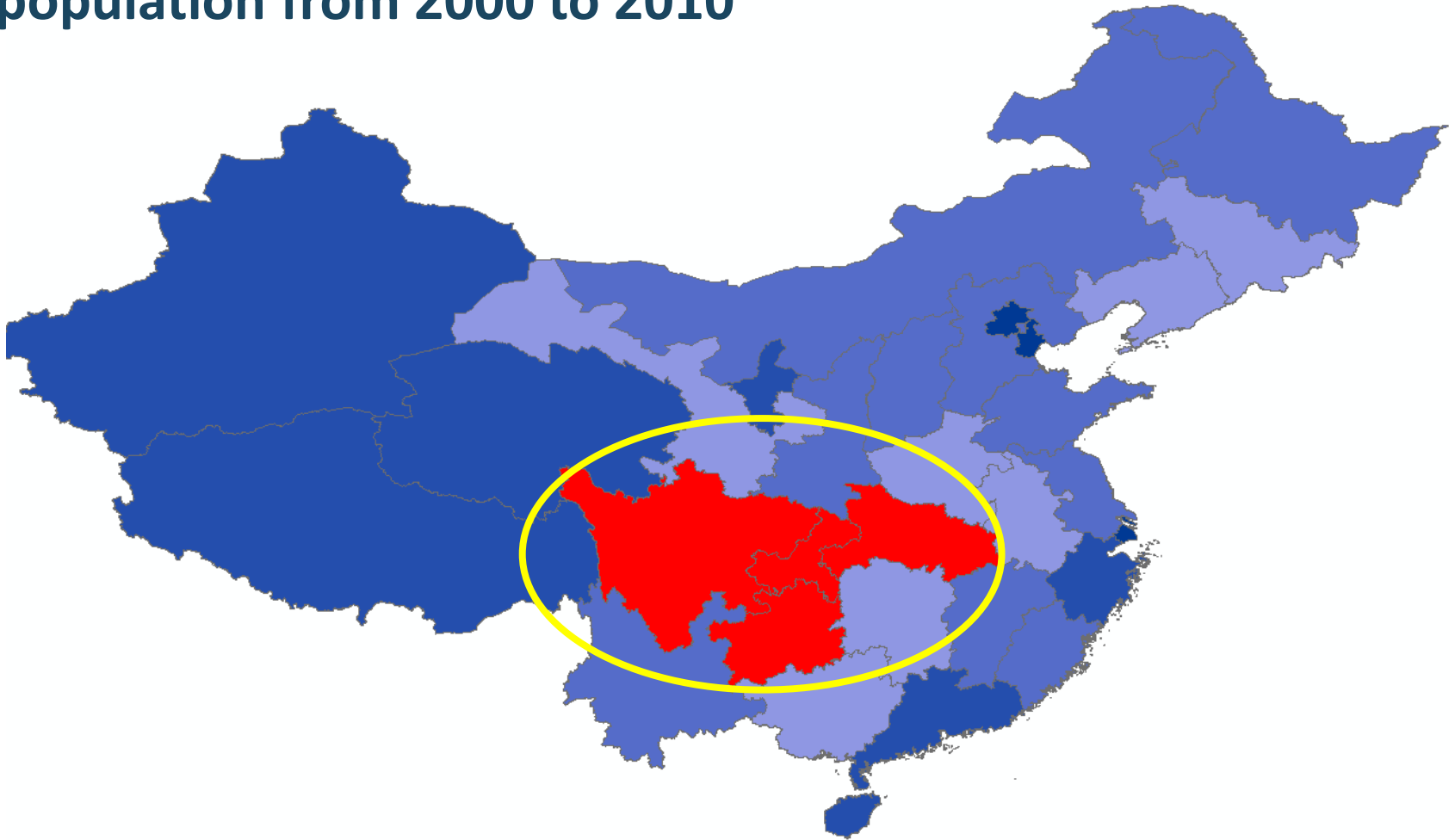
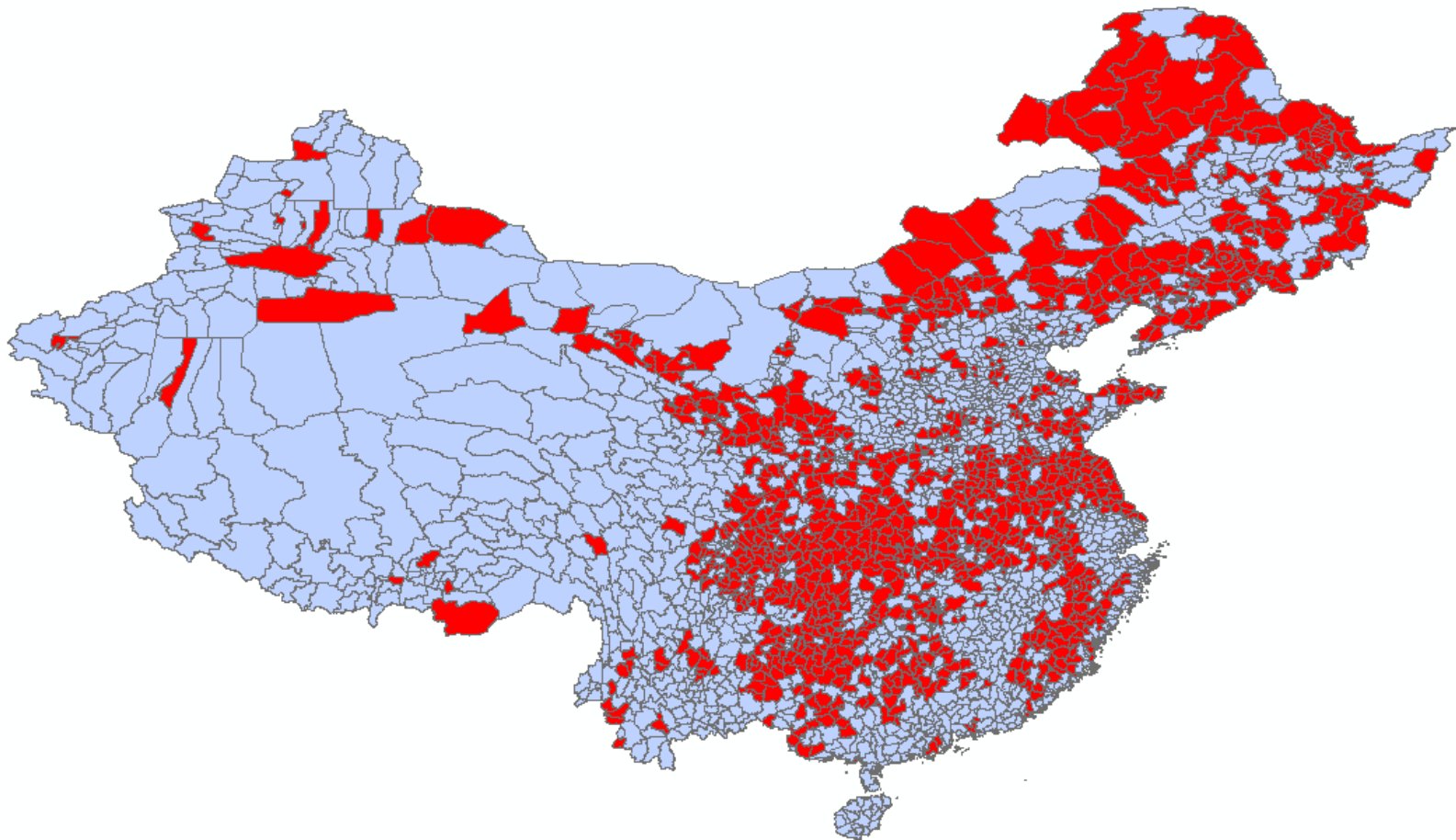# Prefecture Cities with Population Loss in China
2000 - 2010

Among 343 prefecture cities in mainland China, 97 cities experienced shrinking population from 2000 to 2010

Counties with Population Loss in China
2000 - 2010

Among 2,751 counties/districts in mainland China, 1,033 counties/districts experienced shrinking population from 2000 to 2010.

