Research Report—"Mapping Political Economies Over Time: Teaching Regional Systems Theory with G.W. Skinner's Historical GIS Datasets"

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This study documents an ongoing project compiling and publishing open access Historical GIS manuals, and associated datasets, for teaching the Regional Systems approach to mapping historical world economies to undergraduate and graduate students with no prior knowledge of GIS. Regional Systems Theory was pioneered by the anthropologist G. W. Skinner (lived 1925-2008) to map and measure the effects of economic systems on social and cultural processes over the nineteenth and twentieth centuries.[1] The first edition of the manual "Mapping Political Economies over Time" is described here (Ryavec and Henderson 2017). It focuses on urban systems, trade, and historical demography with examples from 19th century China and France. This manual is a collaborative GIS pedagogical research product of two of Skinner's former students, Karl E. Ryavec and Mark Henderson.

Skinner's oeuvre largely focusses on applications of his theory and methods to explain how demographic processes and cultural institutions were largely conditioned by the trade and

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marketing systems of regional economies in China, France, and Japan (Skinner 1964, 1965, 1985). Skinner applied the term 'macroregion' to describe these historical regional economies centered on the trade and marketing areas of bulk goods prior to the invention of mechanized transportation. Another important aspect to this research project concerns the history of historical GIS itself, because Skinner's research efforts led to the first historical instances of national-level Historical GIS (HGIS) databases being built and utilized for research during the 1980s and 1990s for the study of China, France and Japan. Skinner, however, did not refer to his methodology as HGIS because the term was not widely used until the 1990s, and consequently his efforts have not been recognized as such. For example, in Knowles' (2016) survey of HGIS in relation to the field of Social Science History, no mention is made of this early project on France largely because Skinner did not publish on this area of his research. But when the new HGIS field began to take shape from different disciplines in the 1990s, early proponents quickly recognized how well-suited the project was for the study of regional economic growth and change (Healy and Stamp 2000).

Thus, a hands-on GIS manual of Regional Systems Theory will help students and scholars learn how to conduct theoretically informed spatial histories of economies, societies and polities, and their integrations into the Modern World System, and also ensure that Skinner's work and the methods he pioneered become more visible and central within HGIS. We based the manual on Skinner's original case studies of China, France, and Japan, and described a series of steps illustrated with screen shots from an industry standard GIS software (ArcGIS) and files from freely available datasets. Though, as stated above, this first edition of our manual only contains HGIS exercises pertaining to Skinner's work on China and France, an expanded second edition is currently under development that will also include Japan among other regions. Our pedagogical approach is based on two key premises: First, that the kind of GIS that humanists and social scientists need to learn is perforce more theoretically informed than the environmental science-based GIS commonly taught at the undergraduate level in American colleges and universities; and second, that graduate students often need to learn GIS to conduct their research but lack suitable graduate-level methods courses that teach GIS for beginners while also covering standard literature reviews. This manual "Mapping Political Economies over Time" provides a vehicle for surmounting both of these barriers.

The Relationship between Regional Systems and World-Systems Theories

Regional Systems Theory focusses on how the historical agrarian-based marketing systems of societies functioned according to the logics of regional economies that conditioned aspects of culture, such as demography. Regional Systems Theory also examines how traditional peasant economies and societies changed as they ultimately evolved into industrial political economies. This problem also forms the crux of Immanuel Wallerstein's (1974) World-Systems Theory, with

its main tenet that a Modern Capitalist World System arose in Europe in the sixteenth century and led to European hegemony over a single world economy that connected more and more peoples and their regional economies together through trade, migration, and investment. Before this period, there was no single world economy but instead many regional economies, or macroregions, based where economic activity was largely self-contained due to the limitations of pre-steam powered transportation, but with some interaction with other cultures and civilizations through long-distance trade. The idea that historical groupings of macroregional economies provided the material basis for societies and civilizations was proposed by Fernand Braudel (1981-1984), a key figure of the *Annales* school of history, using the term *économie-monde* (World Economy) to describe those economically autonomous parts of the world.

The striking complementarity between Skinner's Regional Systems Theory and Immanuel Wallerstein's World-Systems Theory can be seen in several similar general rules:

1. The changing geographical extent of world economies over time;
2. The dominance of major urban centers over their hinterlands within each regional economy
3. The hierarchical nature of the nested core-periphery zones.

World-Systems Theory, as it has been articulated so far, however, only provides a generalized mapping according to modern state boundaries. Regional Systems Theory, on the other hand, provides spatial detail on how marketing systems connected urban centers with rural areas, and the historical socioeconomic transformations in human culture that occurred when the Modern Capitalist World System spread and integrated disparate world economies.

