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A Study of Spatial and Temporal Distribution of Confucius Institute in the United States

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A STUDY OF SPATIAL AND TEMPORAL DISTRIBUTION OF CONFUCIUS

INSTITUTES IN THE UNITED STATES

by

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A Thesis

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Abstract

This thesis used geographical information system (GIS) to analyze the spatial and temporal distribution pattern of Confucius Institutes (CIs) in the U.S. The GIS is used to identify the range of CIs services and to analyze relevant demographic, social and economic profiles. The major focus of this study is to present the temporal distribution pattern of CIs, to identify the factor which may impact the spatial distribution of CIs and the factor which may influence State's demand for CIs.Several statistical methods such as kernel density estimation, Spearman's rank correlation and multiple regression have been adopted in the study.

Results found that (1) the temporal distribution of CIs from 2004-2013 are not evenly distributed. (2) The CIs are clustered around metropolitan regions, especially in East coast and the Great Lakes Megalopolis region. (3) There is a weak association between the spatial distribution pattern of CIs and their local demographic, socio-economics characteristics. (4) Two variables, including China-U.S. trade volume and the population with higher educational attainment, were found to have association with the state's demand for CIs.

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Chapter 1: Introduction

Background Information

Confucius Institutes (CIs). CIs are non-profit public institutions that aim to promote Chinese language and culture, support local Chinese teacher and facilitate cultural exchanges. In 2004, the Confucius Institute Headquarters, which aims to promote global knowledge of Chinese language and culture in other countries, was launched in Beijing (Hanban, 2006). It cooperates with applicant institutions such as universities, colleges, or local governments to create CIs all over the world.

In 2004, the first CIs was launched in Korea. From then on, CIs have experienced a sharp increase and have provided more and more opportunities for people to study Chinese language and culture. It also has become a platform for cultural exchanges between China and other countries. By the end of 2013, there have been 440 CIs launched in 120 countries (region): 93 of CIs are in Asian; 37 are in Africa; 149 are in Europe; 144 are in America and 17 are in Oceania. There have been 646 Confucius Classroom established: 150 in Asian; 10 in Africa; 153 in Europe; 384 in America, and 49 in Oceania (Hanban, 2014).

Confucius Institute Headquarters-Hanban. Confucius Institute Headquarters, also called Hanban, is affiliated with the Ministry of Education of the People's Republic of China. Hanban is a non-profit organization, located in Beijing in the People's Republic of China.

According to Hanban's bylaws, the Confucius Institute Headquarters shall be governed by the council. The duties of the Council include: formulating and amending the Constitution and bylaws of the CIs; examining and approving the development

strategies; examining and approving annual reports and working plans of the

Headquarters; and discussing issues of significant concerning the development of CIs

(Hanban, 2014).

The organizational framework of Hanban, as listed on their website, is presented

in Table 1:

Table 1

Organization Framework of Hanban, 2014

Council of the Confucius Institute Headquarters	
Confucius Institute Headquarters	
Division of General Affairs	Division of Volunteer Affairs
Division of Human Resources	Division of Teaching Materials
Division of Accounting and Auditing	Division of Testing
Division of Finance	Division of Scholarships
Division of Development and planning	Division of Cultural Affairs
Division of Policy and Research	Division of Sinology and China Studies
Division of Asian and African Confucius	Division of Public Relation
Division of American and Oceania CIs	Division of International Exchanges
Division of European CIs	Division of Logistics
Division of Teachers	

Under the leadership of the Council, the Confucius Institute Headquarters carries out its own daily operations. The duties include:

- Formulating development plans, criteria for the establishment of CIs, and assessment standards for the CIs;

- Examining and approving applications for new CIs;

- Examining and approving the implementation plans of annual projects, annual budgetary items, and final financial accounts of individual CIs;

- Providing guidelines and making assessments to activities carried out by CIs, supervising their operations and doing quality assurance management;

- Providing support and teaching resources to individual CIs;

- Selecting and appointing directors and faculties from the Chinese side for individual CIs, and training administrative personnel and instructors for these CIs;

- Organizing CIs Conferences annually;

- Constituting regulations and institutions for the management of the Chinese funds. (Hanban, 2013)

One of the most important duties of Hanban is to organize an annual conference. In 2006, the first CIs Conferences was held in Beijing. From then on, Hanban organized the CIs conferences annually. The conference had several sessions, including nominating excellent CIs and directors; releasing the data such as contact information and student enrollments; reporting the budget, and discussing the development plans.

Other duties of Hanban also include providing funding and Chinese instructors to each CIs and CCs. According to Hanban bylaws, a newly established Confucius Institute will receive funds provided by Hanban. The funds for its annual projects shall be raised

by individual CIs and its host institutes together in a ratio of approximately 1:1 commitment in general. (Hanban, 2014)

Confucius Classrooms (CCs) CCs is an extension of CIs, which is administered through a network of CIs. It gives K to 12 five-year grants to provide students the opportunity to study Mandarin Chinese, to learn about Chinese culture and history, and to share their own culture and history with Chinese students through school-to-school exchange programs. It also provides Chinese instructors, pays the salary of the instructors, and makes Chinese educational and cultural activities available to students. Through CCs, local schools can develop a partnership with a Chinese school, receive technical and academic support and have qualified Chinese instructor from China.

There are three types of CCs: most CCs are affiliated with a CI, but operated in a local school (primary school, middle school, or high school); some CCs are affiliated with a local institute such as Asia Society Confucius Classroom Network and a few CCs are independent such as Confucius Classroom in Denver.

The goal of CCs is to establish a high-quality, sustainable Chinese language program in all regions of the United States. It is devoted to strengthening Americans' understanding of China and in building bridges between young Chinese and American students by providing educational services in primary and secondary schools, communities and enterprises.

Chinese Partner & Application Procedure. The CIs are initiated by Hanban but the individual Confucius Institute is hosted by the applicant country and its Chinese partner (typically a university in China). Any corporate entity outside of China, capable of facilitating language instruction, conducting educational and cultural exchange

activities, and meeting the requirements for application as stated in the bylaws may apply to the Confucius Institute Headquarters for establishing a Confucius Institute (Hanban, 2014).

According to the CIs' application procedure, requirements for the permission to establish a Confucius Institute should be:

- That there is a demand for learning the Chinese language and culture at the applicant's location;

- That the personnel, space, facilities, and equipment required for language and culture instruction are available;

- That the capital for the establishment is in place, and that the source of funds for operation is stable.

To prepare the application materials, the applicant should connect with a Chinese partner (usually a Chinese university). The applicant can ask Hanban to recommend a Chinese partner institute if they are unable to find one. The Chinese partner will be responsible for providing Chinese instructors, offer training programs, and cooperate on cultural activities. The Chinese partner school also sends a director to CIs, who is responsible for communication with Hanban.

Once the proposal is approved by Hanban, the newly established Confucius Institute will receive funding for its initial operation.

Volunteer Chinese Teacher Program. In order to provide qualified Chinese teacher worldwide, Hanban established the "Volunteer Chinese Teachers Program" in 2006. Volunteer Chinese teachers are primarily recruited from professional teachers, as well as graduate students and undergraduate students. Volunteers should have majored in

disciplines of liberal arts such as teaching Chinese as a foreign language, Chinese linguistics and literature, foreign languages, education, history, etc. After taking a series of training classes, qualified volunteers will be dispatched to overseas locations. The terms of service for the volunteers is normally one year, but is allowed to be extended for maximum of three years.

As a pilot program, Hanban sent the first group of volunteers to Thailand and the Philippines in 2003. In 2004, the Volunteer Chinese Teacher Program was launched. According to Hanban's website, by the end of 2013, Hanban had sent over 14,400 volunteers to 139 countries in Asia, Europe, the Americas, Africa and Oceania. Teaching Chinese as second language in these countries has been greatly improved by the volunteers' work, and many countries have applied to Hanban for more volunteers.

Problems Statement

During the past 10 years, CIs experienced a rapid expansion in the United States. By 2013, there were 456 CIs and CCs established in the United States. Every year, Hanban needs to assign teaching resources, determine the annual budget, and evaluate each Confucius Institute's performance. The potential contributions of CIs, such as promoting the local Chinese language education and increasing the regional culture diversity, are becoming more and more significant. For the Confucius Institute Headquarters, understanding CIs' spatial and temporal distribution pattern in the United States can ensure that funding is used appropriately, and can support Hanban to evaluating CIs' performance. It can be a very valuable tool for Confucius Institute headquarters to develop future planning and management of CIs in the United States.

The attractiveness of locations lies in their ability to provide valuable resources in the form of good infrastructure, student potential enrollment, and communication links. Considering the general Confucius Institute headquarters policy is to increase the number of CIs in the United States, it is necessary for policy maker to identify future locations, find out the potentially favorable aspects of the local area and continue investing in current CIs.

For each individual CIs and its Chinese partner university, understanding the factors that may influence regional demand for CIs would allow the director to systematically assess the operation and figure out where it can be improved. It can increase the Confucius Institute's capacity to conduct a critical self-assessment and help CIs develop their future strategies, as well as strengthen the Confucius Institute's operations and, consequently, improve the CIs' service.

A spatial and temporal analysis of the distribution pattern of CIs also can help to classify and categorize CIs for setting an evaluation system. By simplifying and summarizing the complex data of CIs, this thesis is expected to help achieve a clear representation and description of CIs. Many researchers implicitly assume a great homogeneity among CIs in terms of its mission, function, and students served, however, CIs in the United State are in fact quite diverse in terms of geographic location, demographic and students served. A study of their spatial and temporal distribution can help researchers to quantify the diversity, identify their similarities and develop a comprehensive system for evaluation of effectiveness.

As stated above, the Confucius Institute Headquarters needs a decision support system which will assist CIs' managers in planning and in developing CIs. This study

intends to create a database for Confucius Institute Headquarters' development and management. The aim of this study is to perform spatial and statistics evaluations on regional potential demand for CIs, as well as to access the impact of socioeconomic variation on CIs spatial distribution pattern.

Purpose and Objectives

Geospatial analysis is an approach to apply statistical analysis to geographical data. Over the last 20 years spatial data analysis has undergone significant changes. As a result of modeling procedures being developed with Geographic Information System (GIS), the methodologies used for research of spatial data have become more sophisticated. GIS permits geographically referenced information to be stored, edited, manipulated and analyzed to generate interpretive maps (Barnet, 1993). It stores spatial data in a separate layers related to one another by a common projection and coordinate system. These layers can be joined to allow statistical analysis. It provides a powerful tool for management, visualization and analysis of spatial data.

This research used GIS software (ArcGIS 10.2) to analyze the distribution pattern of CIs, and to access the impact of socioeconomic variation on regional demand for CIs. The main goal of the research is to identify and cross-reference relevant data sets within a GIS framework to pursue the following objectives:

- Creating a CIs locational database for analysis.
- Conducting spatial and temporal analysis to explore the locational behavior of CIs, as well as identify the demographic and socioeconomic variables, which may affect regional demand for CIs.

Some of the questions, which were defined for the study, were addressed as follow:

- Is the distribution pattern of CIs clustered?

- How is the geographic distribution of the CIs affected by the demographic composition of the U.S.?

These questions will be addressed by using statistical analysis and GIS functions. Results will be displayed and profiled by thematic maps and statistical outcomes.

Study Area

The study area of analysis, as presented in Figure 1, will be limited to the continental United States, which has 48 U.S. states in North America. The state of Alaska, the state of Hawaii and the District of Columbia were excluded in temporal analysis and visual correlation analysis. American Indian area is not included: some American Indian entities may cross state lines, such as federally recognized American Indian reservations, off-reservation trust lands, tribal subdivisions, and tribal designated statistical areas, are thus excluded from the study.

According to the 2010 Census of Population and Housing Report, there are 308.7 million people in this study area. Of that number, 157.0 million were female (50.8%) while 151.8 million were male (49.2 %). The number of people under age 18 was 74.2 million (24.0% of the total population); 112.8 million persons (36.5%) are 18 to 44 years old; 81.5 million persons (26.4 %) are 45 to 64 years old; and 40.3 million persons (13.0 %) are 65 and over years old.

The number of people ages 18 to 44, represented 112.8 million persons (36.5 %). The number of people ages 45 to 64, made up 81.5 million persons (26.4 %). Finally, the 65 and over population was 40.3 million persons (13.0 %).

The 10 most populous states contained 54.0 percent of the U.S. population in 2010 (similar to the percentage in 2000), with one-fourth (26.5 %) of the U.S. population in the three largest states: California, Texas, and New York. The next seven most populous states— Florida, Illinois, Pennsylvania, Ohio, Georgia, Michigan, and North Carolina—contained an additional 27.5% of the population.

The reminder of the paper proceeds as follows. Chapter 2 presents background literature on the spatial analysis and the study of CIs. Chapter 3 examines the methodology and data used in the study, while Chapter 4 presents the empirical results and discussion. Chapter 5 concludes the paper and provides the limitations of the study and recommendations for future research.
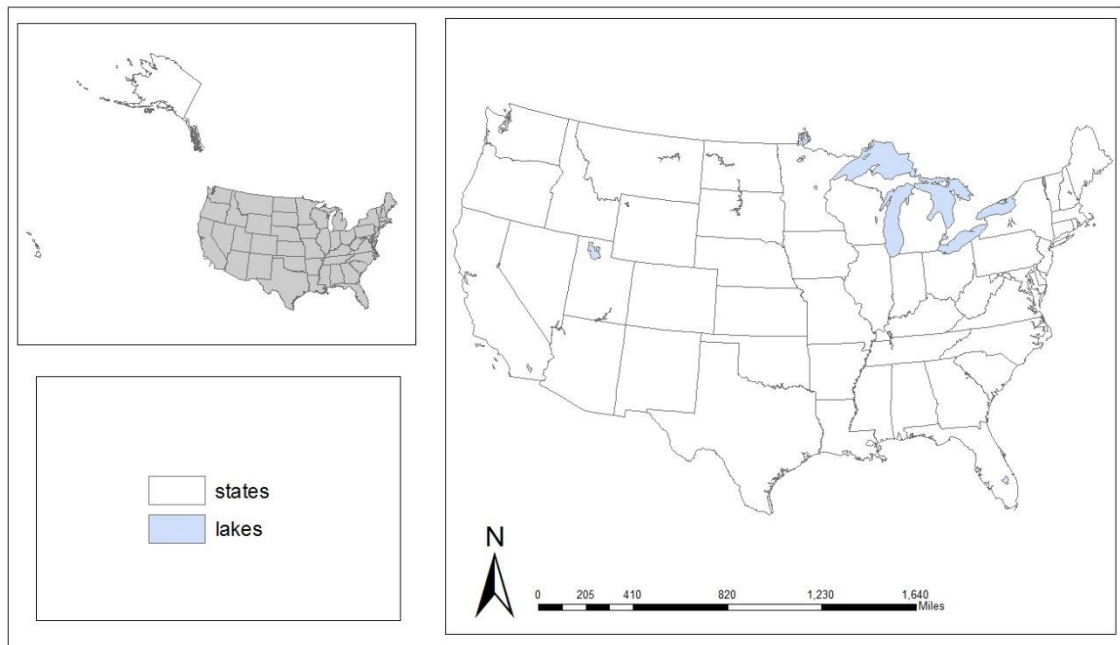
Figure 1. Study Area

Chapter 2: Literature Review

This literature review explores three main questions: First, spatial analysis of school locations and performance; second, statistical methods and GIS technique in location analysis; and third, the debates and the study of CIs.

Spatial Analysis of School Location

Attention is now given to a number of spatial and demographic factors that have been found to be related to location analysis. The studies of location have been one of the most popular topics since the late 1980s, with more and more researchers noticing the contributions of location when they try to identify the main factors driving entrepreneurs' success. In 1988, Anselin found that a business in one particular location may be affected by nearby variables due to spatial dependence effects (Anselin, 1988). This theory then be extended to educational services.

Unlike businesses, it is hard to quantify the performance of a school. Some researchers employed student achievement to measure the performance of a school, but there is no consistency in identifying the specific output. For example, Hoxby in 1994 used students' educational attainment and high school graduation rates to measure the quality of public schools, and found the competitiveness significantly raises them; but Heish and Urquiola (2003) failed to find such a relationship.

Other researchers relied on student enrollment numbers to estimate schools performance. The most frequently used methods were the Herfindahl-Hirschman Index (HHI; Borland and Howsen, 1993) and grade-specific enrollment (Geller, Sjoquist, & Walker, 2006). Although the enrollment numbers are not always precise estimates, it is

still the most frequently used to measure the performance of schools.(Geller et al, 2006, Jepsen, 2002, McMillan,2000,). Researchers find that school enrollment is correlated with demographic and socioeconomic characteristics (Belfield & Levin, 2002) .

The effect of socioeconomic characteristics is complex when studying the school's performance and enrollment. A significant amount of research has been conducted to investigate the impact of students' socio-economic compositions on school enrollment and school efficiency. Research has shown that a school's racial and socio-economic compositions is important for school's performance. For example, Hanushek (1998,1999), Hoxby (2002), and Ching (2000) confirmed that students' socio-economic characteristics significantly influence students' academic abilities which in turn affects schools' overall performance. Fairlie (2006) and Epple and Romano(1998) found that racial disparities among private and public schools continue to exist, as parents enroll their children in racially homogeneous schools rather than racially heterogeneous schools. In this way, school choice and social cohesion are linked.

A student's socio-economic status is also used to account for the home environment. Low income students are often exposed to abnormal environments, such as poverty and foster care (Ching, 2000). Failure to account for such factors may reduce the explanatory power of research. There are other variables, such as parents' education, parents' marital status, number of siblings and students' extracurricular activities that should have an impact on student achievement (Misra, 2012).

The location analysis becomes more complicated when researcher try to compare rural and urban school performance. Not surprisingly, researchers found differences in academic outcomes between these two types of schools. For example, Snyder and West

(1992) and Alspaugh (1992) found that urban or metropolitan students' mathematics, reading, and science scores are better than those of rural students.