Case Study: Regional Dynamics of China

Aim: An exploratory analysis of declining population in Mainland China with three levels analysis at **national**, **regional** and **local** levels.

Objectives:
- To identify those regions with declining population from 2000-2010 in China – **Where declining?**

- To identify the primary difference in the population and industry structure between regions with declining or growing population – **What difference?**

- To identify primary changes in the population and industrial structure of regions with declining population – **What changes?**

Findings from Previous Studies

❑ **Declining population growth** (Hansen, 1939; Barro, 1991)

❑ **People follow jobs** (Borts & Stein, 1964; Muth, 1971; Steinnes & Fisher, 1974).

❑ **Growth pole spillover and backwash effect** (Richardson, 1976; Gaile 1980; Guile, 2010)

Method

- Tables
- Reports
- Charts
- Maps

Data: http://china-data-online.com

Data Source	Description
Statistics (Nation, province, city)	Yearly statistics, including general economy, population, employment, industrial production, investment,...
Census Data (Province, city, county)	Data from population census and economic census aggregated at province, city and county levels.
Administrative boundary maps	Administrative boundary maps of provinces, cities and counties.

Challenges: Spatial and temporal comparability

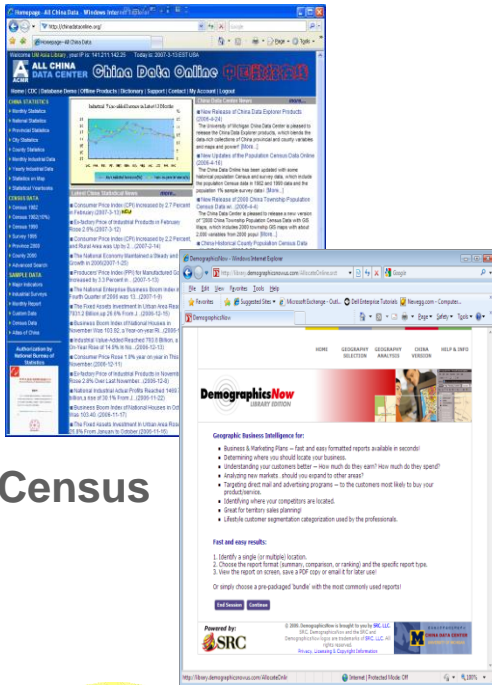**Yearly statistics:** data is not available for all counties and urban districts

Census data: not all variables are available for all counties and urban districts from official publications

Administrative maps: variation of administrative boundaries between different census years.

China Geo-Explorer
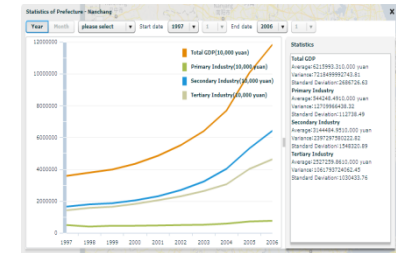## An Integration of Spatial Data and Analysis for China Studies

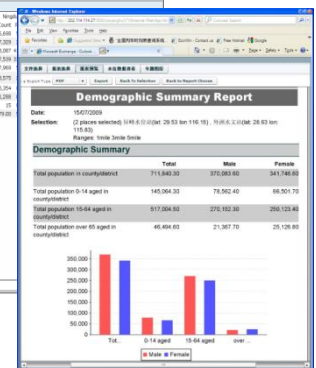**Statistics**

Data

Output

Charts

Census

Tables

Reports

GIS

Modeling

Maps

PySAL

StatGL

Data: China

Province | Prefecture | County | Township | ZIP | Sq Km Grid

- **Government Statistics**
  - Provincial Statistics (1949 -)
  - City Statistics (1996 -)
  - County Statistics (1997 -)
- **Population Census**
  - Census 1953
  - Census 1964
  - Census 1982
  - Census 1990
  - Census 2000/2010 (province, city, county, township, GRID)
- **Economic Census**
  - Industrial Census 1995 (province, city, county, ZIP)
  - Basic Unit Census 2001 (province, city, county, ZIP)
  - Economic Census 2004/2008 (province, city, county, ZIP)
- **Establishments** (more than 7 millions companies and organizations)
- **Geography and Environment**
  - Land Use data
  - Night-Time data

Declining Population Growth

Declining Population Growth Rate with Economic Growth: National Level Analysis

National Accounts|GROSS DOMESTIC PRODUCT OF CHINA|Per- Capita GDP by Province of Nation

Total Permanent Population(year-end): 1949 - 2016

Per Capita GDP Growth 1952-2016 (Yuan)

Population Growth in China 1960-2016 （in 10,000)
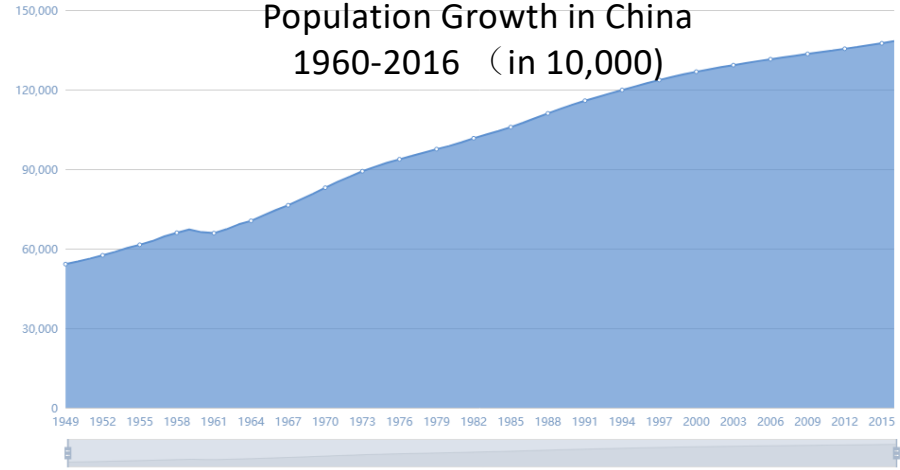
The Population Growth of China: 1949 - 2016

Birth Rate(‰)　　Death Rate(‰)　　Natural Growth Rate (%)