Another key difference between World-Systems Theory and Regional Systems Theory lies in the focus of the latter on the marketing of economic surplus directly from peasant production and how this form of commercialization affected social processes according to location, while Wallerstein considers the narrative of greater interest once proletariats subsisting on their wage labor arose in different parts of the world. When this happened, largely due to industrialization initially in Europe, a greater power hierarchy started to operate between urban "core" states, and more rural "periphery" states in which these powerful and wealthy capital-intensive core societies could dominate and exploit weak and poor labor-intensive peripheral societies. Wallerstein, however, generalizes about the historical geography of these socioeconomic changes over centuries by placing entire nations and societies into abstract, spatially undifferentiated developed cores or less developed peripheries according to modern state boundaries. In reality, vast regions since ca. 1500 were beset by uneven development caused by Imperialism, Colonialism, and Capitalism. Some people profited from commercialization side-by-side with peasant subsistence producers. There also exist today historically enduring internal core-periphery geographies within

each of Wallerstein's theoretical cores and peripheries, such as the Celtic Fringe of British national development, and Native American Nations within the United States.

Background to the Development of Regional Systems Theory

Despite a great amount of effort exerted by Skinner over the 1980s through the early 2000s in working on comparative macroregional systems case studies of nineteenth century China, France, and Japan with the support of large grants and specialized workshops, only his work on China and Japan resulted in formal peer-reviewed publications (Skinner 1993, 1994; Skinner, Henderson, and Yuan 2000; see also Henderson 2013). The work on France, in contrast, can only be studied now by reading Skinner's relevant unpublished grant proposals, conference papers, and lectures (Skinner 1988, 1991). Furthermore, Skinner's archived statistical and GIS datasets for France are in disarray compared to his more polished China data available online for the late imperial and PRC periods, and a recent Beta-version of his Japan data (Henderson and Berman, 2016).

There was also a shift in Skinner's refining of Regional Systems Theory over the 1990s to a focus on China's contemporary demographic structure due to the accuracy of China's 1982, 1990, and finally 2000 censuses compared to the largely inaccurate and spatially incomplete historical data on Chinese society. Though there are isolated cases of demographic data for various small areas in China historically, there were no accurate data offering complete spatial coverage of China prior to the 1982 census.[2] Skinner (1987) published key findings on this problem based on nineteenth century population data from Sichuan, where he found that while imperial concern and pressure may have led to short runs of empirically based reports, the reporting system quickly reverted to the systematic fabrication of data. The telltale signs of such fabricated data series are invariant population growth year after year coupled with growth rates that steadily and regularly decline. For this reason, only Skinner's research on France and Japan included the analysis of pre-twentieth century macroregional systems of the entire countries with demographic variables, such as fertility. In his study of dynastic China, mainly during the late Qing period of the nineteenth century, Skinner based his macroregional systems analysis largely on estimates of the size and importance of urban centers. It is mainly due to this reason that Skinner focused on contemporary China in his late research and justified it to some extent by arguing that China retained important traits of a mature Eurasian peasant economy as documented in the 1982 census, and to varying extents in the 1990 and 2000 censuses. Skinner argued that the rigid household residency (Chinese: *hukou*) requirements of the Maoist period, still largely retained by 1990, allowed the traditional

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[2] The China Data Center at the University of Michigan has, more recently, digitized county-level data from the 1953 and 1964 censuses, but even so, those tabulations offer less detailed demographic information than the later censuses and were also subject to Maoist period data rigging and manipulation.

rural-urban characteristics of Chinese civilization to be studied and compared with modern census data alongside recent changes due to economic modernization, such as in rail transportation.

Regional Systems Theory utilizes classic Land Use, Central Place, and Time Geography Theories to quantitatively map and measure how trade and marketing conditioned the human geography of traditional peasant societies, unlike the largely qualitative Marxist approach of Wallerstein's World-Systems Theory. The expansion of a European capitalist mode of production from the 16th century onwards clearly did not lead to global homogenization, but rather to new forms of systematic areal differences in culture and demography, such as in life expectancy, fertility rates, and family systems. The advantage of a regional systems approach to the handling of spatial and historical data for world system and world history theorists lies in its ability to construct and analyze detailed HGIS models of societies, settlement systems, and commercial economies so that a more detailed spatial history of changes wrought by increasing modes of capitalism in the Modern Period may be mapped and compared with earlier patterns.

Criticism of Skinner's Regional Systems approach largely stems from concern that as a spatial model it fetishizes the traditional marketing systems of peasant societies according to geometric zones of urban and rural land use, and that it is unable to take into account impacts from increasing modes of capitalist accumulation and global investment in the Modern Period (Szymanski and Agnew 1981, Cartier 2002). However, much of these lines of criticism represent the frustration of more theoretical scholars that forms of quantification in Regional Systems Theory, specifically its use of HGIS databases, are actually necessary for both testing hypotheses and the generation of new knowledge in historical economic geography. Wide acceptance of this view would threaten contemporary paradigms in how history and geography should be practiced as disciplines. This project argues that constructing and utilizing HGIS datasets can advance the theory-based understanding of impacts from marketing and trade on entire civilizations and societies, and the changes wrought since the 16th century by the rise of a Global Capitalist Economy.