Statistical Methods and GIS Technique in Spatial Analysis

Employment of the GIS approach provided a unique way to explore the distribution patterns of CIs in the United States. A review of the literature indicates that this thesis is one of the first to provide a statistical link between socioeconomic dimensions of CIs and their performance, as well as to identify the main effect factors on CIs' locational behavior.

Various studies utilized GIS for data management and spatial analysis. For example, Bocco presented a GIS model in 1997 to determine the statistical correlation among the U.S. Census population and demographic characteristics and local pollutions. (Bocco, 1997); Levine combined the distribution patterns and cluster of traffic crashes to determine the causal factors (Levine et al., 1995); Much research effort also has been spent on investigating schools' choice of location (Misra Grimes & Rogers, 2012).

According to Cressie (1993), there are three main spatial analysis topics:

- Point pattern analysis: focus on a location data
- Regional analysis: focus on zonal model of space(such as census districts)
- Geostatistical modeling: focus on resolving spatial problems.

Cressie's basic idea has been developed further by Asgary. He summarized the major spatial and temporal pattern analyses and visualization techniques in spatial analysis: map animation, isosurface method and comap (Asgary, Ghaffari & Levy, 2010) .Traditionally, the comap method is useful to illustrate spatial-temporal patterns using small multiples of diagrams. (Brunsdow, Corcoran & Higgs, 2007). A time period is

broken down into a series of time intervals. Therefore, the spatial pattern can be analyzed and illustrated for each time interval. (Asgary et al., 2010). In this study, I used comap to present the temporal distribution of the CIs.

Spatial analysis also concentrated on the cluster. There are various approaches that are aimed at identifying the cluster or spatial hotspots such as Getis-Ord Gi (Barnao,2009; Erdogan,2009; Getis & Ord,1992), K-mean clustering (Kim, 2004; Levine, 1995), Nearest Neighborhood Analysis (Levine, 2006; Levine, 2009), Moran's I Index (Khan, 2008; Prasannakumar, 2011) and Kernel density estimation (Sabel, 2006). A noticeable difference in these methods is how spatial correlations are considered. For example, when using nearest neighborhood analysis, its threshold value is pre-specified. That is, the extent of clustering in the neighborhood should be determined before applying nearest neighborhood analysis in the study. If the distance between given point is smaller than the threshold value, these points are grouped into the same cluster. The minimum number of points to be in a cluster should be specified as well (Lalita, 2015). In contrast, the bandwidth used in KDE method, is placed on each given point. Moreover, KDE is simple and easy to implement. By calculating the density of points around each individual observation; KDE is particularly efficient for visualization since the high intensity can be clearly identified. (Anderson, 2009; O' Sullivan & Unwin, 2003; Silverman, 1986).

In this thesis, I also used the spatial regression model to study the effect of socio-economies characteristics on location. This method was applied in a significant amount of research. For example, in Brazil, spatial regression was used to determine the causal factor of infant mortality from 1980-1989 (Ferreira & Waldman, 2002), Kennedy (1988)

used regression modeling to assess the increase or decrease of the linear relationship between the male and female lung cancer mortality rates in the United States. Chi-square test and correlation were also used to evaluate the correlation between smoking habits and the appearance of infant death cases (Lavezzi, Ottaviani, Mingrone, & Matturri, 2005).

Debate and Study of CIs

CIs and CCs, named after an ancient Chinese philosopher, are becoming more and more popular throughout the United States. At the same time, they are highly controversial and cause uproar during their international expansion.

Much of the opposition stems from the relationship between CIs and their host institutes. Critics worried about the improper influence over academic freedom at the host institutes (Bloomberg, 2011; Lionel, 2007).

On the other hand, proponents pointed out that CIs and the CCs provide the opportunities for students to study Chinese culture, language and history. In a survey of American high schools, the College Board found that 50 students said they would like to study Russia; about 175 said Japanese; and 240 said Italian - and 2,400 said they would prefer Chinese (Howard, 2006). "After China's economic reforms started, we discovered we had an urgent need for communication, and we found that it's not enough that we learned foreign languages," said Wu Yongyi, deputy dean of the International College of Chinese Studies at East China Normal University in Shanghai, "Today, about 90,000 foreign students comes to China every year to study the language." he said.

Proponents believe that CIs are good for students because China is the biggest emerging partner in economic globalization, as well as the second largest trading partner

of the USA. Students need to be prepared for the global economy. "They (CIs) are using Chinese culture to create a warmer, more positive image of Chinese society," said Nancy Jervis, vice president of the China Institute, a nonprofit Chinese-language study group that will be home to a Confucius Institute in New York City. "That is probably why the State Council has funded them, and why they've given a fair amount of money in turn to the College Board."(Howard, 2006)

Research also has yielded mixed results on the effect of CIs on China′s soft power. James pointed out that CIs spread Chinese language and culture, increase their collaboration with foreign academic institutions therefore could increase China's soft power (James, 2009). Rui and Jeffrey found that by promoting Chinese language learning, CIs have been successful in creating a positive image of China and have an influence on higher education, especially in universities (Jeffrey, 2008; Rui, 2010).

A significant amount of research has been carried out to investigate the impact of CIs. For example, Donald attempted to use gravity models to analyze the influence of CIs on trade and foreign direct investment (FDI) flows from China, and He found a significant increases in both Chinese exports and outward FDI flows when a developing countries establishes a Cis (Donald, 2012).

Chapter 3: Data and Method

Much research effort has been spent on investigating CIs' impact on teaching Chinese as second language, but only limited research has been carried out to investigate its spatial and temporal distribution patterns in the United States. In this research, I focused on the relationship between the distribution pattern of CIs and demographic composition. The procedure was adopted based on the various spatial analysis methodologies. The primary tool used in these investigations is a software packages known as ArcGIS. Specifically, the application of GIS in the study was used for data visualization, map comparison, and spatial analysis. The statistics analysis was conducted by the software package SPSS. Other software included Microsoft Excel and Python programming language.

This chapter presents the data explanation and the method used in the research. Section 1 describes data used in the study; then section 2 introduces the main method adopted in the research.

Data Source

Background data for the study are obtained from the U.S Census Bureau, including census data, Metropolitan Statistical Areas data (MSA) and Topologically Integrated Geographic Encoding and Referencing database (TIGER Shapefile). The customized information of the CIs was received from Confucius Institute Headquarters (Hanban) and each CIs website. Modern Language Association data (MLA) and the CIs annual report provided general information on individual CIs.

2010 U.S. Census TIGER/ Line Shapefile

The 2010 TIGER/LINE Shapefile was provided by the U.S Census Bureau. It is used to describe land attributes, as well as census tracts. This dataset included boundaries, roads, address information and water features. All legal boundaries and names are as of January 1, 2010.

2010 United States Census Data

The demographic and socio-economic parameters in this thesis derived from the 2010 the United States Census Data, at the state and county level.

The American Community Survey (ACS)

The American Community Survey (ACS) is an ongoing survey that provides data every year. It releases 1-year, 3-year and 5-year data products every year. In this study, ACS 2004 and ACS 2012 datasets were used.

MSA Data

Metropolitan and Micropolitan Statistical Areas data (MSA) is a collective term for both metro and micro areas defined by the United States Office of Management and Budget (OMB). It is an area containing a recognized population nucleus and adjacent communities that have a high degree of economic and social integration with that nucleus. A metropolitan area contains a core urban area of 50,000 or more population, and a micropolitan area contains an urban core of at least 10,000 (but less than 50,000) population. Current metropolitan and micropolitan statistical area definitions were announced by OMB effective June 6, 2003.

Confucius Institutes Data

All CIs data and information were obtained from Hanban annual conference report, Hanban website, each Confucius Institute′s website, and its Chinese partner website. The database includes CIs' addresses, establishment dates, Chinese partners and the U.S. partners. The database file was geocoded using address attribute, provided by ArcGIS resource center. The final result was a point shapefile representing the precise geographic location of CIs. Each entry in the shapefile contained information regarding the name, address, city and zip code of each CIs.

School Data I

The United States-School enrollment and ranking data comes from the U.S. News & World Report 2013. This is an American news magazine which is known for its ranking system and annual reports on American college and graduate schools. Their ranking data includes tuition, total enrollment, fall semester acceptance rate, average freshman retention rate, graduation rate, and SAT/ACT 25th-75th percentile.

School Data II

The China-School enrollment and ranking data comes from the Ministry of Education's Project 985 and Project 211. These projects were initiated by the Ministry of Education of the People's Republic of China, with the intent of strengthening about 150 universities since 1995. Project 985 is aimed at supporting 39 top universities to become outstanding schools in China; While Project 211 is aimed to support 100 universities to raise their teaching and research level.

Definition of CIs' Enrollment

CIs' enrollment is an important indicator that can be used to evaluate the demand for CIs. Some schools may only have few students registered in CIs, but have thousands

of students registered in its affiliated CCs. Therefore, any indication of CIs enrollment in this thesis includes student enrollment in CIs and student enrollment in its affiliated Confucius Classroom; any indication of CIs enrollment in the study includes full-time student and part-time student.

Methods

Method Procedure 1- Descriptive Maps and Cluster Analysis

Descriptive Maps. The descriptive GIS mapping techniques was adopted to assess the spatial distribution of CIs. These maps provided preliminary indications of the correlation between spatial distribution of CIs and local demographic, and socio-economic characteristics. All the values were quantitatively classified by natural breaks classification. All classes were assigned graduated colors for future reference.

Cluster Analysis-Kernel Density Estimation (KDE). In this research, a non-parametric approach called kernel density estimation (KDE) was used to estimate the statistically significant clusters of CIs in the Continental U.S. This method is based on the histogram methodology. The main idea is to build the density function at a given point X using neighboring observation. It uses each given point X as the center of the bin width. Defined kernel weights function as:

$$k(x) = \begin{cases} \dfrac{1}{2} if |x| < 1 \\ 0 otherwise, \end{cases}$$

Then, defined kernel function as follows, described in Silverman (1986):

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$$f(x) = \left(\frac{1}{nh}\right) \sum_{i=1}^{n} \frac{K(x - x_i)}{h}$$

Where x_i is the value of the variable X at the location I; "n" is the total number of locations, "h" is the bandwidth or smoothing parameter, and K is the kernel function.

Several types of kernel functions are commonly used: normal, uniform, quartic, Epanichnikov, and triangular, but most researchers agree that the selection of kernel function will not significantly impact results (Silverman, 1986). In this study, quartic functions, as the most used functions, was applied for cluster analysis.

The result of a KDE analysis is a raster layer with pixels assigned values according to the location density. The surface value is "1" at the location of CIs and diminishes with distance until zero at the search radius distance. It is useful for visualization since areas of high density point will be clearly identified.

Cell Size and Bandwidth Selection. The two main parameters which affect the KDE are bandwidth and cell size. In this study, I used ArcGIS 10.2's default cell size, which used Silverman's rule of thumb. It is the shorter of the width or height of the output extent in the output spatial reference, divided by 250.

The bandwidth of the Kernel is a free parameter which may influence the resulting estimate. It is calculated in ArcGIS 10.2. In this research bandwidth = 2.5 was chosen to illustrate the KDE results.

Method Procedure 2—Correlation Analysis

The Spearman's Rank Correlation, also called Spearman's rho, is a non-parametric method to measure the strength and direction of statistical dependence between two variables. In this study, Spearman's rho was used to determine whether there is an

association between the distribution pattern of CIs and its local economic, social and demographic characteristics.

The Spearman correlation coefficient is defined as the Pearson correlation coefficient between the ranked variables. For a sample of size n, the n raw scores X_i, Y_i are converted to ranks x_i, y_i (from low to high), and ρ is computed from these:

$$\rho = \frac{\sum_i (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_i (x_i - \bar{x})^2 \sum_i (y_i - \bar{y})^2}}$$

A positive Spearman correlation coefficient indicates Y tends to increase when X increases, while a negative Spearman correlation coefficient indicates that Y tends to decrease when X decreases. Zero means that there is no association between X and Y.

It can be used to assess how well the relationship between two variables can be described using a monotonic function. The results of Spearman's rho can verbally describe the strength of correlation as following:

- .00-.19: "very weak"

- .20-.39: "weak"

- .40-.59: "moderate"

- .60-.79: "strong"

- .80-1.0: "very strong"

The Null hypothesis is:

H_0: $\rho = 0$, the correlation coefficient is equal to zero in the population. (There is no association between the variables)

The alternative hypothesis is:

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H_A: $\rho \neq 0$, the correlation coefficient is not equal to zero in the population. (There

is an association between the variables.)

Method Procedure 3--Multiple Regression

Multiple regression is a statistical process for estimating the relationship between

a dependent variable and a set of independent variables. It provides a simplified view of

the relationship between variables and gives a model, to predict the values of dependent

variable y from independent variable x.

In a multiple regression model, there are p independent variables, can be

expressed as a linear mathematic equation:

$$y_i = \beta_1 x_{i1} + \beta_2 x_{i2} + ... + \beta_p x_{ip} + \varepsilon_i;$$

Where y_i is the predicted value of the dependent variable; β is the estimated slope of

a regression of y_i and x_i. The "coefficient of multiple determination", also expressed by

R^2, is used to estimating how well the model fits data in analysis. R^2 can range from 0 (for

no relationship between dependent variable and independent variable) to 1(for a perfect

fit between variable and independent variable).

Multiple regression, as a kind of linear regression model, makes a number of

assumption about the predictor variable:

- Assumption 1: All data should be independence of errors. This assumes that

  the errors of variables are uncorrelated with each other.

- Assumption 2: There is a linear relationship between the dependent variable

  and each of the independent variable.

- Assumption 3: All residuals should be homoscedastic, which means that

  different variables have the same variance in their errors.

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- Assumption 4: All data can't show multicollinearity, which occurs when independent variables are highly correlated with each other.

- Assumption 5: There are no significant outliers.

- Assumption 6: Errors should be normally distributed.

In order to gain valid results, data must be checked to make sure these assumptions are not violated. With real-world data, it is common that some of the assumptions are violated. Therefore, numerous techniques have been developed to overcome these violations.

In this study multiple regression was developed for statistical analysis. By analyzing the relationship of CIs' enrollment and demographic, social-economic characteristics, the researcher tried to find the factor that directly or indirectly affected the enrollment of CIs.

Chapter 4: Results and Discussion

The results of analysis were presented in this chapter. This chapter consists of four section: first, temporal analysis results; second, cluster analysis results; third, visual correlation analysis results; the last is statistical analysis results.

Temporal analysis results portray the temporal distribution of CIs in the United States from 2004 to 2013. Their clusters, service coverage and corresponding data were also shown with descriptive maps.

The cluster analysis of CIs in the continental United States was conducted and results are presented in section two. Three clusters were identified by the KDE method. In this section the cluster analysis was used to study the continental United States because there is no cluster in the states of Alaska and Hawaii. Only one (Confucius Institute at University of Alaska, Anchorage) in Alaska and one in Hawaii (Confucius Institute at the University of Hawaii).

The visual correlation was illustrated with descriptive maps in section three. These thematic maps provided preliminary indications of correlation of CIs' locations and local demographic composition.

 In section four, the statistical test is discussed including Spearman's rank-order correlation and multiple regression. They were used to determine the statistically significant association between the CIs' distribution pattern and economic, social and demographic characteristics.

Temporal Analysis and Discussion

In this section, I used GIS mapping techniques to assess the spatial and temporal distribution of CIs in the United States. First, a distribution of CIs in the United States

from 2004-2013 is presented in Figure 2. It indicates a large concentration in the eastern United States.
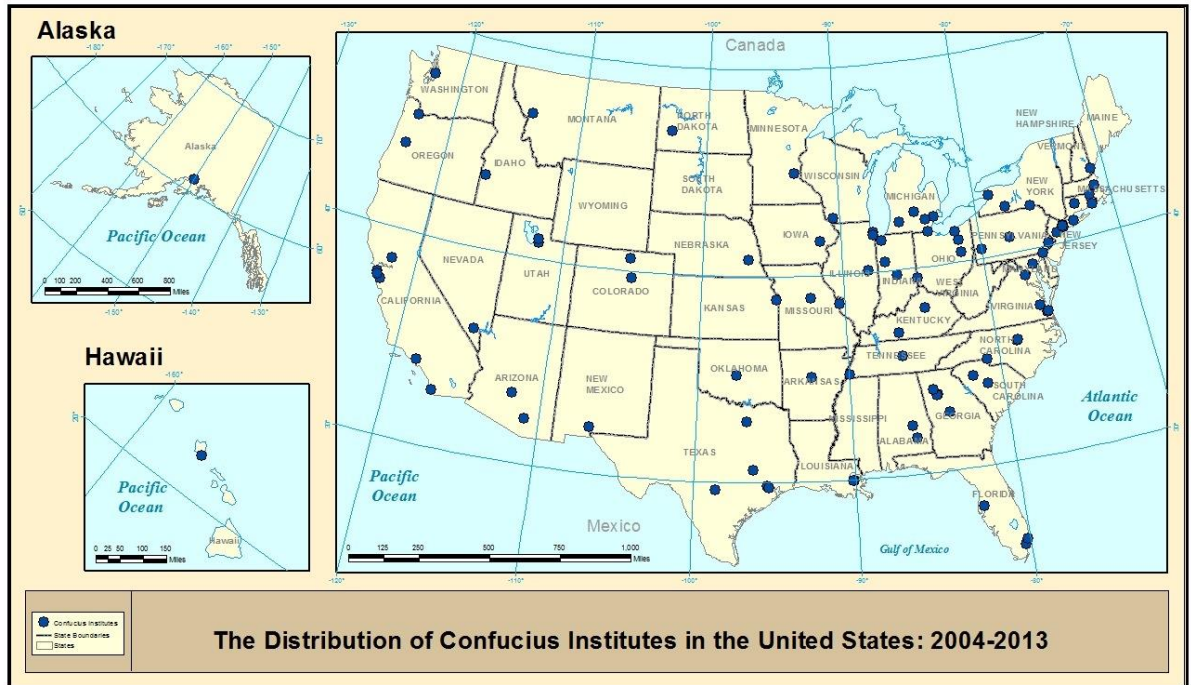
Figure 2. Distribution Pattern of Confucius Institutes in the United States: 2004-2013

Next, the temporal development of CIs in the continental United Stats from 2004-2013 is shown in Figure 3. In 2004, the first Confucius Institute was launched at the University of Maryland. From 2004 to 2007, CIs are more evenly distributed throughout the U.S., but from 2008 to 2013, there are some clusters formed in the Eastern U.S. and on the Pacific Coast.