Data source: http://chinadataonline.org/sdq/search.htm
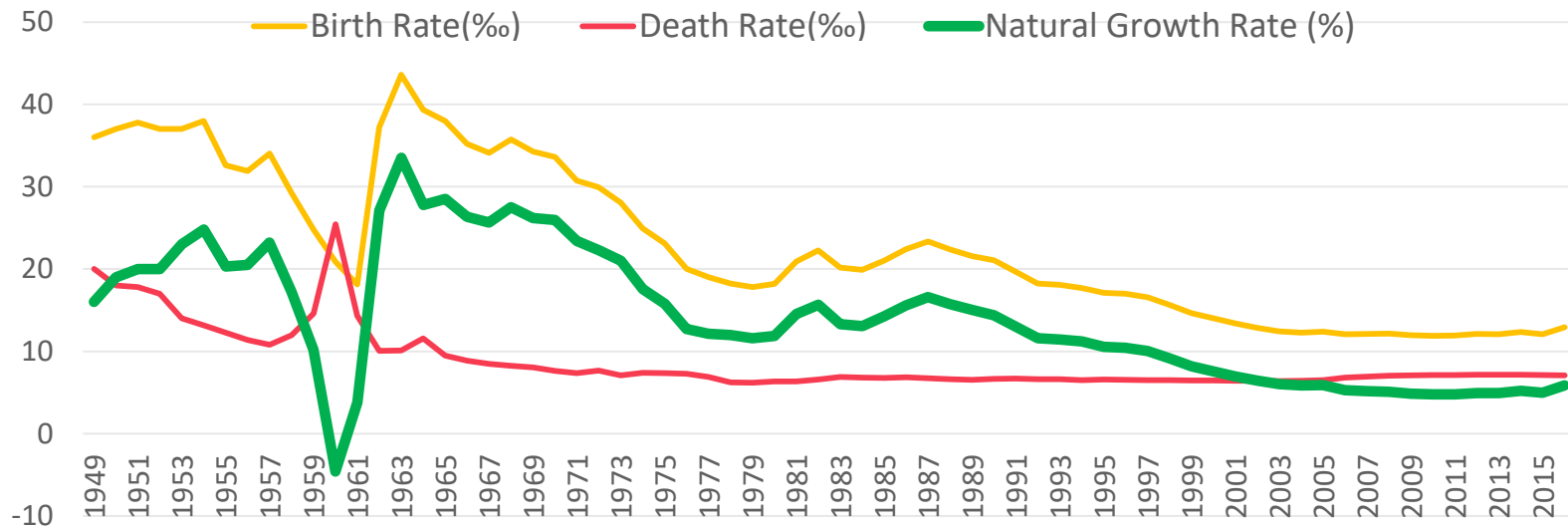
Natural Population Growth Rate (%)
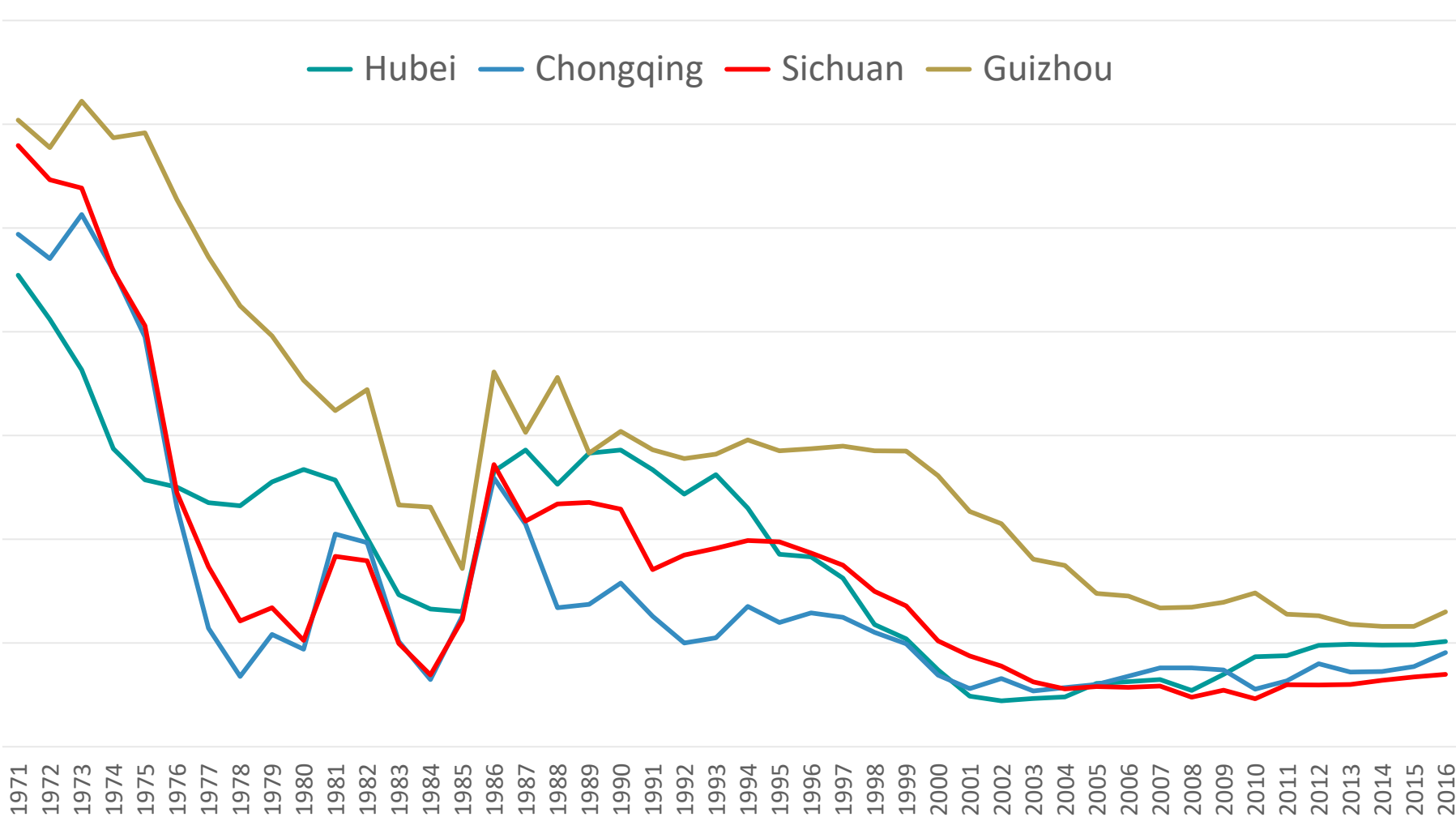
Regional Migration

Population Loss by Provinces: Regional Level Analysis
2000 - 2010
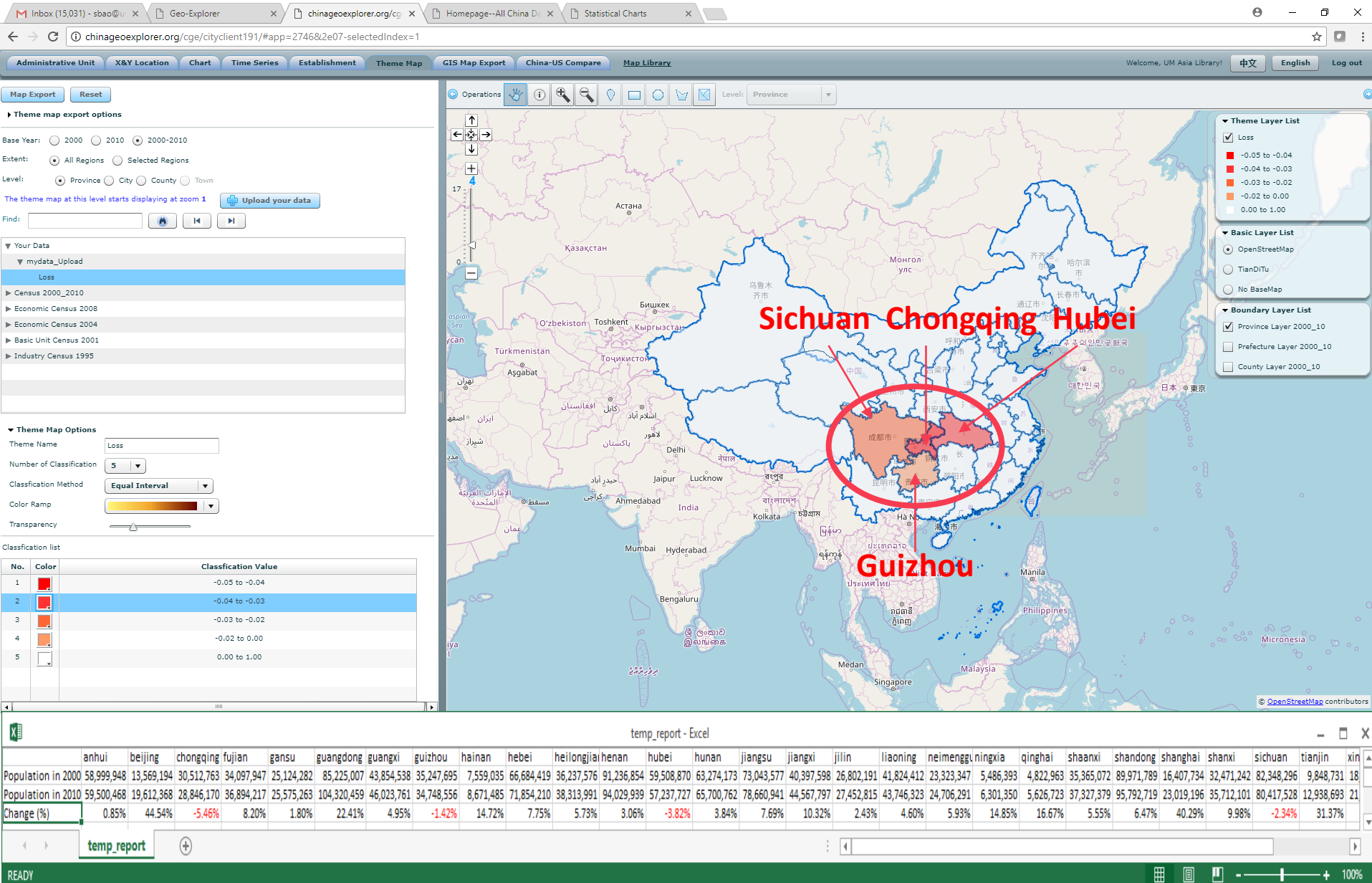
Net Migration by Province from Census 2010

