
DIFFUSING KNOWLEDGE WHILE SPREADING GOD'S MESSAGE:

PROTESTANTISM AND ECONOMIC PROSPERITY IN CHINA, 1840-1920

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Motivation

- Religion and Economic Growth
 - *The Protestant Ethic and the Spirit of Capitalism* (Weber, 1930)
 - teachings of Calvin and Puritan divines of encouraging savings, investment, and relentless pursuit of profit and unintentional consequences of capitalist behavior
 - The “most famous link between culture and economic development” (Acemoglu, Johnson, and Robinson, 2005:401)
 - Empirical vindication of Weber’s thesis have been mixed
 - economic growth was faster in the Protestant countries (Glaeser and Glendon, 1998)
 - no systematic relationship between Protestantism and the spread of capitalism (Delacroix and Nielsen, 2001)
 - available empirical evidence tends to reject rather than support Weber’s thesis (Iannaccone, 1998)

Motivation

- Channels of Protestantism (factors unrelated to Weber's Protestant ethic)
 - Moral codes
 - Protestant countries are less corrupt and provide greater legal protection than do Catholic countries (Lipset and Lenz, 2000; Stulz and Williamson, 2001)
 - Openness
 - Catholicism tends to provide less protection for outsiders than Protestantism did (La Porta, et al, 1998)
 - Spiritual capital
 - Religious beliefs—especially beliefs in the concept of hell (Barro and McCleary 2003; Barro 2004; McCleary and Barro 2006a, 2006b)
 - Social networks
 - Networks fostered by churches are important elements of social capital (Sacerdote and Glaeser 2001; Putnam 2000)
 - Human capital
 - Increase in literacy (Becker and Woessmann, 2009, 2010; Gallego and Woodberry, 2010; Woodberry, 2006, 2007a, 2007b, 2010a, 2010b)

Why China?

- For Weber, China represents the counter-case of the development of Western religion
 - failure for Protestantism to develop in China the main reason behind the failed development of capitalism (Weber, 1930, 1964)
- The external introduction of Western religion
 - allows us to exploit the exogenous variations in the diffusion of Protestantism and the measureable effects of their activities on economic development
- Timing crucial for examining the causality between religious practices and economic outcomes
 - the period under analysis (1840-1920) represents the genesis of widespread capitalist development in China—the setting when the Protestant ethic should be most effective
 - once capitalistic modes of labor relations and production were established, the relationship between religion and economic activity would weaken
 - Protestant ethic would become embodied in general ethical codes and social and legal institutions and would no longer depend on specific forms of religious practices and beliefs

A Preview of the key findings

- Protestantism has a significant and positive effect on economic prosperity or urbanization (OLS), whereas Catholicism is not significant
- Instrumented Protestantism (2SLS) continues to have a significant and positive effect on urbanization, and with larger magnitudes
- “Protestant ethic” is not evident: Counties predominated by Calvinism did not grow fastest
- But counties predominated by the Baptists, the Wesleyans and the Lutherans did:
 - denominations invested most heavily in primary schools and hospitals (a story of knowledge diffusion)

Protestant Ethic and Economic Growth

—the Chinese case

- “The impact of the mission movement came through the spread of Christian texts, the publication of general historical or scientific works, the development of schools, and the introduction of new techniques of medicine” (Spence, 1990, p. 206).
- “Through their texts, their presses, their schools, and their hospitals, the efforts of missionaries affected Chinese thought and practice. The strength of that influence is impossible to calculate, but the missionaries did offer the Chinese a new range of options, a new way of looking at the world” (Spence, 1990, p. 208).