Figure 3. Development of Confucius Institutes in the United States from 2004-2013

The temporal distribution of CIs is also presented in Figure 4 and 5. After 2005, CIs experienced a sharp increase until 2007 and decreased after 2010. This limited development can be explained as a cautious strategy of Hanban -- A Sustainable Development Strategies was announced by Hanban in CIs conference, 2007. From then on, the number of CIs has been reduced. The 24% of CIs established in 2007, were reduced to 18% and 14% in 2008 and 2009. Although a relatively larger proportion of CIs (14%) were approved by Hanban in 2013, it is important to remember that most of them have not started operating yet.
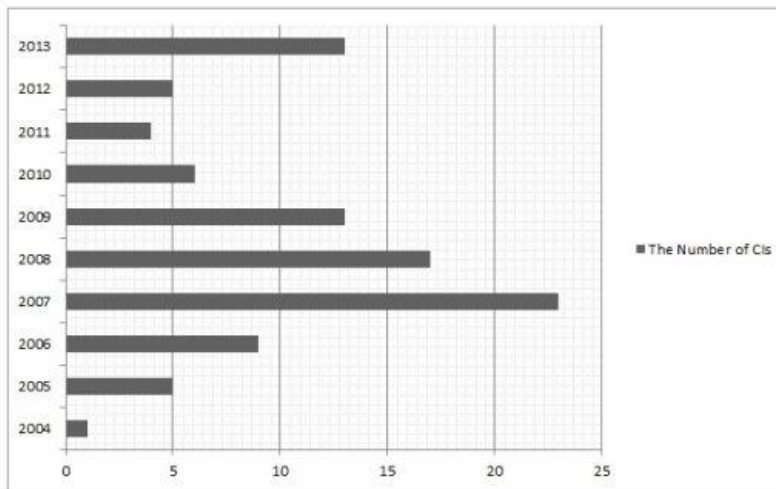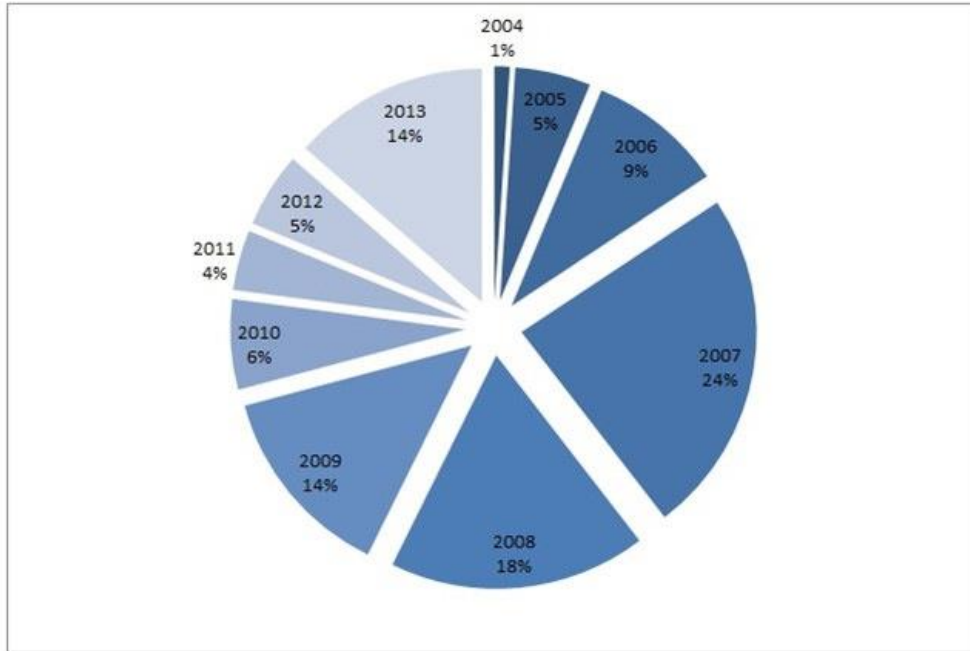
Figure 4 & Figure 5. Number of Confucius Institutes established in each year 2004-2013

(pie and bar)

The distribution pattern of CIs is complex and appears to be sensitive to time variation. Figure 6 presents the spatial-temporal distribution of CIs in each year from 2004 to 2013. In 2004, the first Confucius Institute was established on the east coast, located in the University of Maryland, Maryland. In the next year, four CIs were established and evenly spread out on the east coast, in the Midwest and on the West coast. In 2007, 17 CIs opened in Tennessee, Texas, Illinois, Missouri and Indiana. There were 16 CIs established in 2008 and 12 CIs established in 2009, most were located on the east coast, west coast, and in the Great Lakes-Region. During 2010-2013 they tended to spread out to middle and west of the United States (eee Appendix I and II). By combining temporal and spatial distribution I found that the spatial distribution is subject to temporal fluctuation.
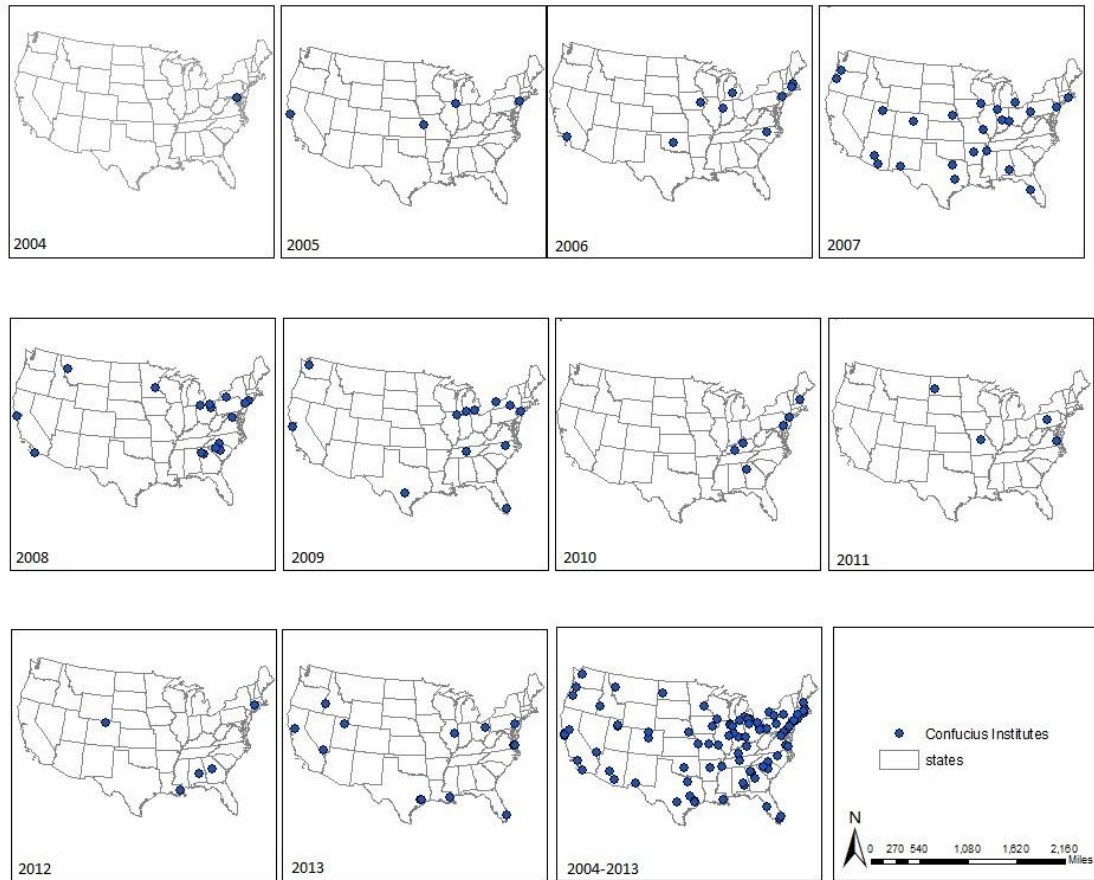
Figure 6. Number of Confucius Institutes established in each year 2004-2013 (map)

Cluster Analysis Results and Discussion

The KDE is one of the most commonly used and well-established methods to identify spatial distribution of point features. It can be used to determine whether a series of occurrences are related to one another in geographic terms. In this study, I used KDE to identify the primary hotspots of CIs in the continental U.S. The results show that CIs are particularly clustered around metropolitan-areas.

In order to illustrate a meaningful result, I used the bandwidth value = 2.5, as shown in Figure 7. There are three clearly clusters in the eastern United States, especially

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along the East coast. Along the West coast, there is a cluster also is forming. Regarding a higher density population and faster economic growth in these locations, we can assume that the spatial pattern of CIs appears to be responsive to demographic and socioeconomic characteristics.
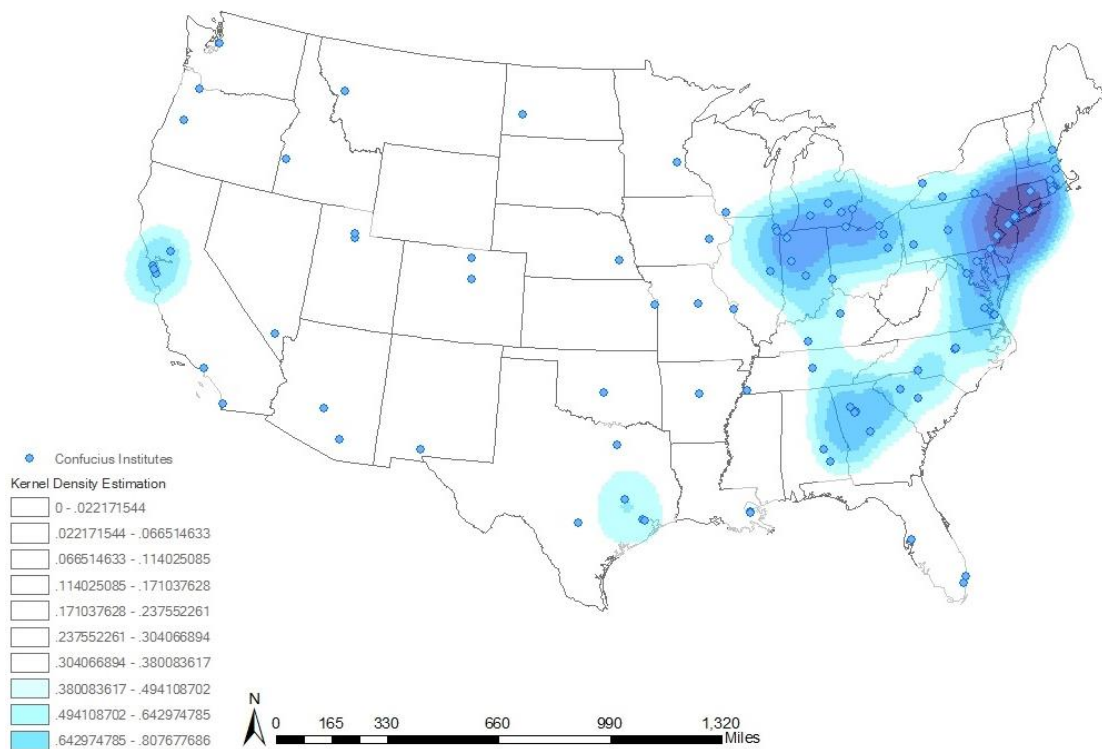
Figure 7. Cluster of Confucius Institutes in the continental United States, 2013

Visual Correlation Analysis and Discussion

This section presents how the spatial distribution of CIs responds to demographic and socioeconomics characteristics. Results indicate that CIs appear to be located in high annual income, urban areas, and high population density area. Counties with greater rates of educational attainment also have strong correlation with the spatial pattern of CIs.

We also explored the demand and supply of Mandarin Chinese by analyzing the impact of CIs on the Chinese speaking population. Results show that CIs also correlated closely with the growth of the Chinese speaking population.

Results also indicate that the spatial pattern of CIs is not sensitive to school enrollment, since there is only a weak correlation between the high school enrollment and CIs' location. An unbiased statistical result will be discussed in the next section.

Effects of Population on Spatial Distribution of CIs in the United States.

First, I examined the effect of population in the spatial distribution of CIs. Figure 8 shows that most of the CIs are located in the counties with population greater than 22,012.
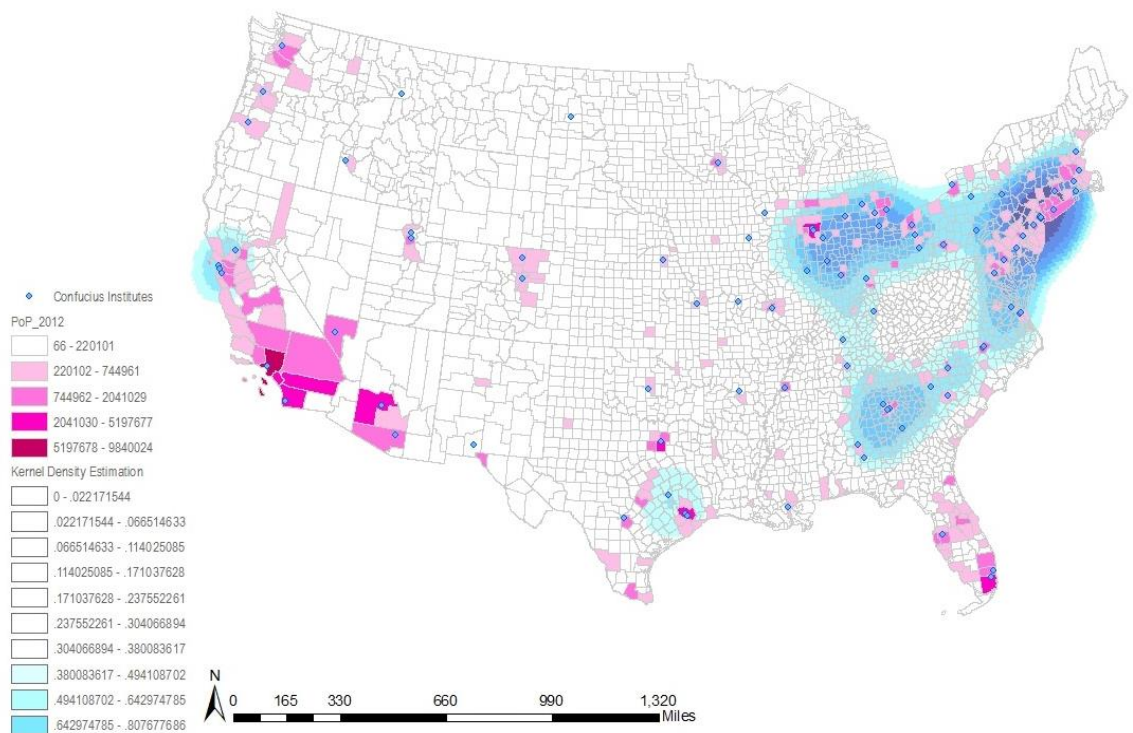
Figure 8. Visual Correlation of Confucius Institutes' Location and Population

Effects of Economics on Spatial Distribution of CIs in the United States. The relationship of demographic composition might also indirectly reflect the tendency of CIs locational decision, that appears less clustered in poverty area and concentrate in the high income area, shown in Figure 9 and Figure 10.