Spatial Concentration

Population Loss by County (%) in China
(2000-2010)

Counties with Population Loss (%): 2000-2010

Growth Pole Spillover and Backwash Effect:
County Population Changes of Hubei: 2000 - 2010

Spatial Dynamics Revealed by Night-time Light
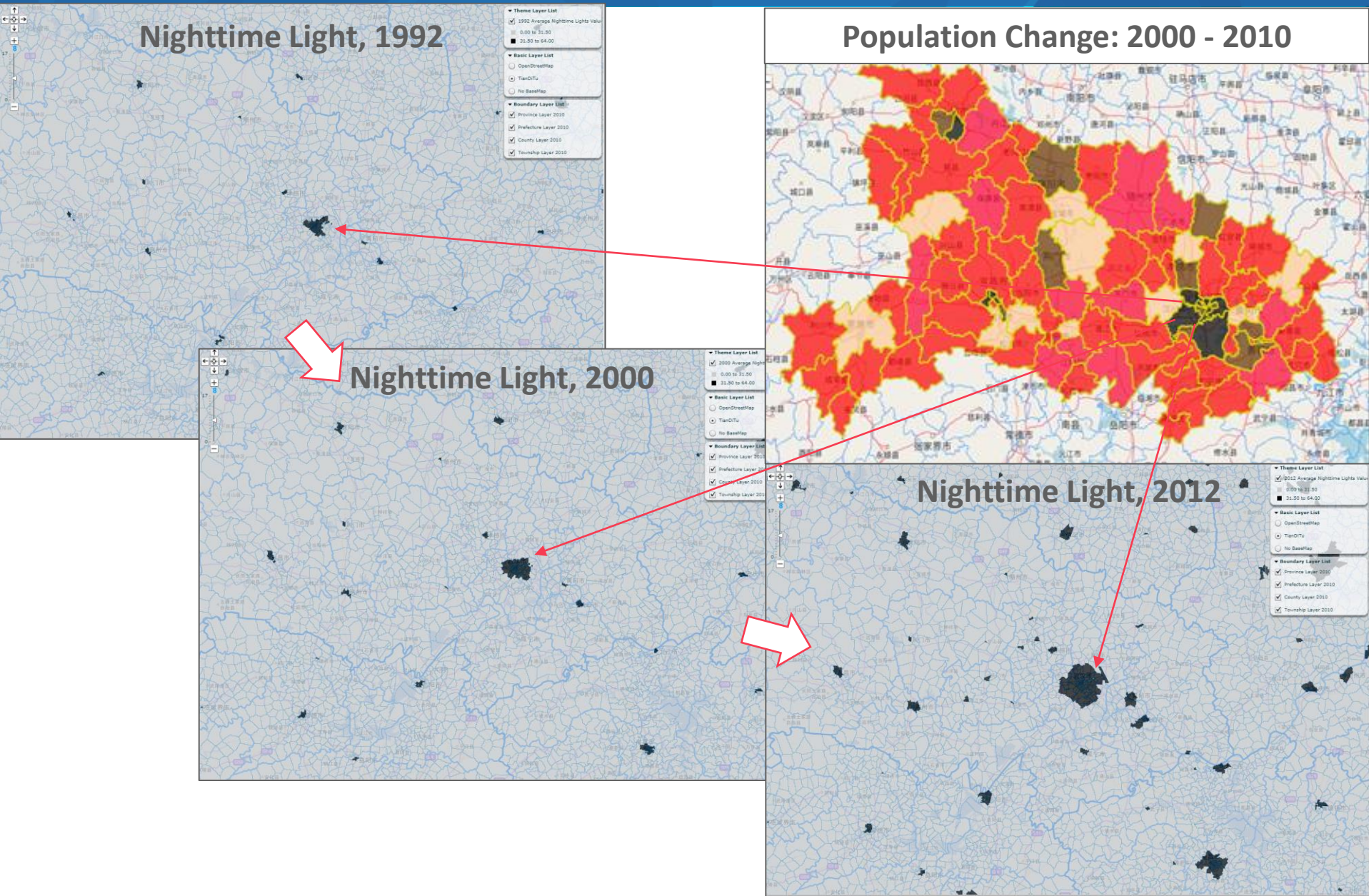
People Follow Jobs:
Spatial Concentration of Population and Industry

Software Development Consulting By County of Hubei, 2001

Software, 2001

Legend
- 0
- 1.00 to 1.00
- 1.00 to 2.00
- 2.00 to 3.00
- 3.00 to 10.00
- 10.00 to 56.00