In conclusion, it might be useful to apply the classic parable of the blind men and an elephant to compare Skinner's and Wallerstein's efforts to describe how historical world economies functioned and became more integrated over time. Each approach offers an accurate assessment of a part of the historical world system. In Skinner's case, the impacts of urbanization and marketing on demography and social structure are explained and mapped in detail for the historical economies of China, France, and Japan according to both traditional peasant systems and increasing modes of industrialization. Wallerstein, in turn, explains how and why capitalism developed and spread after about 1500 CE, and impacted historical world economies. The next, and final, section of this article presents the rationales for why specific GIS and cartography techniques are taught to achieve the learning objectives of this Primer of Regional Systems Theory

focusing on the mapping of historical world economies and their integrations into the Modern World System.

Mapping Political Economies over Time:
A Primer of Regional Systems Theory and Methods

The following sections describe each of the four HGIS exercises pertaining to China and France published in Edition 1 of our manual. For each exercise, the overarching rationale and learning objectives are outlined, and the GIS data files are documented. The text of each exercise may be downloaded from the University of California open access publication platform eScholarship (https://escholarship.org). Datasets referenced in this exercise may be downloaded from the Harvard Dataverse repository at https://dataverse.harvard.edu/dataverse/mpe.

GIS Exercise 1: Urban Systems in 19th Century France
Permalink: https://escholarship.org/uc/item/5gh6f7fb

According to Skinner, the first step of regional systems analysis is the assignment of central places to levels in the urban hierarchy. In this first exercise, we provide a brief introduction to basic ArcGIS mapping functions and then proceed with identifying the cities at the top of France's urban hierarchy (Paris and cities at the next highest level) based on population size in the 1831 census. After adding elevation and hydrography layers to help visualize the terrain that would facilitate or hinter interurban commerce, we guide students through the process of how the boundaries of urban systems relate to cities and their hinterlands and use population densities to sketch the core-periphery structures of the systems.

Students completing this exercise will learn basic techniques for displaying and querying GIS vector data, and displaying raster data, and be able to create maps showing the population size of urban centers with point data, and the population density of administrative units (French cantons) with polygon data. They will identify regional economies of the 19th century in relation to the French urban hierarchy and recognize their core-periphery structures in relation to terrain and population density. Files used in this exercise include shapefiles of points (cities), lines (rivers,), and polygons (cantons, watershed boundaries), as well as a raster grid file (a digital elevation model).

GIS Exercise 2: Cities and Water Transportation in 19th Century France
Permalink: https://escholarship.org/uc/item/78h641r7

The economic history of states and societies shows strong interrelationships between inexpensive transport by water, improved market access, cheaper raw materials and economic and demographic

growth. Skinner observed that watershed boundaries—the dividing line between river basins— often formed the boundaries of socioeconomic regions, since transportation costs were less within basins than across mountain passes. As transportation access improved, though, we can expect commerce and culture to follow the canals, railroads, and eventually superhighways that cut across watershed divides. In this exercise we prepare students to test this hypothesis, comparing France in 1831 (before the advent of railroads) with subsequent changes in the agrarian economy based on land and water transport. Students completing this exercise will also learn techniques for selecting geographic features by their attributes (cities of over 25,000 population) and by their proximity to other features (cities within two miles of water transport routes), and to compare statistics for different sets of selected features.

GIS Exercise 3: Urban Systems in 19th Century China
Permalink: https://escholarship.org/uc/item/98k0w8mg
For the third exercise we turn to China, for which Skinner first developed his regional systems approach. Since 19th century China lacks any comprehensive census data, such as we used for the previous analyses of France, Skinner mapped the outlines of the premodern economies of China using a range of 19th and early 20th century data, mainly official gazetteers about the status of towns and cities in the imperial field administration. For this exercise, we start with Skinner's database of administrative capitals of the Qing period (1644-1911) from two China-wide gazetteers published in 1820 and 1893, in addition to numerous local gazetteers. These data were published as the ChinaW dataset, a GIS point file of urban centers with numerous socioeconomic and physical attributes. Students completing this exercise will learn how to use the raster-based Kernel Density function to create a map showing densities of urban populations, approximating the core-periphery patterns Skinner found in each macroregion of China.

GIS Exercise 4: Comparing Urban Population Densities in 19th Century China and France
Permalink: https://escholarship.org/uc/item/5q24s27q
In this exercise, we will compare late 19th century urban population densities between Agrarian China and France based on the best available historical GIS data. Students will re-use their Kernel Density map of urban population densities in China from the previous exercise, and then conduct the same raster-based analysis for France using a new data frame. Displaying these two difference maps at the same scale, France appears comparable to a single one of China's nine macroregions. While such attempts to compare historical aspects of economic development between Europe and non-Western societies are difficult to quantify due to the lack of comparable standardized datasets,

this approach offers a first step that provides a theoretically informed historical GIS technique students may test in other contexts.

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