Figure 9 illustrates the population which has an annual income of less than $ 25,000, identified as "Poverty". The poverty threshold for a family group in 2013 was $ 23,050, according to the U.S Census Bureau data released on September 13th, 2011.
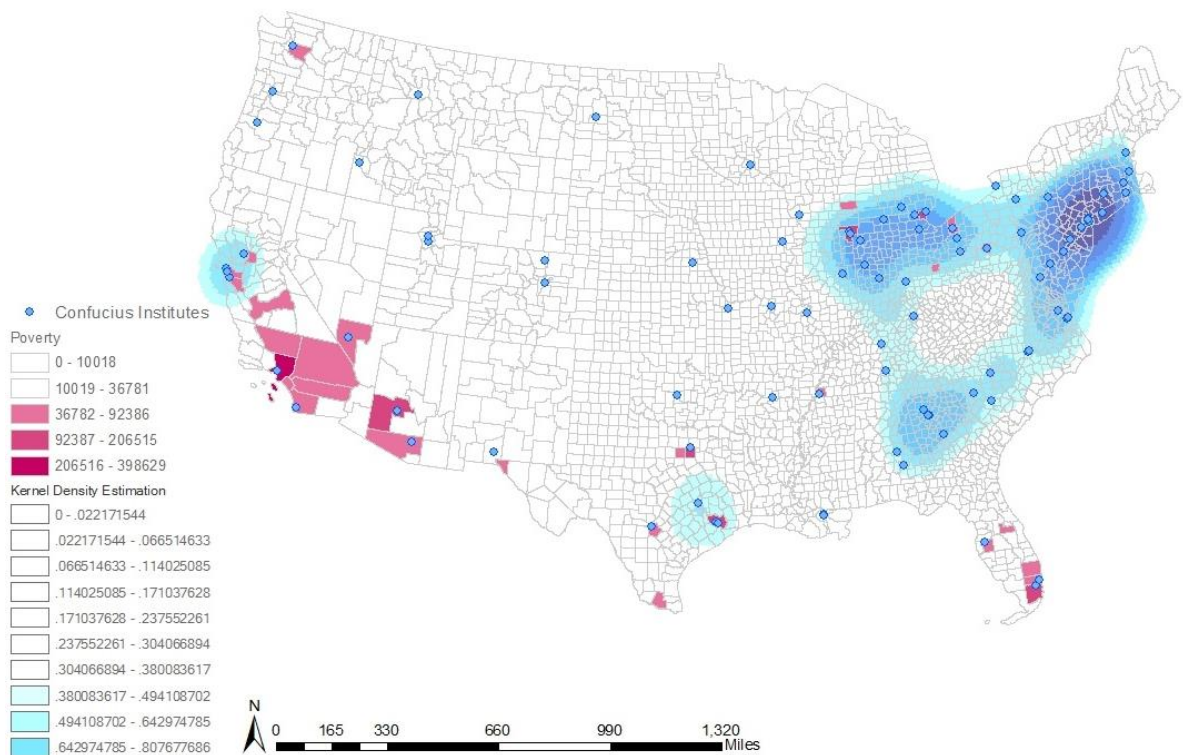
Figure 9. Visual Correlation of CIs' Location and Poverty Population

Figure 10 illustrates the population which has annual income more than $ 75,000, identified as "mid-high income".
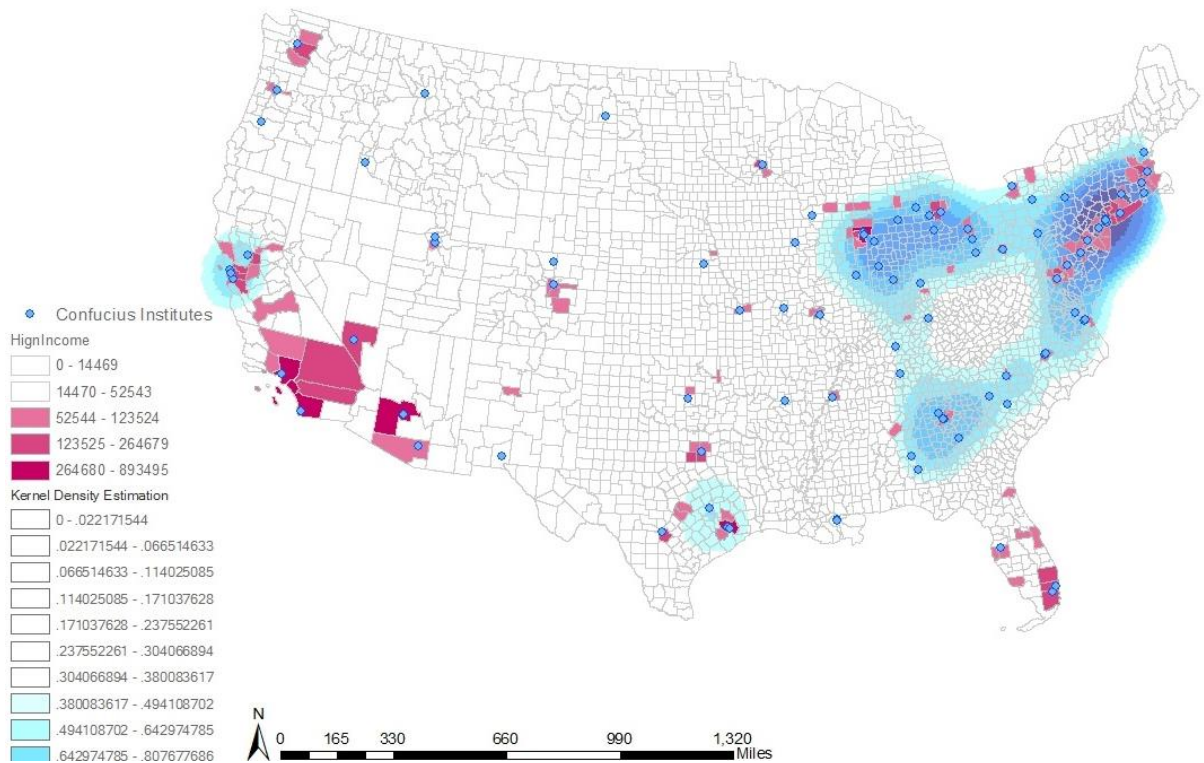
Figure 10. Visual Correlation of Confucius Institutes' Location and High Income

Population

Effects of Urban/Rural area on Spatial Distribution of CIs in the United States. CIs also are more likely to be located in urban area. According to the Census Bureau's urban-rural classification, urban and rural areas are identified as follows:

- Urbanized Areas (UAs) : 50,000 or more people;

- Urban Clusters (UCs): At least 2,500 and less than 50,000 people.

A visual analysis of the CIs clusters reveals that there is a clear association between CIs clusters and urbanized areas & urban clusters. I also presented the urbanized

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areas map and the CIs′ clusters in Figure 11, 70 of 95 CIs located in urbanized areas,

which account for 73.7% of total CIs in the U.S.
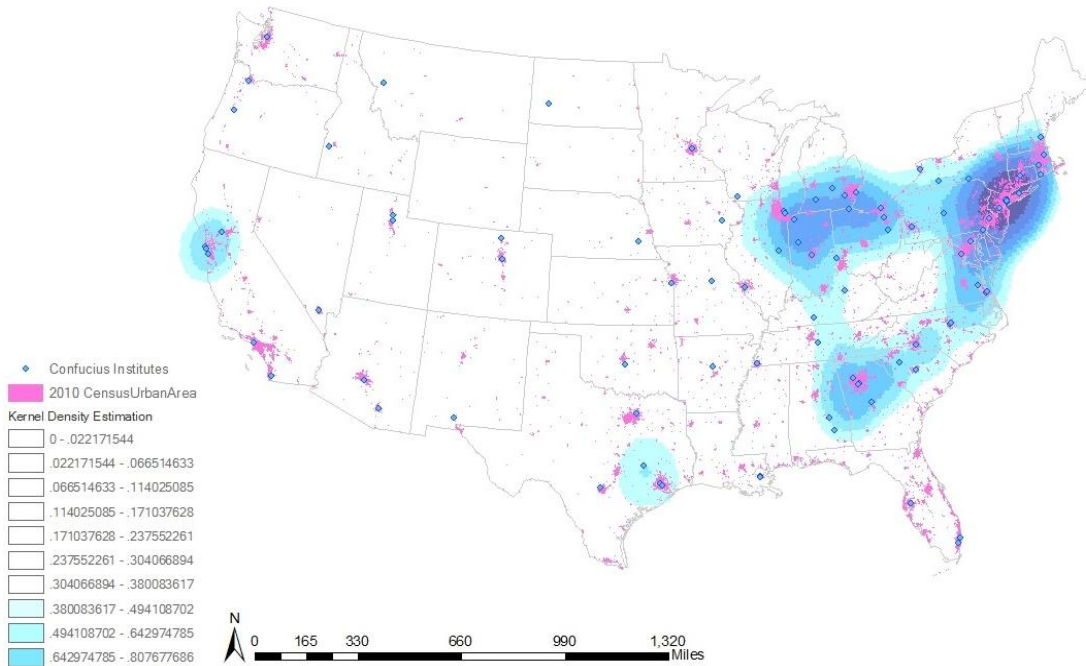
Figure 11. Visual Correlation of CIs' Location and Urban Area

Effects of Educational Attainment on Spatial Distribution of CIs in the

United States. Figures 12-14 indicate how CIs' spatial distribution was related by

educational attainment. Figure 12 presents the population with a high school degree;

Figure 13 presents the population which has bachelor degree; Figure 14 presents the

population which has a Master′s or Ph.D. degree. It is hypothesized that people with

higher educational attainment tend to support their local CIs, therefore, tend to send their

children to CIs for learning Mandarin Chinese and Chinese culture.
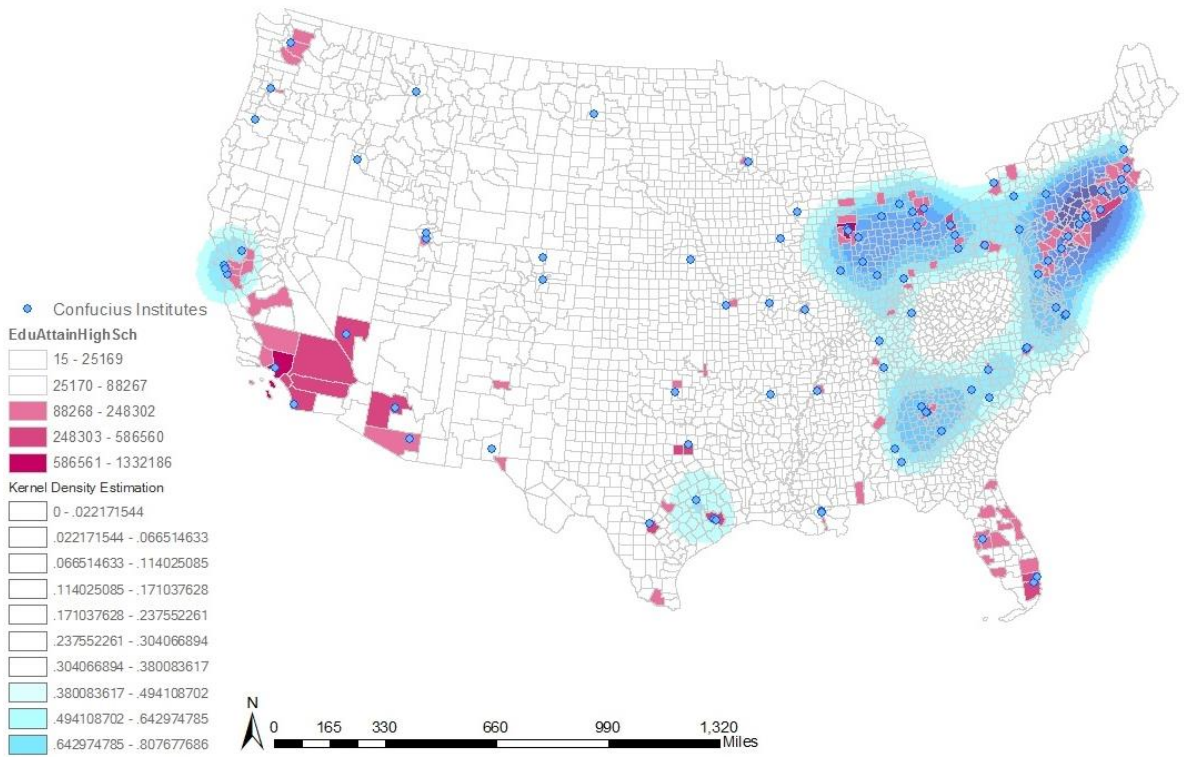
Figure 12. Visual Correlation of Confucius Institutes' Location and the Population which

have High School Degrees
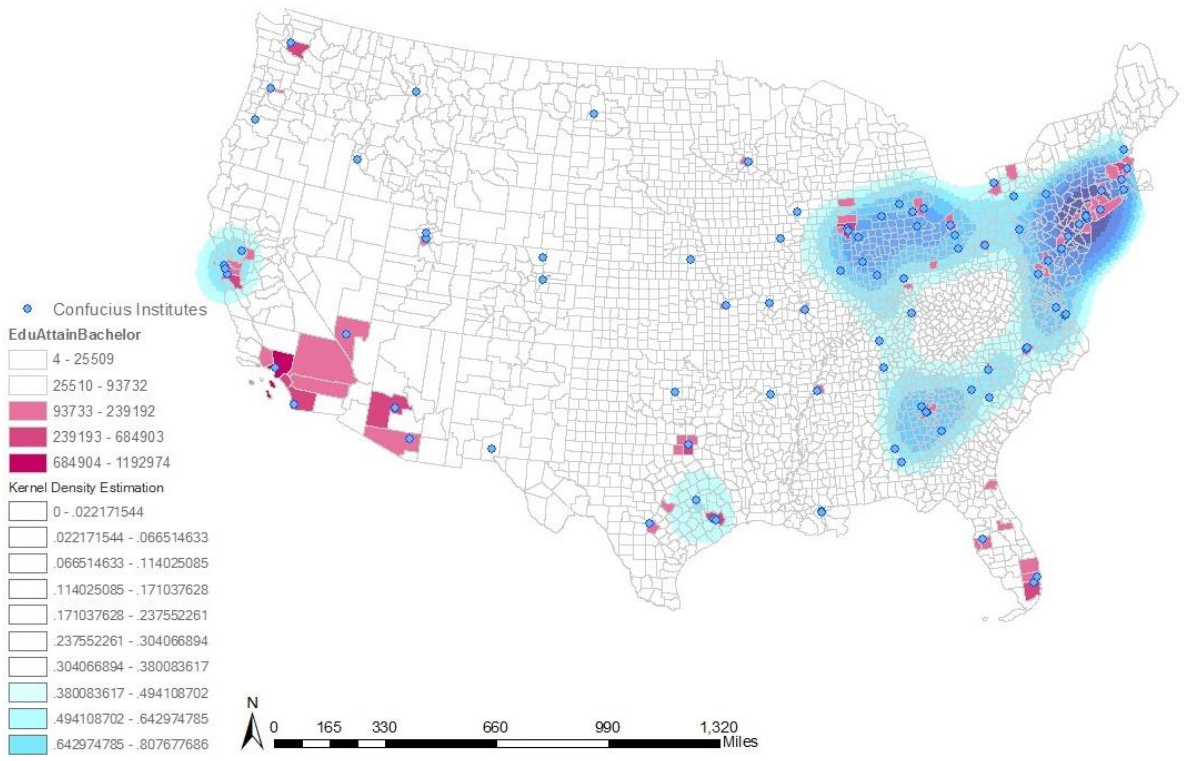
Figure 13. Visual Correlation of Confucius Institutes' Location and the Population which

have Bachelor 's Degrees
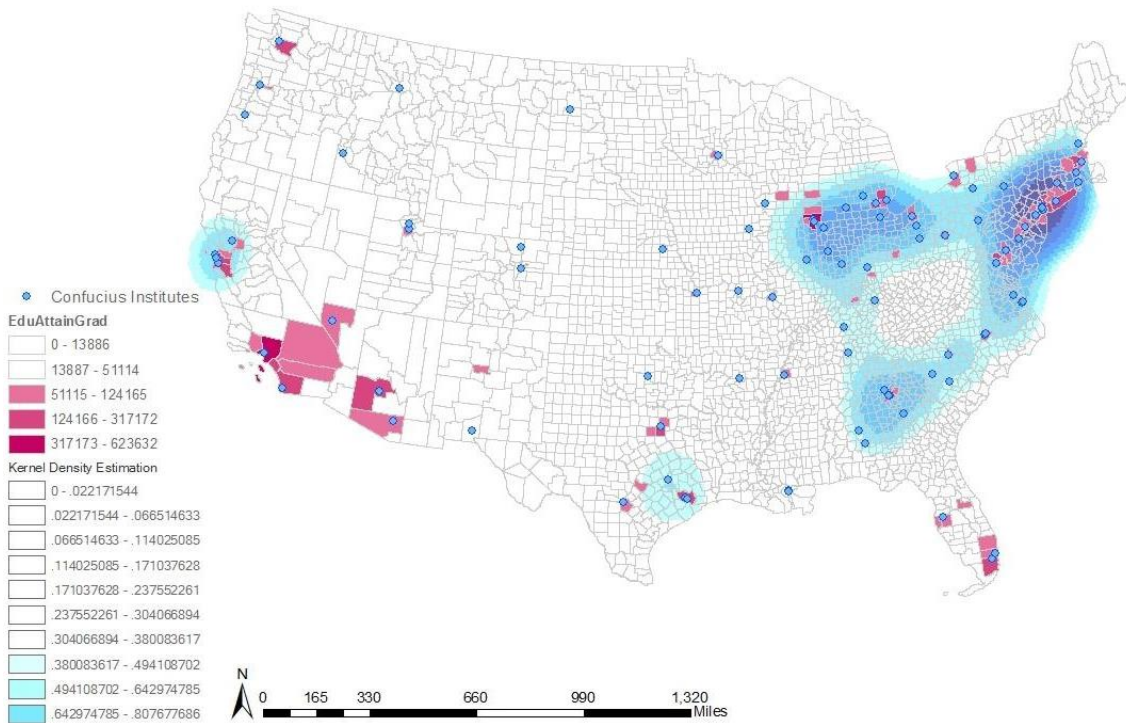
Figure 14. Visual Correlation of Confucius Institutes' Location and the Population which

have Graduate Degrees

Effects of School's Enrollment on Spatial Distribution of CIs in the United

States. School's enrollment, which is related with potential demand for learning Chinese

language, also was considered in my analysis. This data comes from the Census data, that

captures the population who reported be enrolled in elementary school and high school.

Since that most of the students enrolled in affiliated CIs are coming from primary schools

and high schools, I expected that CIs' student might quite be similar to the demographics

of traditional schools in terms of age, gender and social status. Therefore, CIs should

have an association with student enrolled in high school and less of an association with

college students as shown in Figure 15. Unfortunately, this correlation is insignificant.