China Data Center & Spatial Data Center of University of Michigan. Development Consulting By County of Hubei. Statistical Map Lib Hubei. Map-ID: 8620013in_8310_142
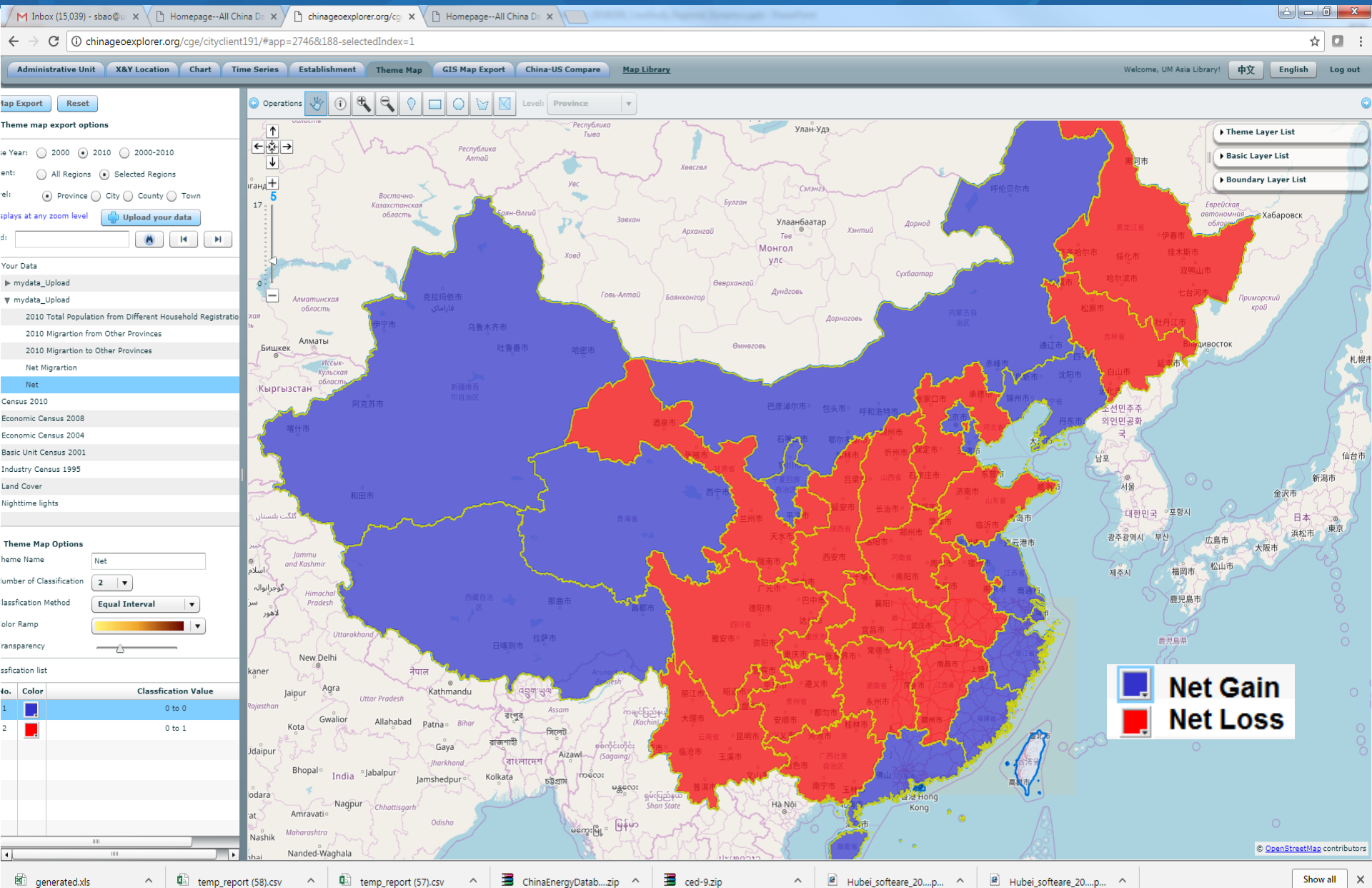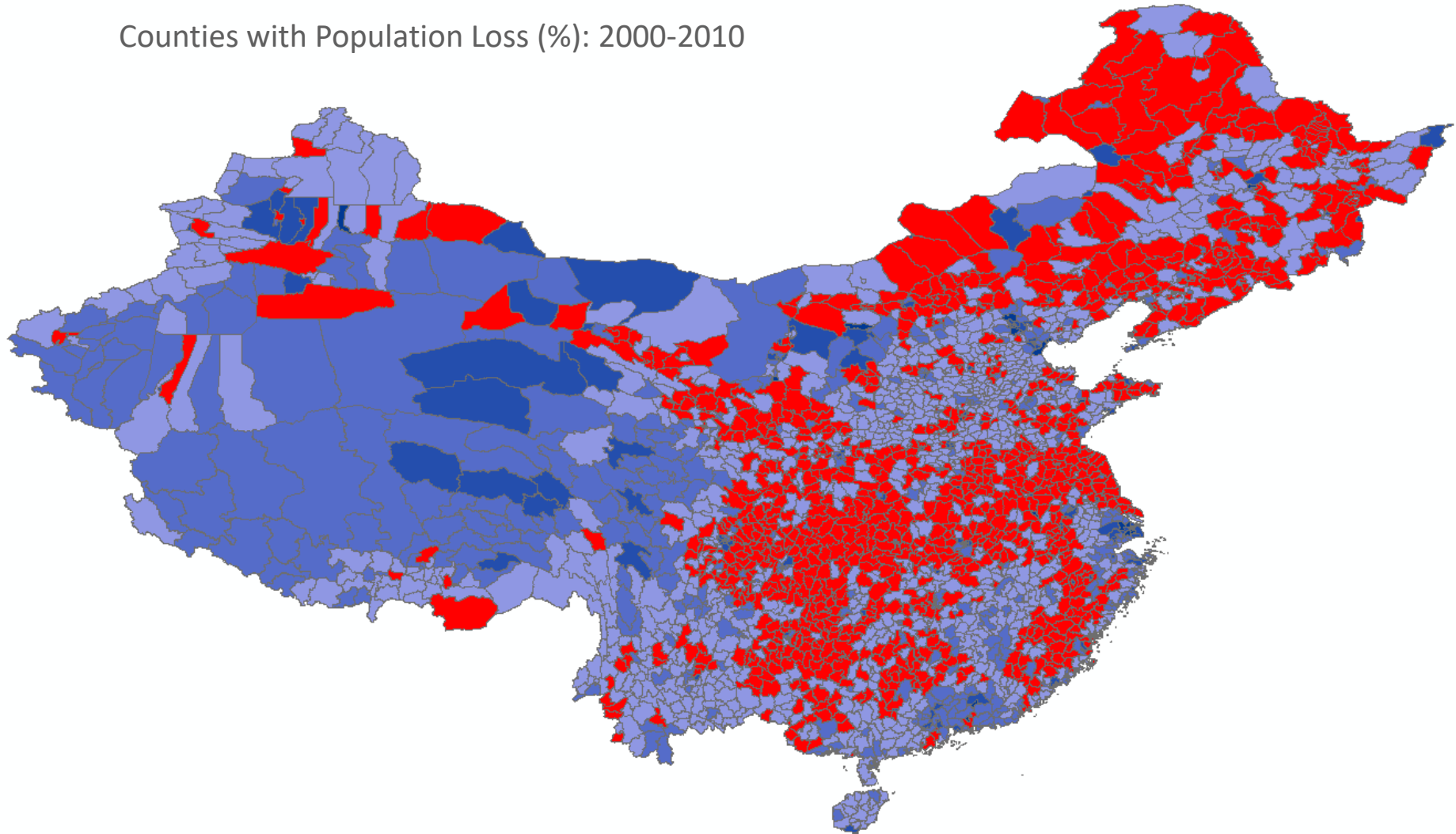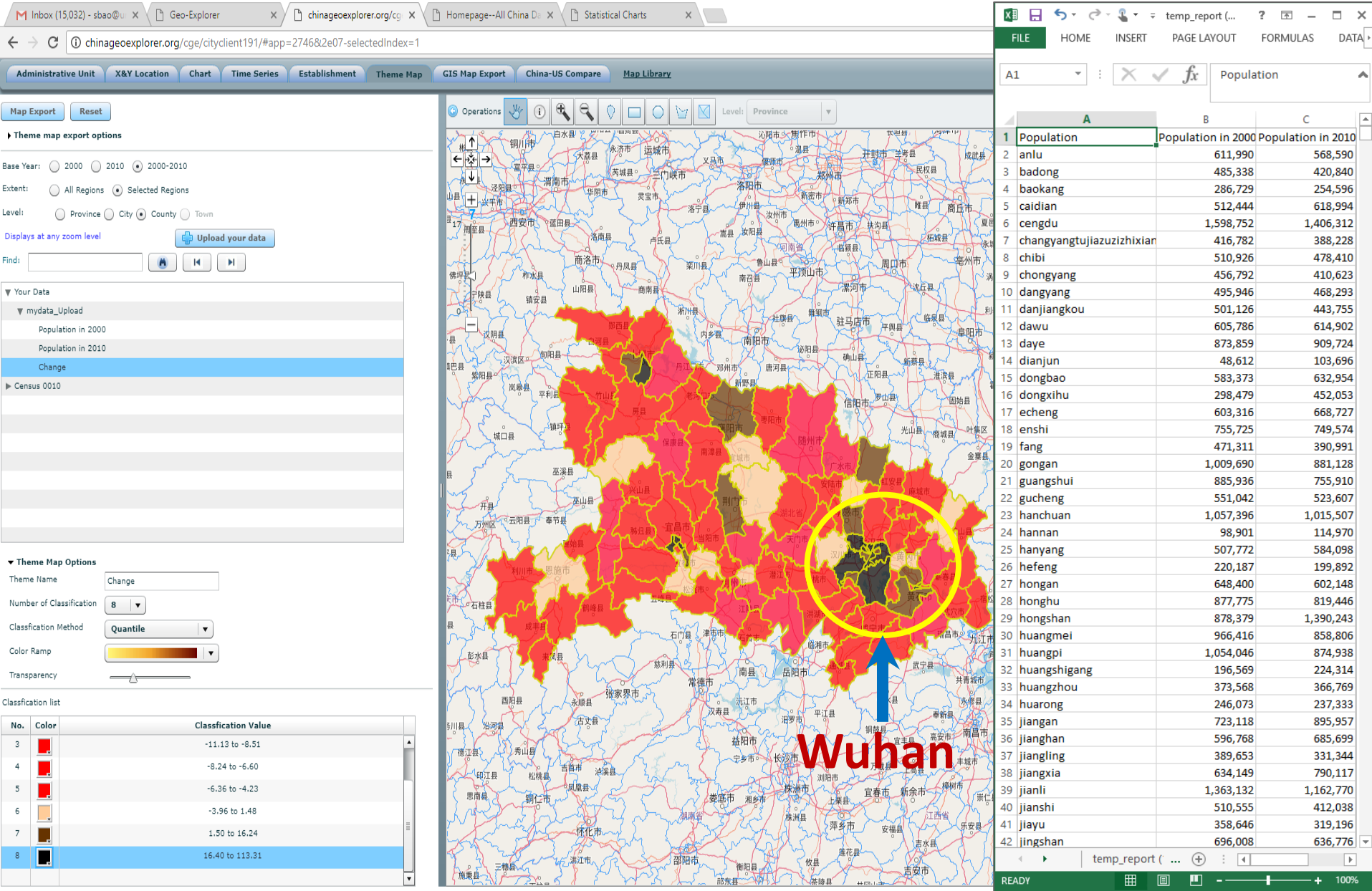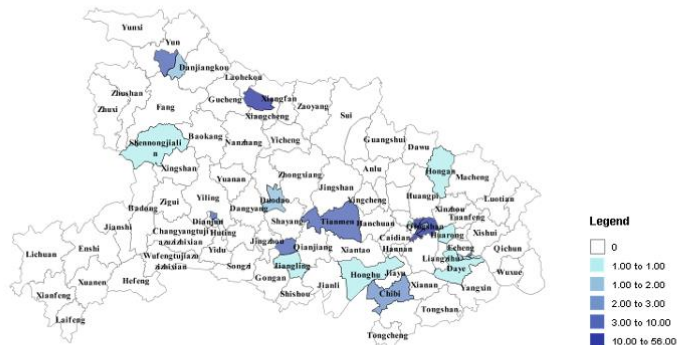
Application software services By County of Hubei, 2004

Software, 2004

Legend
- 0
- 1 to 1
- 1 to 2
- 2 to 4
- 4 to 11
- 11 to 58

China Data Center & Spatial Data Center of University of Michigan (2018). Economic Census 2004, Information Transmission, Computer S Software, Software Industry, Application software services By County of Hubei. Statistical Map Library by China Data Center of University Country: China. Region: Province - Hubei. Map-ID: 8620043in_6212_442

Population Change: 2000 - 2010
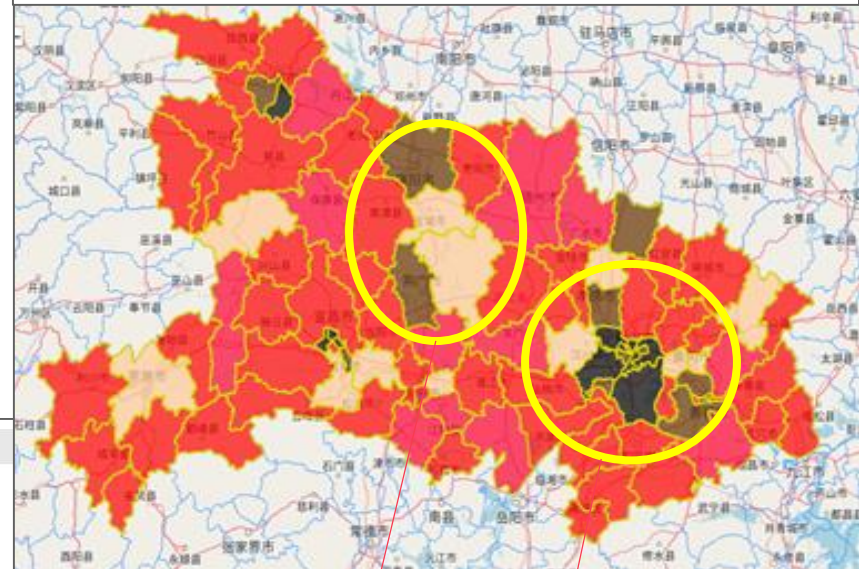
Application software services By County of Hubei, 2008

Software, 2008

Legend
- 0
- 1 to 1
- 1 to 3
- 3 to 5
- 5 to 16
- 16 to 275

China Data Center & Spatial Data Center of University of Michigan (2018). Economic Census 2008, Information Transmission, Computer Services and Software, Software Industry, Application software services By County of Hubei. Statistical Map Library by China Data Center of University of Michigan. Country: China. Region: Province - Hubei. Map-ID: 8620083in_6212_08_1042

Spatial Difference of Population and Industry

Population Difference between Cities with Growing and Declining Population

Census Code	The Percentage by Per 10,000 Persons	Growing City	Declining City	Difference
A101015	Sex Ratio of Population from Collective Households (M/F)	1.73	1.55	0.18
A100008	Urban Population	0.50	0.41	0.09
A104001	Population from Different Household Registration Places	0.20	0.12	0.07
A105010	Percentage of Non-agricultural Population to Total Population	0.31	0.26	0.05
A104010	Population Registered in Other Provinces	0.06	0.02	0.04
A300014	Migration from Other Provinces	0.06	0.02	0.04
A703001	Population from Other Region by current Residence & Household Registration Places	0.06	0.02	0.04
A105004	Agricultural Population	0.68	0.73	-0.05
A302010	Dependency Ratio of The Aged	0.17	0.22	-0.05
A302008	Dependency Ratio	0.42	0.47	-0.05
A102004	Population Who Reside in the Township or Towns and Have Their Permanent household Registration There since 2000	0.79	0.87	-0.08
A100009	Rural Population	0.50	0.59	-0.09
A103001	Household Registration Population	0.97	1.14	-0.17

❖ Cities with growing population are featured with higher % of male/female ratio, urban population, non-agriculture population and migration
❖ Cities with declining population are featured with higher % of agriculture population, dependency ratio, aged ratio, and rural population
❖ Data source: 2010 Population Census.