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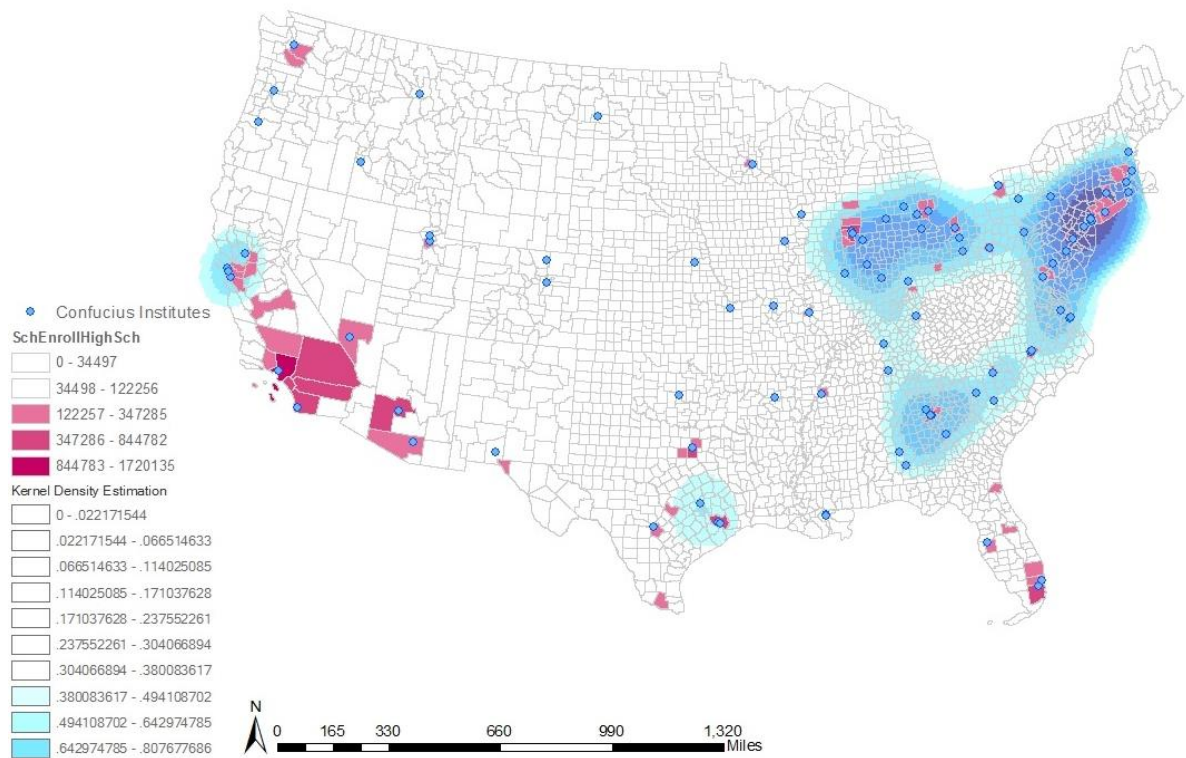
Figure 15. Visual Correlation of Confucius Institutes' Location and Students enrolled in

High School

Effects of Chinese-speaking population on Spatial Distribution of CIs in the

United States. Chinese-speaking population, measured by how many people speak

Chinese at home was involved in my study. The effects of Chinese-speaking population

on the spatial distribution of the CIs also have been considered. Figure 16 illustrates the

distribution of the Chinese-speaking population and CIs location in 2012. There is a very

close spatial association between them, shown in Figure 16. This association might be

determined by the interaction of Chinese language's supply and demand. In order to

explore how this interaction works, I created Figure 17, which presents the distribution of

Chinese-speaking population and CIs location in 2005. Figure 18 illustrates the increase

and decrease of Chinese-speaking population in each county during the period of 2005 to

2012.
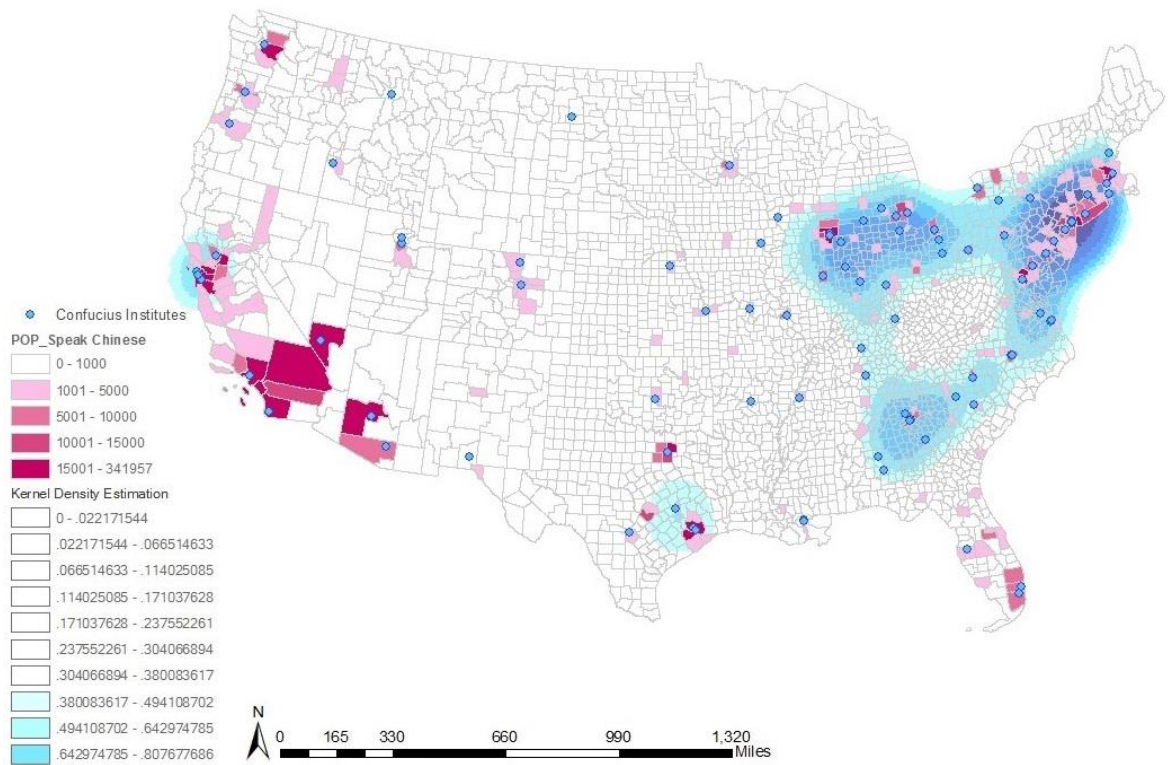
Figure 16. Visual Correlation of Confucius Institutes' Location and Chinese-speaking
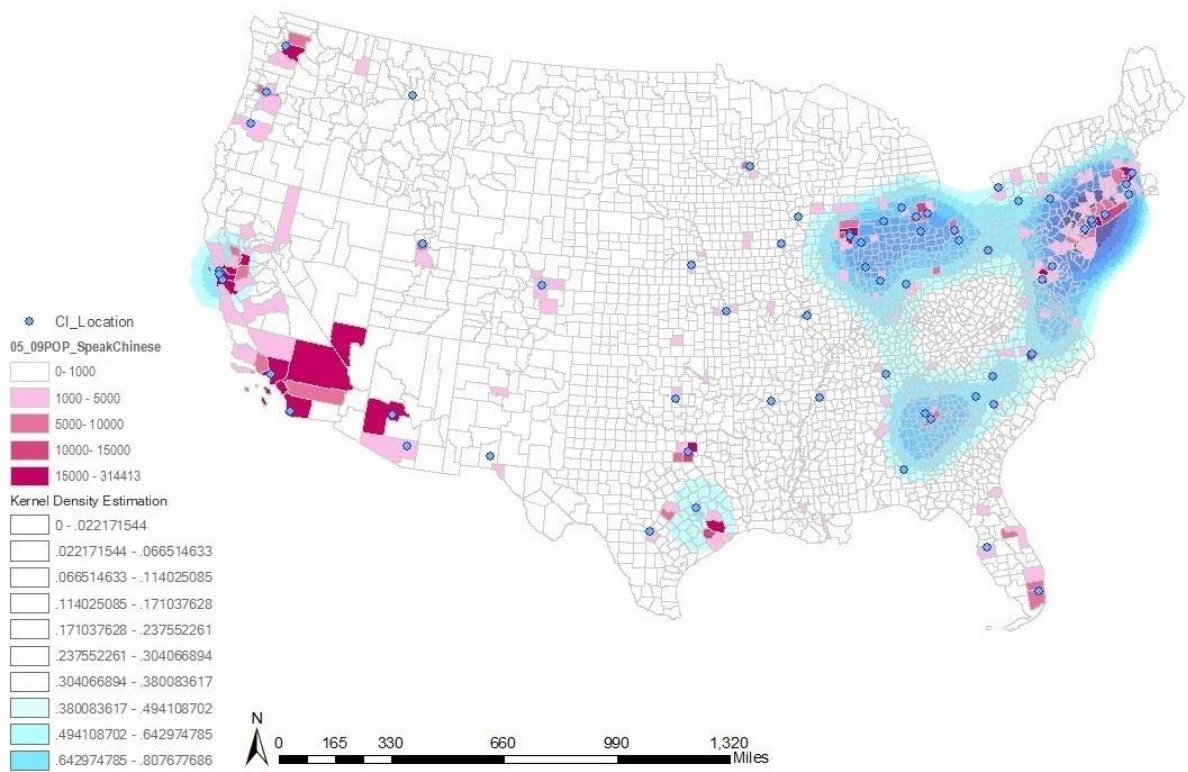
Population, 2012

Figure 17. Visual Correlation of Confucius Institutes' Location and Chinese-speaking
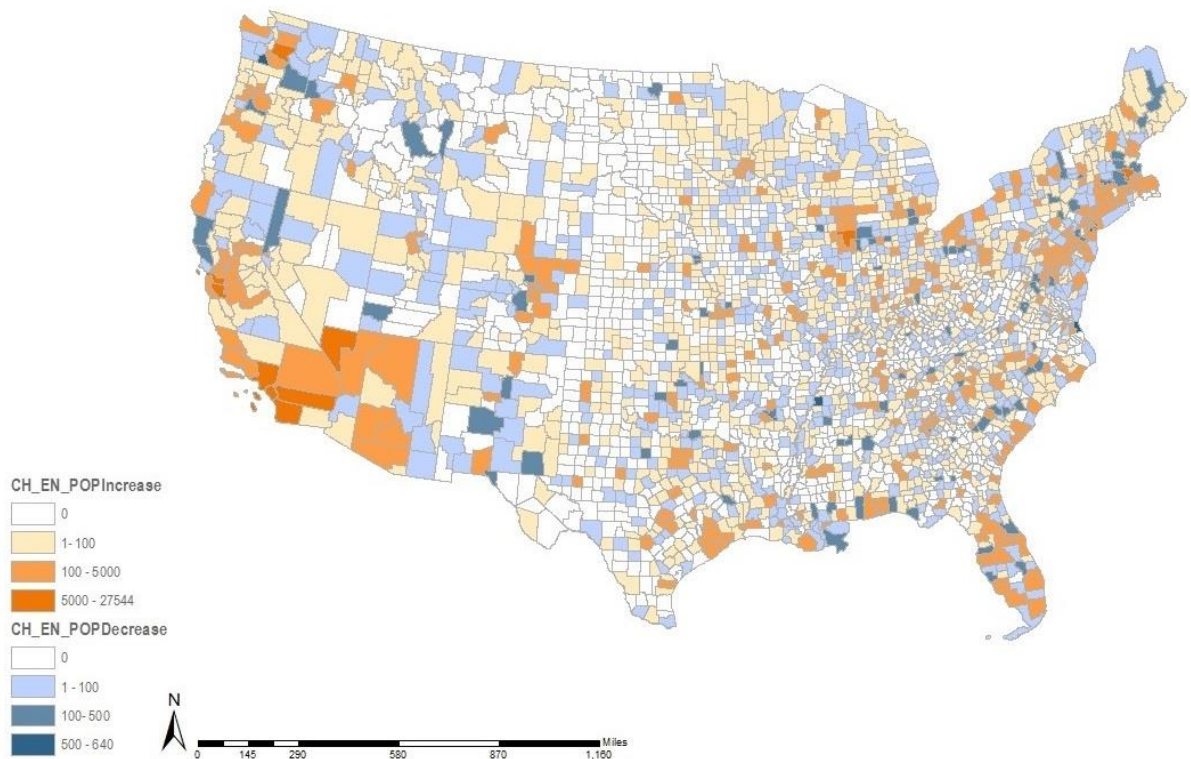
Population, 2005

Figure 18. Decreased and Increased Chinese-speaking Population, 2005-2012

From figure 18, 761 of 3,222（23.6%）counties experienced a decrease in their

Chinese speaking population; 116 of 3222（36.4%) counties stayed stable and 1,298 of

3,222（40%）counties experienced an increase in Chinese speaker population. In general,

the Chinese speaking population increased from 2,465,055 to 2,812,448, a 14.1%

increase in 7 years (2005-2012). Among the counties which had local CIs, 11 counties

(11.4%）declined in Chinese speaking population and 84 counties (87.5%）increased in

Chinese speaking population. The total population increased from 134,965 to 154,075,

growth rate rising to 14.1%. In addition, among the counties without CIs, 749 counties

(23.8%）declined in Chinese speaking population, and only 1,125 counties (39%）

increased in Chinese speaking population. I also checked the top 10 counties which have

the highest Chinese speaking population growth rate, 7 of these counties with a high

growth rate (70%) have local CIs, as indicated by Table 2 and Figure 19.

Table 2

Top 10 Counties with the most Chinese-speaking Population

	State	County	GEOID	Chinese Speaking Population(2005)	Chinese Speaking Population (2012)	Difference of Chinese Speaking Population (2005-2012)	Local CIs
1	CA	Los Angeles	06037	314,413	341,957	27,544	YES
2	NY	Kings	36047	133,265	160,491	27,226	NO
3	NY	Queens	36081	154,695	174,210	19,515	NO
4	CA	Alameda	06001	105,251	117,715	12,464	NO
5	CA	San Francisco	06075	132,718	144,602	11,884	YES
6	CA	Santa Clara	06085	114,343	125,809	11,466	YES
7	WA	King	53033	49,873	61,196	11,323	YES
8	NV	Clark	32003	16,156	23,437	7,281	YES
9	IL	Cook	17031	48,814	54,879	6,065	YES
10	CA	San Diego	06073	35,067	50,585	5,518	YES
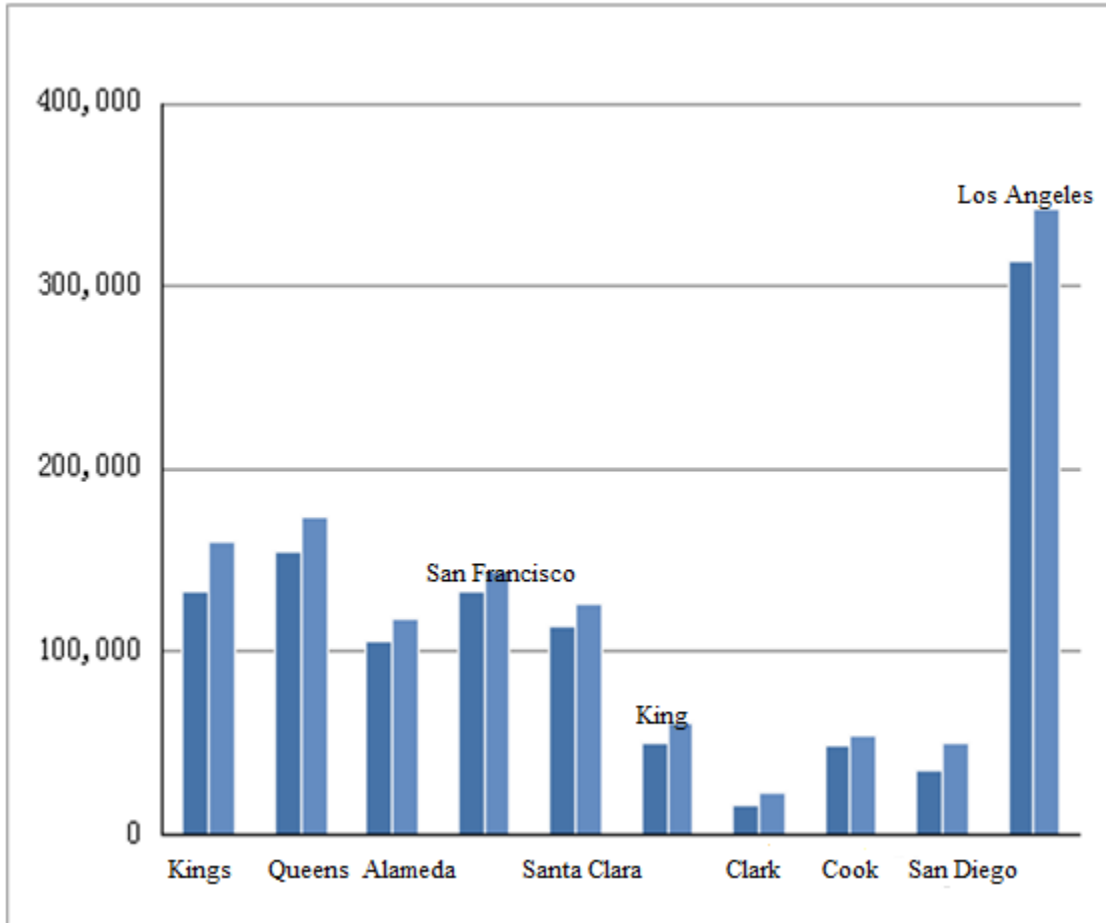
Figure 19. Decreased and Increased Chinese-speaking Population in Top 10 Counties, in

year 2005 and 2012

On the other hand, I found that CIs have a tendency to choose the county which

has higher Chinese speaker population as their new location. In 2005, 1,562 (48.3%)

counties had no Chinese speaking population; 1,444 (44.8%) counties had less than 1,000

people in their Chinese speaking population; 143 (4.5%) counties had Chinese speaking

population from 1,000 to 5,000 and only 72 (2.3%) counties had more than 5000 Chinese

speaking population. In contrast to these, in 2012, there were 40 (42%) CIs that chose a

counties with more than 5,000 Chinese speaking population; 27 (28%) CIs chose a

counties with 1,000 to 5,000 Chinese speaking population and 29 (30%) CIs chose a

counties with Chinese speaking population less than 1,000. Few CIs would like to be located in a county without Chinese speaking population.

As stated above, there is a strong correlation between Chinese speaking population and the CIs′ locations. The spatial distribution of CIs may be affected by the Chinese speaking population, and in turns also promotes Chinese language learning.

<div align="center">

Statistical Analysis Results and Discussion

</div>

In this section, multiple regression analysis and Spearman's rank correlation analysis were presented to investigate the factors that may influence the spatial distribution pattern of CIs. Those spatial analysis methods make it easier for identifying the impact of socio-economic characteristics on CIs development. First, multiple regression analysis was used to analysis the relationship between socio-economic/demographic characteristics and a state's demand for CIs. then, Spearman's rank correlation analysis were performed to examine the association between regional socio-economic/demographic characteristics and the CIs location decision making.

Multiple Regression Analysis. In this section multiple regression was used to examine the relationship between demographic/socio-economic characteristics and the potential demand for CIs in the United State. The research question for this section is:

Research question I: Do socio-economic and demographic factors influence a state's demand for CIs?

Descriptive statistics for each independent variable are shown in Table 3.

Table 3

Descriptive Statistics for Multiple Regression

Dependent Variable	Variable definition	Number of Variable	Min.	Max.	Mean	SD.
Chinese Population	Percentage of Chinese population in States	N=50	.10	4.00	.6800	.80964
China_U.S.Trade-Volume	U.S. International Trade (Exports and Imports) with China in Goods, Services and Merchandise (Values in millions of dollars)	N=50	114	141,724	10,548.96	21,362.329
CIenrollment(State)	CIs's enrollment in a States	N=50	0	32,815	3,173	5,495.37
Age 5_19	Percentage of people that 5-19 years old in States	N=50	111,310	7,920,709	1,265,467	1,435,032
Income	Mean annual income	N=50	51,064	94,306	68,133	10,762
HlevelEdu	Percentage of population whose the highest level of education is Bachelor or higher	N=50	.17	.39	.2743	.04846
POP	States Population	N=50	563,626	37,253,956	6,162,876	6,848,235
State_Persons per square mile	Population Density	N=50	1.2	1,195	194	261

Variable Selection for Multiple Regression Analysis. An important notation

throughout this chapter is that the demand for the CIs, in this study is measured by CIs'

enrollment.

This enrollment number can be used to quantify the regional demand for the CIs. In general, a great investment in learning Mandarin Chinese would also create a demand for CIs. The states with higher CIs enrollment number will be considered that have higher demand for CIs.

The explanatory variables were selected by using stepwise regression procedures. The primary criterion for selecting the appropriate independent variable was that the regression coefficients were significantly different from zero (Draper and Smith,1981). At last, seven independent variable were selected for multiple regression analysis. I want to explore whether or not a socio-economic characteristics influence a State's demand for the CIs. If yes, which characteristic is a significant variable.

In this study, a state-level Census data was used in multiple regression analysis. The reason is stated as follows:

In the U.S., One CI has several CCs, which may be located all over the state. Since most of the Chinese language courses and cultural activities are offered by their affiliated CCs, one CI′s enrolled students are actually located all over the state as well. Therefore, state level Census data are more effectual for analyzing how a state′s demographic characteristics affect its CIs student enrollment.

First variable group. To study whether or not socio-economic and demographic factors affect a state's demand for CIs in the United States, I included indicators such as a percentage of Chinese population and school –aged population (5-19 years old).

Many U.S companies have large operations in China and also have business relationship with Chinese corporations. In order to become valuable candidates for employment, many students choose Mandarin Chinese as their second language when

they were in school. On the other hand, I presumed Chinese people tend to send their children to CIs to study Mandarin Chinese as well. Therefore, I expected a correlation between a high demand of CIs and a high Chinese population and high 5-19 years old population.

My hypothesis is:

- The potential demand for CIs, measured by the CIs' enrollment in a state, should have an association with a high Chinese population and large 5-19 years old population.

Second variable group. To investigate other factors that may influence the regional demand for CIs, annual mean income and high educational attainment were included in the regression model. I supposed that people who have higher annual income or higher educational attainment are more intended to ask their children learning Mandarin Chinese and Chinese culture.

My hypothesis is:

- The states with higher annual mean income or higher rate of educational attainment, should have higher demand for CIs.

I also considered the economics trade relationship between China and each states in the United States. My hypothesis is:

The state which has closer economic ties with China (higher export and import value) should have more students learning Chinese, therefore, should have higher demand for CIs.

Third Variable group. Population and population density were selected in the model to investigate how the population and population density influence states's demand for Mandarin Chinese and CIs. My hypothesis is:

The states which have higher population or population density should have higher demand for CIs.

Test assumption and data transformation. Before the multiple regression was conducted, all data were tested further to ensure that they satisfied the assumptions of regression (Draper & Smith,1981). These violations can be detected by plotting the residual values against the predicted value. In this study, preliminary analysis showed a highly skewed distribution of variables, suggesting a violation of assumption six.

Table 4

Test of Normality

Variable	Skewness	Skew.Z-score	Kurtosis	Kurt.Z-score
Income	.781	2.318	-.071	-.107
HlevelEdu	.236	.7	-.204	-.308
China_U.S Trad Volume	5.066	15.033	29.958	36.19
Age 5-19	2.847	8.448	10.04	15.166
Chinese Population	2.801	8.311	8.042	12.148
Population	2.373	7.041	5.594	8.45

As presented in Table 4, there was a highly skewed distribution of variable. Therefore, a data transformations was applied to approximate normal distribution and to provide uniform error variance. In this study a logarithmic transformation was determined to be optimal for the dependent variable because it was considered more

suitable for strongly, positively skewed data. Values for data were transformed to log base ten and the non-normal distributions of variable were corrected.

Results of Multiple Regression. Then, a linear regression was applied to check the association between the dependent variable and the independent variable. Results are shown in Table 5. The regression coefficients and R^2 values shown above indicated a strong relationship between the dependent variable and independent variable including the 5-19 years old population, the volumes of trade between China and state in the United States, and the Chinese population. Income and population density are shown that have little influence on States' demand for CIs

Table 5

Results of Simple Linear Regression

	Estimate of the Effect Size	**Regression Coefficient**
PoP	.067	.703
Age 5_19	.239	1.687
China_U.S.TradeVolume	.299	1.217
Income	-.003	2.909
Chinese Population	.061	1.143
HlevelEdu	.017	3.625
States_persons per square mile	-.016	.000

Multiple regression analysis was used to evaluate the combined impact of variable.

To build a reliable regression model, it is necessary to remove the variables that do not have a significant influence on states' demand for the CIs, as well as the variables

determined to be unnecessary due to their high correlation with the each other input variables. For this purpose, data mining was performed on seven independent variables using stepwise regression so that unnecessary variables could be removed from the final regression model. The results from this operation are illustrated in Table 6.

Table 6

Results of Stepwise Regression Operation

	Model 1	Model 2
China_U.S.StateTradeVolume		
B	1.103	1.101
β	.554	.553
SE_β	.247	.238
Hign_Educational Level		
B		4.369
β		.252
SE_β		2.073
R^2	.307	.371
F	19.936	12.951
Sig.	**.000**	**.000**

Note. P>.05; B= unstandardized regression coefficient; SE_β =Standard error of the coefficient; β=standardized coefficient.

The two variables determined from the stepwise regression to be most relevant are China-U.S State trade volume and populations with higher educational attainment. They were then used as the input variables for the multiple regression analysis. The results from this operation are shown in Table 7.

Table 7

Results of Multiple Regression

	B	β	Std.Err (β)	t-value	Sig.
China_U.S.StateTrade Volume	1.101	.553	.238	4.623	.000
Hign_Educational Level	4.369	.252	2.073	2.107	.041
R^2		*.371*			
Estimate of the Effect Size		*.342*			
Sig.		***.000***			

Note. P>.05; B= unstandardized regression coefficient; SE$_\beta$ =Standard error of the coefficient; β=standardized coefficient.

The resulting R^2 value from this equation indicated that 37.1% of the variation in CIs enrollment can be explained by the independent variable above.

China-U.S State trade volumes accounted for 55.3% of the variance in CIs enrollment, making it by far the strongest indicator for the potential demand for CIs. This result supports the hypothesis that strengthening U.S State-China Economic relations creates the demand for CIs and Chinese language study.

The variable that highly educated population appeared to be significantly different 0, using a significance level of .041. As stated above, these results suggested that people who have higher educational attainment may have be more intend to send their children to CIs and would be more likely intend to have their child study Chinese language in school.

Spearman Analysis Results. Preliminary investigation of CIs' spatial distribution pattern showed a significant differences in the socio-economic environment between the counties with CIs and the counties without CIs. In this section, I used a Spearman's rank-order correlation to assess this relationship.

A county-level census data were used in this study. The reasons are stated as follows:

By delivering educational programs to general public, offering cultural and language, training for the local business community, supporting professional development and training for local Chinese language teachers, CIs utilize many resources to serve their counties. At the same time, establishing a CIs also requires countywide support. For example, the Confucius Institute in Chicago, works closely with the City of Chicago to provide Chinese language and cultural program to all public K-12 schools in the city of Chicago. Regarding this countywide cooperation and interaction between the CIs and counties, a county-level census data are much more effective for analyzing the effect of local demographic and socio-economic characteristics on spatial distribution of CIs in the United States.

Variable Selection for Spearman's Rank Analysis. Eight dependent variables were considered in the study. These dependent variables including age, economic situation, educational achievement, population and ethnicity, will be used to study the relationship between demographic/ socio-economic characteristics and the CIs' distribution pattern. The research question of this section is:

Research Question: Do socio-economic and demographic factors affect Hanban's location decision making?

Specifically, each variable is discussed as follows:

Service Demand. As indicators of presumed demand for CIs, School Enrollment and the population of Chinese speakers were chosen in analysis. My hypothesis is:

CIs in the United States, prefer to be established in the counties with higher students enrollment in schools or the counties with a large Chinese speaking population.

Economic Factors. Economic Factors in this study include high income households and poverty households. The households with annual incomes of less than $25,000 were identified as "Poverty"; while the households with annual incomes over $ 200,000 were identified as "High Income". The poverty and high income threshold for a household come from the U.S Census Bureau data, released on September 13th, 2011.

Those variables may imply a local community support or financial concern. If CIs are attempting to serve area of the county where the needs are greatest, I expected the coefficients could be positive. So our hypothesis is:

CIs in the United States, are mostly located in counties with high-income households.

Population/Urban Area. Urban areas and rural areas are classified by population density. In this study the value"1" means "urban area" while the value "0" means " rural area". If CIs are targeting urban areas, the coefficient of the population variable should be positive.

Population was also used to investigate how population can influence CIs' locational decisions. My hypothesis is:

CIs in the United States prefer to be located in urban areas and in the counies with a higher population.

Educational Attainment. This variable includes the number of people whose educational attainment is a bachelor's degree or above and the number of people whose educational attainment is lower than high school. These variable were used to test the hypothesis:

CIs in the United States are most likely to be located in the counties with more educated population.

Descriptive statistics for each independent variable are shown in Table 8.

Table 8

Descriptive statistics for Spearman Analysis

Dependent Variable	Variable definition	Number of Variable	Mean	Max.	Min.
Poverty	Number of People that lived in Poverty	N=3221	3,951	398,629	0
HIncome	Number of People that has higher annual income more than 750,00	N=3221	9,749	893,495	0
Population	Total population in County	N=3221	97,130	9,840,024	66
SchEnrollHighSch	Number of students in elementary school and high school	N=3221	15,557	1,720,135	0
EduAttainHDegree	Number of people whose the highest level of education is Bachelor or above	N=3221	17,301	1,816,606	0
EduAttainHighSch	Number of people whose the highest level of education is high school degree	N=3221	17,976	1,332,186	0
Chinese2012	Number of people that speak Chinese and English language in a county(In 2012)	N=3221	873	341,957	0
CI Location	CIs Dummy 0= there are no CIs in the County 1=there are one or more CIs in the County	N=3221	N/A	N/A	N/A
Urban/Rural	CIs Location Dummy 0=CIs locates in rural area and Urbanized Area (population less than 50,000) 1=CIs locates in Urbanized Area(population 50,000 or more)	N=3221	N/A	N/A	N/A

Results of Correlation Analysis: Results are based on the variable "CI Location". The value "1"means "There is a Confucius Institute located in County"; The value "2" means "There are one or more CIs located in County"; The value "0" means "There is no CIs located in County". After I estimated 3,221 counties, I found that some of these variables are associated with the CIs locations (Table 9).

Table 9

Results of Spearman's Rank Correlation Analysis

	Correlation Coefficient	Sig.(2-tailed)	N.
Chinese2012	.245	.000	3221
EduAttainHDegree	.207	.000	3221
HIncome	.125	.000	3221
EduAttainHsch	-.194	.000	3221
Population	.241	.000	3221
Poverty	-.131	.000	3221
SchEnrollHighSch	.237	.000	3221
Urban/Rural	.230	.000	3221

Correlation is significant at the 0.01 level (2 tailed).

As stated in Chapter 3, the result of Spearman's rank correlation analysis does not show a strong association, which suggested that CIs locational decision process is not simply impacted by local demographic characteristics and socioeconomic status. The results are analyzed as follows:

CIs are less likely located in the poverty areas and the population with lower educational attainment, as shown by the negative and significant coefficient for the number of people that lived in poverty ($rs = -.131, p < .0005$) and the number of people whose highest educational attainment is at or below a high school degree ($rs = -.194$, $p<.0005$).

The Chinese speaking population variable is not significant correlated with CIs. The interpretation of the Chinese speaking population variable must be considered in conjunction with people whose first language is or is not Chinese. This variable was collected in the American Community Survey, gather how many people speak Chinese at home, and how well English is spoken. This variable may include the Chinese American population, American-born Chinese population, and American who study Chinese. The positive correlation simply reflects the phenomenon that rather than just targeting the Chinese American and American-born Chinese, CIs also try to attract English spoken people.

The positive and significant correlation demonstrates that the CIs are most likely to be located in urbanized areas and the counties with more population.

The next two significant variables are the number of people whose educational attainment is a Master's degree or above ($rs = .207, p < .0005$)   and the number of students in elementary school and high school ($rs = .237, p < .0005$). The association with the number of highly educated population perhaps indirectly reflects Hanban's location preference. About 95% of CIs (91 out of 96) are hosted by a university or college, suggesting local support from the people with a higher level of education such as school faculty or staff. On the other hand, as a primary targeting market, it is not

surprising that the number of students in elementary school and high school have an association with the CIs' locations.

As an indicator of socioeconomic status, the number of people whose annual income is more than $75,000 is also included in our model. The result demonstrates that CIs are attempting to serve areas with higher annual income population. ($rs = .125, p < .0005$)

Chapter 5: Conclusion

The primary goal of this study was to explore the spatial and temporal distribution pattern of CIs in the United States from 2004 to 2013. The GIS tools and statistical methods are used in this study, for investigating the correlation between demographic/socio-economic characteristics and CIs′ distribution pattern, as well as assessing the factor which may affect state′s demand for CIs.

Finding of the study are presented as follows:

First, the temporal distribution of CIs from 2004-2013 are not evenly distributed. The number of CIs increased from one in 2004 to ninety-six in 2013, with peak growth of twenty-four institutes in 2007. Growth peaks of CIs also are observed in 2007, 2008 and 2009.

Second, the spatial distribution of CIs is more complex and appears to be sensitive to time variation. In 2004, the first CIs were established in the east coast, located in Maryland. In the next year four CIs were launched and evenly spread out in East coast, Midwest and West coast. In 2007, 17 CIs opened at Tennessee, Texas, Illinois, Missouri and Indiana. In 2008 there was 16 CIs established and twelve CIs established in 2009, most were located in east coast, west coast and Great Lakes Megalopolis region. From 2010 to 2013 CIs tend to spread out to middle and west of the continental United States.

Third, the spatial patterns of CIs are not evenly distributed. It is particularly clustered around metropolitan region, especially concentrated in east coast and Great Lakes Megalopolis region. The top three states that have the most CIs is New York, California and Ohio. (See appendix I)

Fourth, visually, CIs appear to be located in high annual income, urban areas and high population density areas. Counties with greater rates of high educational attainment also have a strong correlation with CIs' location.

Fifth, multiple regression analysis indicates that educational attainment and the China-U.S. State trade volume affecting the state's demand for CIs in the United States. The state with higher educational attainment rates and higher China-U.S. trade volume is relatively have more student enrolled in CIs, therefore suggests a higher demand for CIs in a statewide. This result indicates that the educational attainment, as well as regional economic ties between China and the U.S, creates more Chinese language skill demand.

Sixth, Spearman's rank correlation analysis reveals that the correlation between CIs' location and local demographic/socio-economic characteristics are not statistically significant. Although the visual maps show a tendency for this correlation, the spatial pattern of CIs was not simply impacted by local demographic characteristics and socioeconomic states. These result imply a more complex approach when Hanban set its site selection criteria for CIs.

Seventh, CIs are most likely to avoiding the area with low annual and fewer educated people, as shown by the negative and significant results of Spearan's rank Correlation analysis results. In this regard, economics factor and education still play an essential role in shaping the spatial distribution pattern of CIs.

These results may have wide implications for understanding CIs locational behavior. CIs' policymaker should take geographical area differences into account when they evaluate CIs' performance or decide a location for a new institute. Because relatively

little analysis has been done on CIs′ spatio-temporal distribution in the United States, these results also can be used for Hanban to developing CIs′ growth strategy.

Limitations and Recommendations for Future Research

There are several limitations in this study. First, the CCs′ data were not used in the study. In my database, some of the CIs reported data as a single entry while others reported data for their CCs separately. In this case, I have to combine all the CCs data as one entry affiliated with its CIs. Actually, if the spatial distribution patterns of CCs could be analyzed, the results of this study could be more accurate and reliable. But due to the fact that some of CCs' databases are not public and not updated during the time of this study, I had to carefully choose CIs′ databases as the main data source. Future research would benefit if those CCs' spatial information can be included.