# Business Difference between Cities with Growing and Declining Population

Industrial Code	Establishments Per 10,000 Persons	Growing City	Declining City	Difference
IN_6379	Mechanical equipment and electronic products wholesale	0.65	0.28	0.37
IN_6364	Metal and metal ore wholesale	0.59	0.30	0.28
IN_9630	Religious organizations	0.83	0.61	0.22
IN_6369	Other chemical products wholesale	0.35	0.19	0.16
IN_6373	Hardware and Interface wholesale	0.36	0.20	0.16
IN_9421	General Affairs Management Agencies	1.18	1.06	0.12
IN_6331	Textiles, knitwear and raw materials wholesale	0.18	0.06	0.12
IN_7440	The advertising industry	0.43	0.31	0.11
IN_1310	Corn Milling	0.17	0.29	-0.12
IN_4412	Hydraulic Power	0.23	0.36	-0.12
IN_4900	Building Decoration Industry	0.40	0.53	-0.13
IN_9622	Industrial organizations	0.52	0.67	-0.15
IN_8420	Primary School	1.03	1.18	-0.15
IN_1810	Textile and apparel manufacturing	0.41	0.57	-0.16
IN_9425	Economic management	0.99	1.16	-0.17
IN_3131	Clay brick and tile building block manufacturing	0.44	0.62	-0.18
IN_7710	Technical extension services	0.38	0.61	-0.24
IN_9720	Village autonomous organizations	5.13	5.59	-0.46

❖ Cities with growing population are featured with high tech manufacturing and high-end services
❖ Cities with declining population are featured with low tech manufacturing and basic services
❖ Data source: 2008 Economic Census.

Findings from the Case Study

❑ Slow population growth with rapid economic growth across the country.

❑ Most interior regions northern regions experienced population loss while border regions experienced population gain.

❑ Most city centers experienced spatial concentration and diffusion of population while remote areas from city centers were under the negative backwash effect of growth poles.

❑ Cities with growing population are featured with higher % of male/female ratio, urban population, non-agriculture population and migration while cities with declining population are featured with higher % of agriculture population, dependency ratio, aged ratio, and rural population.

❑ Cities with growing population are featured with high tech manufacturing and high-end services while Cities with declining population are featured with low tech manufacturing and basic services.

A Divided Landscape?
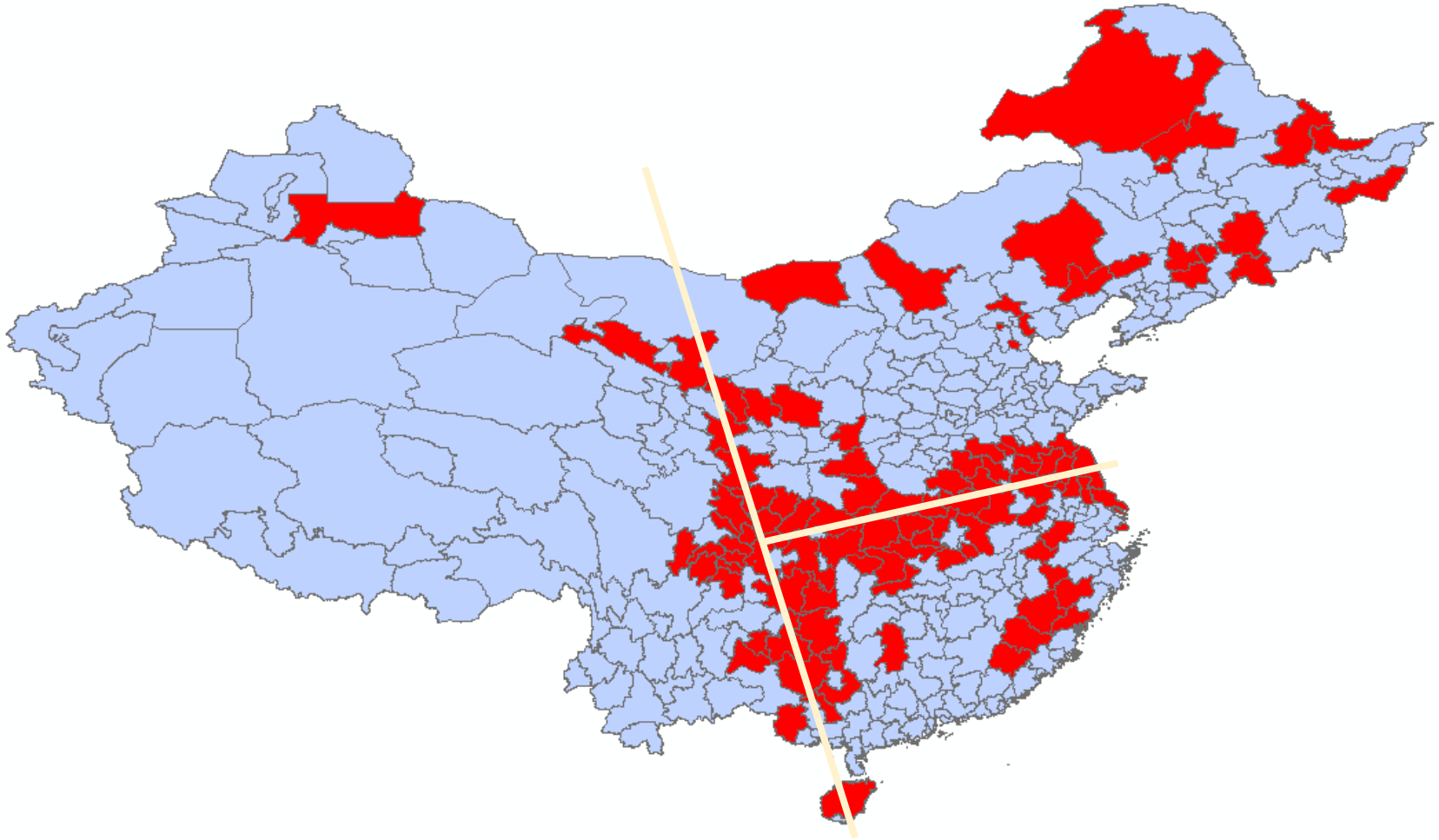
Topics for Further Studies

- What changes to the **population structure** of regions with population loss?
- What changes to the **industrial structure** of regions with population loss?
- What are the difference of **growth models** between those regions with population loss?
- What are the **driving forces** of demographic and industrial changes in shrinking regions?
- What will be the impact on **cultural preservation**?
- What will be the impact on ethnic and **religious landscape**?
- What will be the impact on **socioeconomic landscape**?
- What will be the Implications on the **regional policies**?
- What are the differences between China and the **US and other countries**?
- ……