Another important limitation in this study is the reliance of CIs′ spatial pattern analysis. It is hypothesized that CIs′ spatial pattern would be affected by demographic and socio-economic composition; however, statistical analysis only shows a weak association, which implied a more complex decision policy of the CIs′ location. In order to study how the CIs have been approved its geographical location, future study should consider more factor such as the qualities of CIs′ director. These qualities may included director′s leadership style, the ability of execution, and their personal network, etc. For instance, Xulin, as the director of CIs′ headquarter, admitted that some of CIs were established in the United States because of her personal relationship (Xulin,2012).

In addition, this study relies on student enrollment to measure the state's demand for CIs. This variable is not a precise estimate for evaluation, as the demand for CIs is

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correlated with many other variables, such as business opportunities and personal interest. Since those variables are difficult to quantified, and development of such a evaluational system was beyond the scope of this thesis, I controlled those factor and isolated their effects. However, the results of this study may give clues for developing an evaluation system of regional demand for Mandarin Chinese and CIs. Future research may develop a more reliable measures by using my results.

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APPENDIX I: List of CIs in the United States by State

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
Confucius Institute at University of Alaska Anchorage	2008	3211 Providence Drive	Anchorage	Anchorage	AK	99508	东北师范大学	Annie Ping Zeng	Ming Lu	907-786-1760
Confucius Institute at Troy University	2007	601 university Avenue	Troy	Pike	AL	36082	河北科技师范学院	Iris Hong Xu	TBA	334-808-6290
Confucius Institute at Auburn University at Montgomery	2012	7440 East Dr#107	Montgomery	Montgomery	AL	36124	湖北经济学院	Yang, Eric	Hu Lei	334-244-3629
Confucius Institute at the University of Central Arkansas	2007	201 Donaghey Ave Conway	Conway	Faulkner	AR	72035	华东师范大学	Guo-ou Zhuang	Xiaohong Lu	501-852-5221
Confucius Institute at Arizona State University	2007	699 S MILL AVE	Tempe	Maricopa	AZ	85287	四川大学	Joe Cutter	Fannie Tam	480-965-7179
Confucius Institute at the University of Arizona	2007	1295 N Martin Ave	Tucson	Pima	AZ	85724	None	John W. Olsen	Zhaochen	520-626-5124
Confucius Institute at Stanford University	2009	450 Serra Mall Building one	Stanford	Santa Clara	CA	94305	北京大学	Connie Chin	TBA	650-725-1775
Confucius Institute at San Francisco State University	2005	1600 holloway Avenue	San Francisco	San Francisco	CA	94132	北京师范大学	Jiaxin Xie	Chengnian Wu	415-338-7631
Confucius Institute at San Diego State University	2008	5500 Campanile Drive	San Diego	San Diego	CA	92182	厦门大学	Paul Wong	Wei Lu	619-594-5456
Confucius Institute at the University of California, Los Angeles	2006	405 Hilgard Avenue	Los Angeles	Los Angeles	CA	90095	上海交通大学	Susan Pertel Jain	Xiaojie Ma	310-825-0322
Confucius Institute at University of California, Davis	2013	1 Shields Ave	Davis	Yolo	CA	95616	江南大学	Michelle Yeh	Lixia Liu	530-754-1234
Confucius Classroom at the Chinese Language Education and Research Center	2008	510 Broadway	Millbrae	San Mateo	CA	94930	国侨办	N/A	N/A	919-314-2826
Confucius Institute at Community College of Denver	2007	2190 East Iliff Avenue	Denver	Denver	CO	80217	重庆三峡学院	Jane Lim	Gang Xu	303-352-5030
Confucius Institute at Corolado State University	2012	1062 Campus Delivery	Fort Collins	Larimer	CO	80521	湖南大学	Harry Imbeau	Xuemei Luo	970-492-4018
Confucius Institute at Central Connecticut State University	2012	1615 Stanley St.	New Britain	Hartford	CT	6053	山东师范大学	Steve Kliger	TBA	860-832-1771
Confucius Institute at the University of Delaware	2010	5 W MAIN ST	Newark	New Castle	DE	19716	厦门大学	Jianguo Chen	Jianjun Huang	302-831-7188
Confucius Institute at Miami Dade College	2009	1780 West 49th Street	Hialeah	Miami-Dade	FL	33132	徐州师范大学	Xuejun Yu	Wenghui Zhang	305–237-7581
Confucius Institute at the University of South Florida	2007	4204E Fowler Ave.	Tampa	Hillsborough	FL	33620	南开大学	Kun Shi	Mingjian Zhang	813-974-6740
Confucius Institute at Broward County Public Schools	2013	600 SE Third Ave	Fort Lauderdale	Broward	FL	33301	N/A	N/A	N/A	N/A
Confucius Institute at Atlanta	2008	1707 N Decatur Rd	Atlanta	DeKalb, Fulton	GA	30322	南京大学	Rong Cai	Yuhai Ren	404-727-8186
Confucius Institute at Georgia State University	2010	33 Gilmer St SE#200	Atlanta	DeKalb, Fulton	GA	30302	北京语言大学	Kimberly Griffin	Zhong Chen	404-413-5298

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
Confucius Institute at Kennesaw State University	2008	1000 Chastain Road Northwest	Kennesaw	Cobb	GA	30144	扬州大学	Ken Jin	Dongmei Liao	770-423-6048

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
Confucius Institute at Wesleyan College	2012	4760 Forsyth Rd	Macon	Bibb	GA	31210	广州大学	Vivia Fowler	Xiaoping Jiang	478-757-2450
Confucius Institute at the University of Hawaii	2005	2500 Campus Road	Honolulu	Honolulu	HI	96822	北京外国语大学	Cythia Ning	Qikeng Li	808-956-2692
Confucius institute at the university of Iowa	2006	201 S Clinton st.	Iowa City	Johnson	IA	52242	华东师范大学	Chuanren Ke	TBA	319-335-3857
Confucius Institute at Northwest Nazarene Unversity	2013	623 S University Blvd	Nampa	Canyon	ID	83686	西北大学	N/A	N/A	208-467-8439
Confucius Institute in Chicago	2005	1034 N. Wells Avenue	Chicago	Cook	IL	60610	华东师范大学	Dali Yang	TBA	773-534-0021
Confucius institute at the university of Chicago	2009	5801S ellis Ave	Chicago	Cook	IL	60637	中国人民大学	N/A	N/A	N/A
Confucius Institute at University of illinois at Urbana-Champaig	2013	901 West illinois St	Urbana	Champaign	IL	61801	N/A	Hua-Hua Chang	Jian Zhang	217-333-1000
Confucius Institute at Valparaiso University (CIVU)	2007	1700 Chapel Drive	Valparaiso	Porter	IN	46383	浙江工业大学	Jianyun Meng	TBA	219-465-9490
Confucius Institute in Indianapolis	2007	425 University Blvd,Suite 129	Indianapolis	Marion	IN	46202	中山大学	Zao C. Xu	MenJi Wu	317-274-0547
Confucius Institute at Purdue University	2006	640 Oval Drive	West Lafayette	Tippecanoe	IN	47907	上海交通大学	Wei Hong	TBA	765-494-3859
Confucius Institute at the University of Kansas	2005	12610 quivira Rd.	Overland Park	Johnson	KS	66213	中国华中师范大学	Sheree Willis	TBA	913-897-8613
Confucius Institute at Western Kentucky University	2010	1906 College Heights Blvd. #31082	Bowling Green	Warren	KY	42101	四川外语学院	Terrill Martin	TBA	270-745-0111
Confucius Institute at Kentucky University	2010	620 S. Limestone	Lexington	Lexington-*Fayette* Urban	KY	40506	上海大学	Huajing Maske	TBA	859-257-4607
Confucius Institute at Xavier University of Louisiana	2012	1 Drexel Dr.	New Orleans	Orleans Parish	LA	70125	N/A	Yu Jiang	rongyao wen	504-520-7237
Confucius Institute at Tulane University	2013	6823 St. Charles Ave	New Orleans	Orleans Parish	LA	70118	N/A	Huimin Xie	Quanhong Zhu	504-862-3659
Confucius institute at the university of Massachusetts(boston)	2006	100 WILLIAM T MORRISSEY BLVD	Boston	Suffolk	MA	2133	中国人民大学	Baifeng Sun	Chengyun Liu	617.287.7291
Confucius institute at the university of Maryland	2004	220 Arch St # 14	baltimore	Baltimore	MD	20742	天津南开大学	Donna L. Wiseman	Jianxin Cui	301-405-0213
Confucius institute at Wayne State University	2007	5229 Cass Avenue	detroit	Wayne	MI	48202	华中科技大学	Brender, John	Liang, Li	313-577-0153
Confucius institute at Michigan State University	2006	1407 S Harrison Rd	East lansing	Ingham	MI	48824	中央广播电视大学	Richard Prawat	Ruhui Ni	517-353-6417
Confucius Institute at the University	2009	715 North	Ann Arbor	Washtenaw	MI	48104	中国人民大学	Joseph Lam	Hao Chen	734-764-8888

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
of Michigan		University Ave								
Confucius Institute at Western Michigan University	2009	1903 West Michigan Avenue,	Kalamazoo	Kalamazoo	MI	49008	北京语言大学	Wolfgang schlor	Haitao yu	269-387-3951

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
Confucius Institute at the University of Missouri	2011	111 Jesse Hall	Columbia	Boone	MO	65211	上海师范大学	Wen Ouyang	TBA	573-882-9061
Confucius Institute at Webster University	2007	470 E. Lockwood Ave	Saint Louis	St. Louis	MO	63101	北京语言大学	Deborah Trott Pierce	Ge Lisheng	314-246-2202
Confucius Institute at the University of Montana	2008	32 Campus Drive,	Missoula	Missoula	MT	59812	西南政法大学	Chen Suhan	TBA	406-243-2895
Confucius Institute at North Carolina State University	2006	4700 Hillsborough Street	Raleigh	Wake	NC	27606	中国南京师范大学 7th	Anna Lamm	Dr. Jianning Ding	919-513-2924
Confucius Institute at Pfeiffer University	2008	4701 PARK ROAD	CHARLOTTE	Mecklenburg	NC	28109	中国山西大学 46th	Weihong Yan	TBA	704-237-3366
North Carolina Center of International Understanding Confucius Classroom Network	2009	100 East Six Forks Rd.	Raleigh	Wake	NC	27609	南京师范大学	Rick Van Sant	TBA	N/A
Confucius Institute at Dickinson State University	2011	291 campus Drive	Dickinson	Stark	ND	58601	太原理工大学	N/A	TBA	N/A
Confucius Institute at the University of Nebraska_Lincoln	2007	1400 R Street	Lincoln	Lancaster	NE	68588	西安交通大学	Charles Wood	Rachel Zeng	402-472-5370
Confucius Institute at the University of New Hampshire	2010	105 MAIN ST	Durham	Strafford	NH	3824	成都学院	Yige Wang	Jie Du	603-862-3565
Confucius Institute at Rutgers, the State University of New Jersey	2007	43 College Avenue	New Brunswick	Middlesex	NJ	8901	吉林大学	Ching-I Tu	TBA	848-932-2490
Confucius Institute at New Mexico State University	2007	1780 East University Avenue	Las Cruces	Dona Ana	NM	88003	石家庄语言文化交流学院	Liu Guiyun:	Ren Qiang	575-646-7041
Confucius Institute at Clark County School District	2013	5100 W Sahara Ave	Las Vegas	Clark	NV	89166	N/A	N/A	N/A	N/A
Confucius Institute at the State university of New York at Buffalo	2009	12 Capen Hall	Buffalo	Erie	NY	14260	中国首都师范大学	Jiyuan Yu	Qiaomei Lu	716-645-6480
Confucius institute at Stony Brook University	2008	100 Nicolls Road	Stony Brook	Suffolk	NY	11794	中南财经政法大学	William Arens	TBA	631-632-5477
Confucius Institute at State College of Optometry	2009	33 West 42 nd Street,	New York	New York	NY	10036	温州医学院	Jeffrey Philpott	LiLi Tu	212-938-1012
Confucius Institute at China Institute	2005	125 East 65th Street,	New York	New York	NY	10065	华东师范大学	James B. Heimowitz	TBA	212-744-8181
Confucius Institute at Pace University	2006	551 5th Ave	New York	New York	NY	10017	江苏凤凰出版传媒集团	Weihua Niu,	Min Zhu	212-346-1880
Asia Society Confucius Classroom	2008	725 Park Avenue	New York	New York	NY	10021	国侨办	Josette Sheeran	TBA	212-288-6400

Network

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
Confucius Institute at Columbia University	2009	2960 Broadway	New York	New York	NY	10027	中国人民大学	Lening Liu	TBA	212-854-5027
Confucius Institute of Chinese Opera at the State University of New York at Binghamton	2009	4400 VESTAL PKWY E	VESTAL	Broome	NY	13902	中国戏曲学院	Han Dongqing	TBA	607-777-3056

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
Confucius Institute at Alfred University	2008	1 Saxon Drive	Alfred	Allegany	NY	14802	中国地质大学（武汉）	Wilfred V. Huang	Tao Peng	607-871-2763
Confucius Institute at the University of Akron	2008	302 Buchtel Mall	Akron	Summit	OH	44325	河南大学	Holly Harris Bane	Mingzhou Qin	330-972-2013
Confucius Institute at Miami University	2007	19 North Poplar Street	Oxford	Butler	OH	45056	辽宁师范大学	Chen Zha	Leng Hui,	513-529-2670
Confucius Institute at Cleveland State University	2008	2121 Euclid Avenue,	Cleveland	Cuyahoga	OH	44115	首都经贸大学	Haigang Zhou	Xuhong Zhang	216-523-7127
Confucius Institute at the University of Toledo	2008	2801 West Bancroft Street,	Toledo	Lucas	OH	43606	燕山大学	Xinren Yu	Dawei Han	419-530-7750
Confucius Institute at East Central Ohio Educational Service Center	2013	834 E High Ave	New Philadelphia	Tuscarawas	OH	44663	N/A	N/A	N/A	N/A
Confucius Institute at the University of Oklahoma (OUCI)	2006	660 Parrington	Norman	Cleveland	OK	73019	北京师范大学	Sharon Gou	Yiqing Huang	405-325-0208
Confucius Institute at Portland State University	2007	1633 SW PARK AVE	Portland	Multnomah	OR	97201	苏州大学	Meiru Liu	Mingqiang Gao	503-725-9810
Confucius Institute at the University of Oregon	2007	1585 East 13th Avenue,	Eugene	Lane	OR	97403	华东师范大学	Ina Asim,	Lan Dai	541-346-5056
Confucius Institute at Pennsylvania State University	2011	417 Old Main University Park	Pennsylvania	Centre	PA	16802	大连理工大学	N/A	N/A	N/A
Confucius Institute at the University of Pittsburgh	2007	4200 Fifth Avenue	Pittsburgh	Allegheny	PA	15260	武汉大学	Michele Ferrier Heryford	Tingting Guo	412-648-2256
Confucius Institute at Germantown Academy	2013	340 Morris Rd	Fort Washington	Montgomery	PA	19034	N/A	N/A	N/A	267-405-7563
Confucius Institute at the University of Rhode Island	2007	75 LOWER COLLEGE ROAD	Kingston	Washington	RI	2881	浙江大学	Wenchao He	TBA	401-874-1000
Confucius Institute at Bryant University	2006	1150 Douglas Pike.	Smithfield	Providence	RI	2917	中国地质大学（武汉）	Hong Yang,	Kun Xie	401-232-6884
Confucius institute at the university of South Carolina	2008	1600 Hampton Street	Columbia	Richland	SC	29208	北京语言大学	Tan Ye	Qing liang	803-777-7660
Confucius Institute at Presbyterian College	2008	503 South Broad St.	Clinton	Laurens	SC	29325	贵州大学	Zihua Liu	Yinpan	864-833-8633

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
Confucius Institute at the University of Memphis	2007	3641 Central Avenue	Memphis	Shelby	TN	38152	湖北大学	Hsiang-te Kung	Hu Xiaoyan	901-678-2595
Confucius Institute at Middle Tennessee University	2009	1301 East Main Street	Murfreesboro	Rutherford	TN	37132	杭州师范大学	Quanping Zheng	Yiping Chui	615-494-8696
Confucius Institute at the university of Texas at San Antonio	2009	1 UTSA Circe,	San Antonio	Bexar	TX	78249	中国对外经济贸易大学	Wan Xiang Yao	TBA	210-458-4011
Confucius Institute at Texas A&M University	2007	509 UNIVERSITY DR	College Station	Brazos	TX	77840	中国海洋大学	Randy Kluver	Haiyan Xue	979-845-3099

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
Confucius Institute at University of Texas at Dallas	2007	800 West Cambell Road	Richardson	Dallas	TX	75080	三峡大学	Ming Dong Gu	TBA	972-883-2760
Confucius Institute at Houston Independent School District	2013	4400 West 18th St.	Houston	Harris	TX	77092	N/A	N/A	N/A	713-556-6000
Confucius Institute at the University of Utah	2007	201 presidents Circle	Salt Lake City	Salt Lake	UT	84112	四川大学	Fusheng Wu	Yangmin Xiao	801-585-0988
Confucius Institute at Davis School District	2013	45 E State Street	Farmington	Davis	UT	84025	N/A	N/A	N/A	N/A
Confucius Institute at George Mason University	2008	4400 University Drive	Fairfax	Fairfax	VA	22030	中国北京语言大学	Gaoqing	TBA	703-993-7780
Confucius Institute at the College of William and Mary	2011	308 Jamestown Road	Williamsburg	Williamsburg	VA	23187	北京师范大学	Yanfang Tang	Ma Lei	757-221-1286
Confucius Institute at Old Dominion University	2013	5115 Hampton Blvd	Norfolk	Norfolk	VA	23529	N/A	Qiu Hailstork	TBA	757-683-7058
Confucius Institute at the Academy of International Studies at Rosemont	2013	1330 Branch Road	Norfolk	Norfolk	VA	23510	N/A	N/A	N/A	N/A
Confucius Institute at the State of Washington (University of Washington)	2009	1959 NE PACIFIC ST	Seattle	King	WA	98195	四川大学	Jeffrey Riedinger,	Wang Wenqiu	206-252-8694
Confucius Institute at the University of Wisconsin-Platteville	2007	1 University Plaza	Platteville	Grant	WI	53818	中南民族大学	Mei Reeder	Victor Yu	608-342-1310

APPENDIX II: List of CIs in the United States by Launched Date

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
Confucius institute at the university of Maryland	2004	220 Arch St # 14	baltimore	Baltimore	MD	20742	天津南开大学	Donna L. Wiseman	Jianxin Cui	301-405-0213
Confucius Institute at San Francisco State University	2005	1600 holloway Avenue	San Francisco	San Francisco	CA	94132	北京师范大学	Jiaxin Xie	Chengnian Wu	415-338-7631
Confucius Institute at the University of Hawaii	2005	2500 Campus Road	Honolulu	Honolulu	HI	96822	北京外国语大学	Cythia Ning	Qikeng Li	808-956-2692
Confucius Institute in Chicago	2005	1034 N. Wells Avenue	Chicago	Cook	IL	60610	华东师范大学	Dali Yang	TBA	773-534-0021
Confucius Institute at the University of Kansas	2005	12610 quivira Rd.	Overland Park	Johnson	KS	66213	中国华中师范大学	Sheree Willis	TBA	913-897-8613
Confucius Institute at China Institute	2005	125 East 65th Street,	New York	New York	NY	10065	华东师范大学	James B. Heimowitz	TBA	212-744-8181
Confucius Institute at the University of California, Los Angeles	2006	405 Hilgard Avenue	Los Angeles	Los Angeles	CA	90095	上海交通大学	Susan Pertel Jain	Xiaojie Ma	310-825-0322
Confucius institute at the university of Iowa	2006	201 S Clinton st.	Iowa City	Johnson	IA	52242	华东师范大学	Chuanren Ke	TBA	319-335-3857
Confucius Institute at Purdue University	2006	640 Oval Drive	West Lafayette	Tippecanoe	IN	47907	上海交通大学	Wei Hong	TBA	765-494-3859
Confucius institute at the university of Massachusetts(boston)	2006	100 WILLIAM T MORRISSEY BLVD	Boston	Suffolk	MA	2133	中国人民大学	Baifeng Sun	Chengyun Liu	617.287.7291
Confucius institute at Michigan State University	2006	1407 S Harrison Rd	East lansing	Ingham	MI	48824	中央广播电视大学	Richard Prawat	Ruhui Ni	517-353-6417
Confucius Institute at North Carolina State University	2006	4700 Hillsborough Street	Raleigh	Wake	NC	27606	中国南京师范大学 7th	Anna Lamm	Dr. Jianning Ding	919-513-2924
Confucius Institute at Pace University	2006	551 5th Ave	New York	New York	NY	10017	江苏凤凰出版传媒集团	Weihua Niu,	Min Zhu	212-346-1880
Confucius Institute at the University of Oklahoma (OUCI)	2006	660 Parrington	Norman	Cleveland	OK	73019	北京师范大学	Sharon Gou	Yiqing Huang	405-325-0208
Confucius Institute at Bryant University	2006	1150 Douglas Pike.	Smithfield	Providence	RI	2917	中国地质大学（武汉）	Hong Yang,	Kun Xie	401-232-6884
Confucius Institute at Troy University	2007	601 university Avenue	Troy	Pike	AL	36082	河北科技师范学院	Iris Hong Xu	TBA	334-808-6290
Confucius Institute at the University of Central Arkansas	2007	201 Donaghey Ave Conway	Conway	Faulkner	AR	72035	华东师范大学	Guo-ou Zhuang	Xiaohong Lu	501-852-5221
Confucius Institute at Arizona State University	2007	699 S MILL AVE	Tempe	Maricopa	AZ	85287	四川大学	Joe Cutter	Fannie Tam	480-965-7179
Confucius Institute at the University	2007	1295 N Martin Ave	Tucson	Pima	AZ	85724	None	John W. Olsen	Zhaochen	520-626-5124

of Arizona

Confucius Institute at Community College of Denver	2007	2190 East Iliff Avenue	Denver	Denver	CO	80217	重庆三峡学院	Jane Lim	Gang Xu	303-352-5030

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
Confucius Institute at the University of South Florida	2007	4204E Fowler Ave.	Tampa	Hillsborough	FL	33620	南开大学	Kun Shi	Mingjian Zhang	813-974-6740
Confucius Institute at Valparaiso University (CIVU)	2007	1700 Chapel Drive	Valparaiso	Porter	IN	46383	浙江工业大学	Jianyun Meng	TBA	219-465-9490
Confucius Institute in Indianapolis	2007	425 University Blvd,Suite 129	Indianapolis	Marion	IN	46202	中山大学	Zao C. Xu	MenJi Wu	317-274-0547
Confucius institute at Wayne State University	2007	5229 Cass Avenue	detroit	Wayne	MI	48202	华中科技大学	Brender, John	Liang, Li	313-577-0153
Confucius Institute at Webster University	2007	470 E. Lockwood Ave	Saint Louis	St. Louis	MO	63101	北京语言大学	Deborah Trott Pierce	Ge Lisheng	314-246-2202
Confucius Institute at the University of Nebraska_Lincoln	2007	1400 R Street	Lincoln	Lancaster	NE	68588	西安交通大学	Charles Wood	Rachel Zeng	402-472-5370
Confucius Institute at Rutgers, the State University of New Jersey	2007	43 College Avenue	New Brunswick	Middlesex	NJ	8901	吉林大学	Ching-I Tu	TBA	848-932-2490
Confucius Institute at New Mexico State University	2007	1780 East University Avenue	Las Cruces	Dona Ana	NM	88003	石家庄语言文化交流学院	Liu Guiyun:	Ren Qiang	575-646-7041
Confucius Institute at Miami University	2007	19 North Poplar Street	Oxford	Butler	OH	45056	辽宁师范大学	Chen Zha	Leng Hui,	513-529-2670
Confucius Institute at Portland State University	2007	1633 SW PARK AVE	Portland	Multnomah	OR	97201	苏州大学	Meiru Liu	Mingqiang Gao	503-725-9810
Confucius Institute at the University of Oregon	2007	1585 East 13th Avenue,	Eugene	Lane	OR	97403	华东师范大学	Ina Asim,	Lan Dai	541-346-5056
Confucius Institute at the University of Pittsburgh	2007	4200 Fifth Avenue	Pittsburgh	Allegheny	PA	15260	武汉大学	Michele Ferrier Heryford	Tingting Guo	412-648-2256
Confucius Institute at the University of Rhode Island	2007	75 LOWER COLLEGE ROAD	Kingston	Washington	RI	2881	浙江大学	Wenchao He	TBA	401-874-1000
Confucius Institute at the University of Memphis	2007	3641 Central Avenue	Memphis	Shelby	TN	38152	湖北大学	Hsiang-te Kung	Hu Xiaoyan	901-678-2595
Confucius Institute at Texas A&M University	2007	509 UNIVERSITY DR	College Station	Brazos	TX	77840	中国海洋大学	Randy Kluver	Haiyan Xue	979-845-3099
Confucius Institute at University of Texas at Dallas	2007	800 West Cambell Road	Richardson	Dallas	TX	75080	三峡大学	Ming Dong Gu	TBA	972-883-2760
Confucius Institute at the University of Utah	2007	201 presidents Circle	Salt Lake City	Salt Lake	UT	84112	四川大学	Fusheng Wu	Yangmin Xiao	801-585-0988
Confucius Institute at the University of Wisconsin-Platteville	2007	1 University Plaza	Platteville	Grant	WI	53818	中南民族大学	Mei Reeder	Victor Yu	608-342-1310
Confucius Institute at San Diego State University	2008	5500 Campanile Drive	San Diego	San Diego	CA	92182	厦门大学	Paul Wong	Wei Lu	619-594-5456

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
Confucius Institute at University of Alaska Anchorage	2008	3211 Providence Drive	Anchorage	Anchorage	AK	99508	东北师范大学	Annie Ping Zeng	Ming Lu	907-786-1760
Confucius Classroom at the Chinese Language Education and Research Center	2008	510 Broadway	Millbrae	San Mateo	CA	94930	国侨办	N/A	N/A	919-314-2826

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
Confucius Institute at Kennesaw State University	2008	1000 Chastain Road Northwest	Kennesaw	Cobb	GA	30144	扬州大学	Ken Jin	Dongmei Liao	770-423-6048
Confucius Institute at the University of Minnesota	2008	4 SOUTHEAST OAK STREET	Minneapolis	Hennepin	MN	55455	首都师范大学	Joan Brzezinski	Dehui Liang	612-625-5080
Confucius Institute at the University of Montana	2008	32 Campus Drive,	Missoula	Missoula	MT	59812	西南政法大学	Chen Suhan	TBA	406-243-2895
Confucius Institute at Pfeiffer University	2008	4701 PARK ROAD	CHARLOTTE	Mecklenburg	NC	28109	中国山西大学 46th	Weihong Yan	TBA	704-237-3366
Confucius institute at Stony Brook University	2008	100 Nicolls Road	Stony Brook	Suffolk	NY	11794	中南财经政法大学	William Arens	TBA	631-632-5477
Asia Society Confucius Classroom Network	2008	725 Park Avenue	New York	New York	NY	10021	国侨办	Josette Sheeran	TBA	212-288-6400
Confucius Institute at Alfred University	2008	1 Saxon Drive	Alfred	Allegany	NY	14802	中国地质大学（武汉）	Wilfred V. Huang	Tao Peng	607-871-2763
Confucius Institute at the University of Akron	2008	302 Buchtel Mall	Akron	Summit	OH	44325	河南大学	Holly Harris Bane	Mingzhou Qin	330-972-2013
Confucius Institute at Cleveland State University	2008	2121 Euclid Avenue,	Cleveland	Cuyahoga	OH	44115	首都经贸大学	Haigang Zhou	Xuhong Zhang	216-523-7127
Confucius Institute at the University of Toledo	2008	2801 West Bancroft Street,	Toledo	Lucas	OH	43606	燕山大学	Xinren Yu	Dawei Han	419-530-7750
Confucius institute at the university of South Carolina	2008	1600 Hampton Street	Columbia	Richland	SC	29208	北京语言大学	Tan Ye	Qing liang	803-777-7660
Confucius Institute at Presbyterian College	2008	503 South Broad St.	Clinton	Laurens	SC	29325	贵州大学	Zihua Liu	Yinpan	864-833-8633
Confucius Institute at George Mason University	2008	4400 University Drive	Fairfax	Fairfax	VA	22030	中国北京语言大学	Gaoqing	TBA	703-993-7780
Confucius Institute at Stanford University	2009	450 Serra Mall Building one	Stanford	Santa Clara	CA	94305	北京大学	Connie Chin	TBA	650-725-1775
Confucius Institute at Miami Dade College	2009	1780 West 49th Street	Hialeah	Miami-Dade	FL	33132	徐州师范大学	Xuejun Yu	Wenghui Zhang	305–237-7581
Confucius institute at the university of Chicago	2009	5801S ellis Ave	Chicago	Cook	IL	60637	中国人民大学	N/A	N/A	N/A
Confucius Institute at the University of Michigan	2009	715 North University Ave	Ann Arbor	Washtenaw	MI	48104	中国人民大学	Joseph Lam	Hao Chen	734-764-8888

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
Confucius Institute at Western Michigan University	2009	1903 West Michigan Avenue,	Kalamazoo	Kalamazoo	MI	49008	北京语言大学	Wolfgang schlor	Haitao yu	269-387-3951
North Carolina Center of International Understanding Confucius Classroom Network	2009	100 East Six Forks Rd.	Raleigh	Wake	NC	27609	南京师范大学	Rick Van Sant	TBA	N/A
Confucius Institute at the State university of New York at Buffalo	2009	12 Capen Hall	Buffalo	Erie	NY	14260	中国首都师范大学	Jiyuan Yu	Qiaomei Lu	716-645-6480
Confucius Institute at State College of Optometry	2009	33 West 42 nd Street,	New York	New York	NY	10036	温州医学院	Jeffrey Philpott	LiLi Tu	212-938-1012

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
Confucius Institute at Columbia University	2009	2960 Broadway	New York	New York	NY	10027	中国人民大学	Lening Liu	TBA	212-854-5027
Confucius Institute of Chinese Opera at the State University of New York at Binghamton	2009	4400 VESTAL PKWY E	VESTAL	Broome	NY	13902	中国戏曲学院	Han Dongqing	TBA	607-777-3056
Confucius Institute at Middle Tennessee University	2009	1301 East Main Street	Murfreesboro	Rutherford	TN	37132	杭州师范大学	Quanping Zheng	Yiping Chui	615-494-8696
Confucius Institute at the university of Texas at San Antonio	2009	1 UTSA Circe,	San Antonio	Bexar	TX	78249	中国对外经济贸易大学	Wan Xiang Yao	TBA	210-458-4011
Confucius Institute at the State of Washington (University of Washington)	2009	1959 NE PACIFIC ST	Seattle	King	WA	98195	四川大学	Jeffrey Riedinger,	Wang Wenqiu	206-252-8694
Confucius Institute at the University of Delaware	2010	5 W MAIN ST	Newark	New Castle	DE	19716	厦门大学	Jianguo Chen	Jianjun Huang	302-831-7188
Confucius Institute at Georgia State University	2010	33 Gilmer St SE#200	Atlanta	DeKalb, Fulton	GA	30302	北京语言大学	Kimberly Griffin	Zhong Chen	404-413-5298
Confucius Institute at Western Kentucky University	2010	1906 College Heights Blvd. #31082	Bowling Green	Warren	KY	42101	四川外语学院	Terrill Martin	TBA	270-745-0111
Confucius Institute at Kentucky University	2010	620 S. Limestone	Lexington	Lexington-*Fayette* Urban	KY	40506	上海大学	Huajing Maske	TBA	859-257-4607
Confucius Institute at the University of New Hampshire	2010	105 MAIN ST	Durham	Strafford	NH	3824	成都学院	Yige Wang	Jie Du	603-862-3565
Confucius Institute for Business at State University of New York	2010	116 EAST 55TH STREET	New York	New York	NY	10022	南京财经大学	Maryalice Mazzara	Sun Dong	212-317-3518
Confucius Institute at the University of Missouri	2011	111 Jesse Hall	Columbia	Boone	MO	65211	上海师范大学	Wen Ouyang	TBA	573-882-9061
Confucius Institute at Dickinson State University	2011	291 campus Drive	Dickinson	Stark	ND	58601	太原理工大学	N/A	TBA	N/A
Confucius Institute at Pennsylvania State University	2011	417 Old Main University Park	Pennsylvania	Centre	PA	16802	大连理工大学	N/A	N/A	N/A

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
Confucius Institute at the College of William and Mary	2011	308 Jamestown Road	Williamsburg	Williamsburg	VA	23187	北京师范大学	Yanfang Tang	Ma Lei	757-221-1286
Confucius Institute at Auburn University at Montgomery	2012	7440 East Dr#107	Montgomery	Montgomery	AL	36124	湖北经济学院	Yang, Eric	Hu Lei	334-244-3629
Confucius Institute at Corolado State University	2012	1062 Campus Delivery	Fort Collins	Larimer	CO	80521	湖南大学	Harry Imbeau	Xuemei Luo	970-492-4018
Confucius Institute at Central Connecticut State University	2012	1615 Stanley St.	New Britain	Hartford	CT	6053	山东师范大学	Steve Kliger	TBA	860-832-1771
Confucius Institute at Wesleyan College	2012	4760 Forsyth Rd	Macon	Bibb	GA	31210	广州大学	Vivia Fowler	Xiaoping Jiang	478-757-2450
Confucius Institute at Xavier University of Louisiana	2012	1 Drexel Dr.	New Orleans	Orleans Parish	LA	70125	N/A	Yu Jiang	rongyao wen	504-520-7237

Name	Year	Address	City	County	State	Zipcode	ChinesePartner	Director	DeputyDirector	Contact Info
Confucius Institute at Broward County Public Schools	2013	600 SE Third Ave	Fort Lauderdale	Broward	FL	33301	N/A	N/A	N/A	N/A
Confucius Institute at Northwest Nazarene Unversity	2013	623 S University Blvd	Nampa	Canyon	ID	83686	西北大学	N/A	N/A	208-467-8439
Confucius Institute at University of illinois at Urbana-Champaig	2013	901 West illinois St	Urbana	Champaign	IL	61801	N/A	Hua-Hua Chang	Jian Zhang	217-333-1000
Confucius Institute at Tulane University	2013	6823 St. Charles Ave	New Orleans	Orleans Parish	LA	70118	N/A	Huimin Xie	Quanhong Zhu	504-862-3659
Confucius Institute at Clark County School District	2013	5100 W Sahara Ave	Las Vegas	Clark	NV	89166	N/A	N/A	N/A	N/A
Confucius Institute at East Central Ohio Educational Service Center	2013	834 E High Ave	New Philadelphia	Tuscarawas	OH	44663	N/A	N/A	N/A	N/A
Confucius Institute at Germantown Academy	2013	340 Morris Rd	Fort Washington	Montgomery	PA	19034	N/A	N/A	N/A	267-405-7563
Confucius Institute at Houston Independent School District	2013	4400 West 18th St.	Houston	Harris	TX	77092	N/A	N/A	N/A	713-556-6000
Confucius Institute at Texas Southern University	2013	3100 Cleburne St	Houston	Harris	TX	77004	N/A	Roger Hart	Ying Chen	713-313-7022
Confucius Institute at Davis School District	2013	45 E State Street	Farmington	Davis	UT	84025	N/A	N/A	N/A	N/A
Confucius Institute at Old Dominion University	2013	5115 Hampton Blvd	Norfolk	Norfolk	VA	23529	N/A	Qiu Hailstork	TBA	757-683-7058
Confucius Institute at the Academy of International Studies at Rosemont	2013	1330 Branch Road	Norfolk	Norfolk	VA	23510	N/A	N/A	N/A	N/A