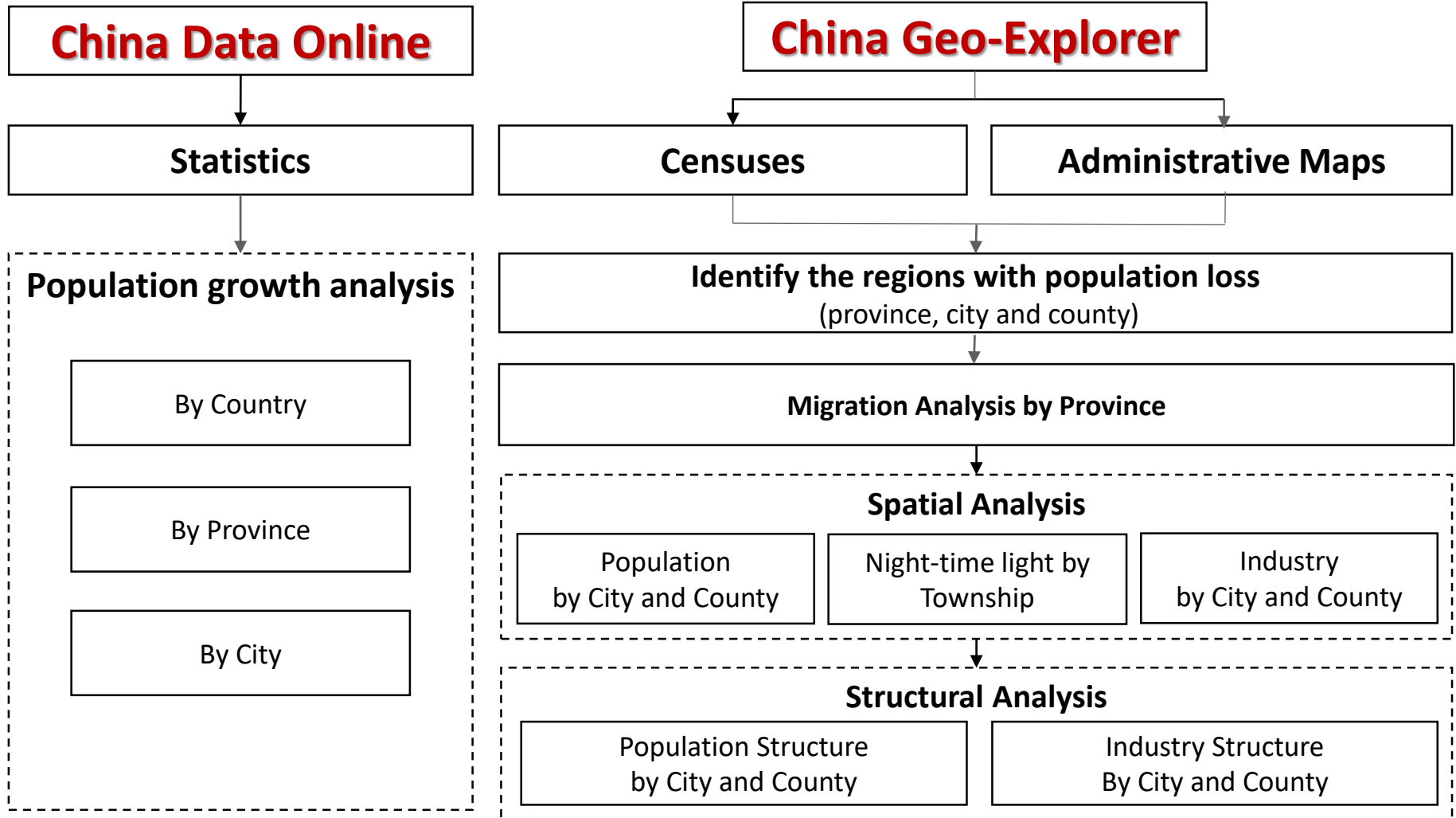# A Comparative Analysis with the US

Tracts with Population Loss (%) in the US
(1970-2010)
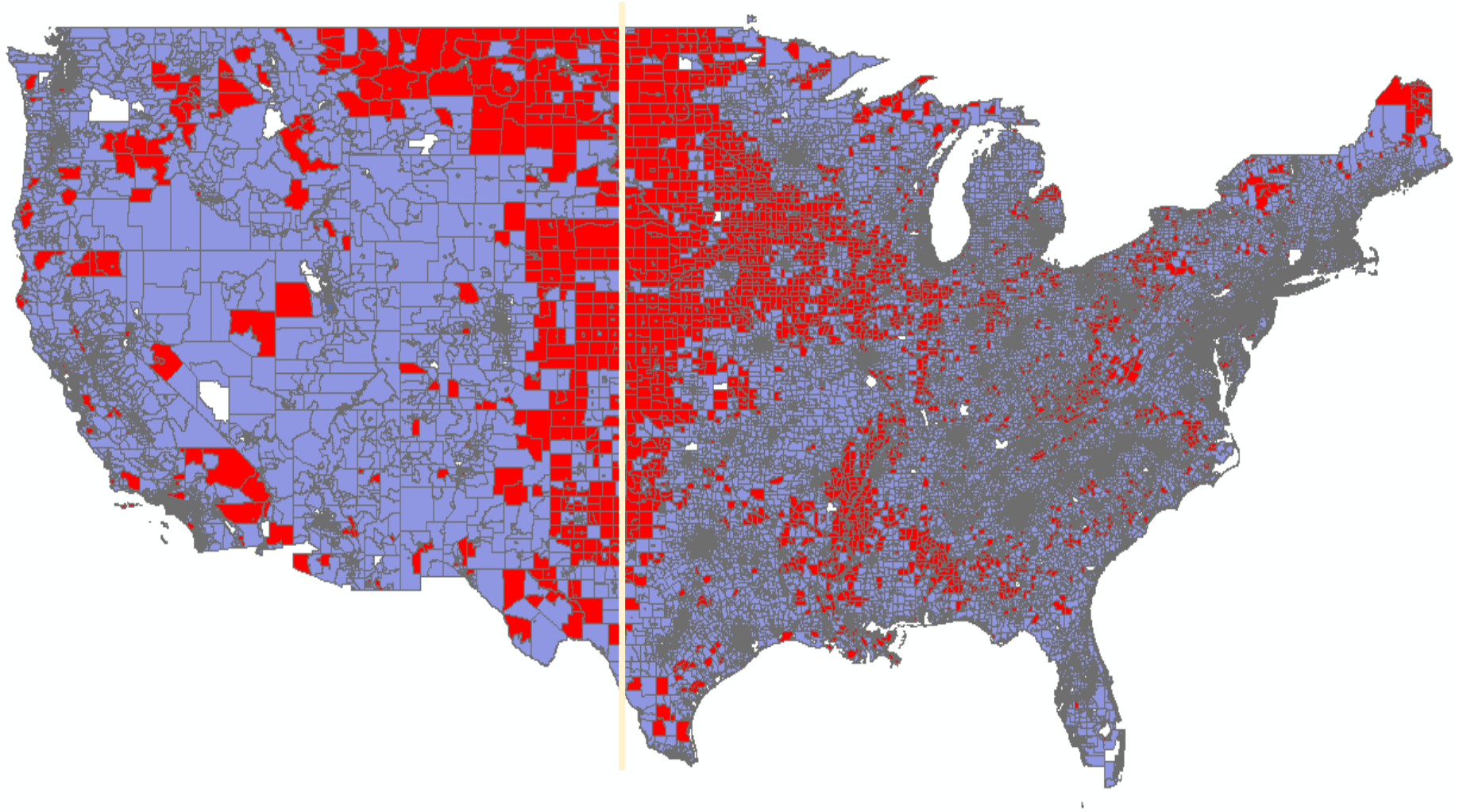
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Vol. 29, No. 1, 1-15.

Barro, Robert J. (1991). Economic Growth in a Cross Section of Countries. In *The Quarterly Journal of Economics*, Vol. 106 (1-2), 407–443.

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Gaile, G. L. (1980). The spread-backwash concept. In *Regional Studies*. Vol. 14 (1), 15–25.

Borts, G. H., & Stein, J. L. (1964). *Economic Growth in a Free Market*. New York, NY: Columbia University Press.

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The Workflow of Data Analysis

China Data Online

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Statistics

↓

Population growth analysis

- By Country
- By Province
- By City

China Geo-Explorer

Censuses   **Administrative Maps**

↓

Identify the regions with population loss
(province, city and county)

↓

Migration Analysis by Province

↓

Spatial Analysis

| Population by City and County | Night-time light by Township | Industry by City and County |

↓

Structural Analysis

| Population Structure by City and County | Industry Structure By City and County |

http://china-data-online.com

Contact

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