The Introduction of Western Knowledge to China

■ Education

□ Translations and publications of texts

- translations and publications of a wide spectrum of Western knowledge both in the natural sciences and administrative sciences (Western government), culture, history, and geography (Elman, 2006; Spence, 1990)
 - Inkstone Press renowned for being “the publishing Mecca of missionary activities
- Chinese terminologies of important fields (chemistry, geography, animals and plants, astronomy, calculus, mechanics, optics and sound etc.) introduced systematically for the first time
- Jesuits’ attempt to do the same in the 17th century had “limited effects” (Elman, 2005); the Protestants published more books on Western sciences than the Catholics did

Education

□ Erection of Schools

- Effort to introduce Western science and other subjects supplemented by the erection of many missionary schools
 - rapid increase in number of missionary schools and students between 1902-1909 (Gregg, 1946; Lutz, 2001)
 - devoted tremendous resource to teaching training and expansion of missionary force
 - Catholics paled in comparison due to their greater emphasis on the cardinal virtue of preserving and nurturing faith among their followers (Wiest, 2001)
- Introduced a qualitatively new—Western-based— curriculum that emphasized Math, Astronomy, English History, and Geography (Graham, 1995)
- Played an integral part in the development of a national system of education via the School and Textbook Committee (1877) and Educational Association of China (Gregg, 1946) in the midst of Empress Dowager's reinstatement of the Imperial Exams System

Putative flaws in the Chinese education system?

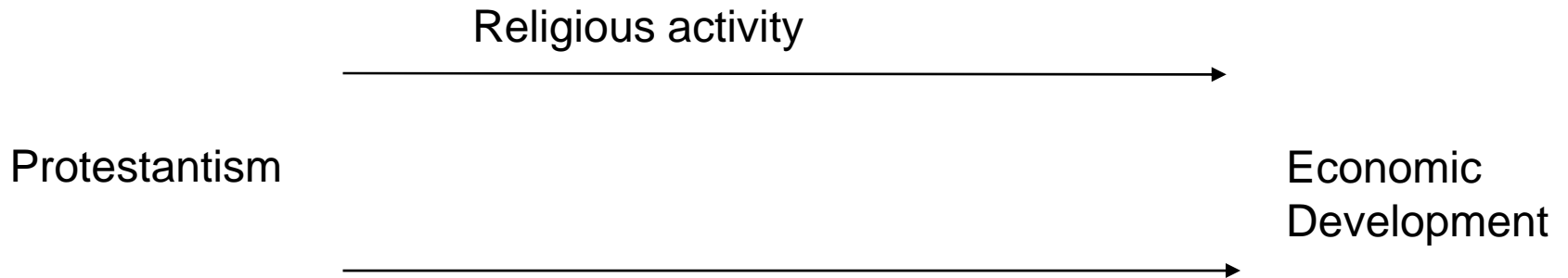
- Western knowledge Vs. Chinese traditional knowledge
 - Traditional Chinese education focused almost singularly on the memorization and mastery of the Confucian classics (for passing the civil exams) and thus bears no relevance for scientific inquiry
 - Various important corpuses of Western knowledge may be more “useful” for economic development (Kuznets, 1965; Yuchtman, 2009)
 - Some attribute the failure of the rise of modern science and industry in late Imperial China to its educational institutions and attendant civil examinations (Ho, 1962; Huff, 2003; Lin, 1995)

Health matters

■ Health

- Established Medical Missionary Society in 1838 and China Medical Missionary Association in 1890
- Pioneered a series of medical and science translations
- Erected many hospitals (271 by 1937) that housed over 224,258 patients and treated more than 4 million out-patients
- set up 140 schools to train nurses
- prior to these endeavors, traditional Chinese medicine was the mainstream medical practices (Needham, 1954)
- Productivity consequence of a healthier workforce?
 - Increase in household knowledge of medicine and health effectively prevented infectious diseases from driving mortality rates in the West after 1870 long before effective cures came about in 1945 (Mokyr, 2002)

Hypothesized channel of Protestantism: Protestant Ethic vs. Knowledge diffusion



Knowledge diffusion

(Aghion and Howitt, 1992; Arrow, 1962; Grossman and Helpman, 1991; Nelson and Phelps, 1966; Romer, 1987, 1990; Solow, 1956; Uzawa, 1965)

Education

Human capital – Literacy (Becker and Woessmann, 2009, 2010; Gallego and Woodberry, 2010; Woodberry, 2006, 2007a, 2007b, 2010a, 2010b)

Human capital – Modern science (Yuchtman, 2009)

Hospital

Health (Mokyr, 2002)

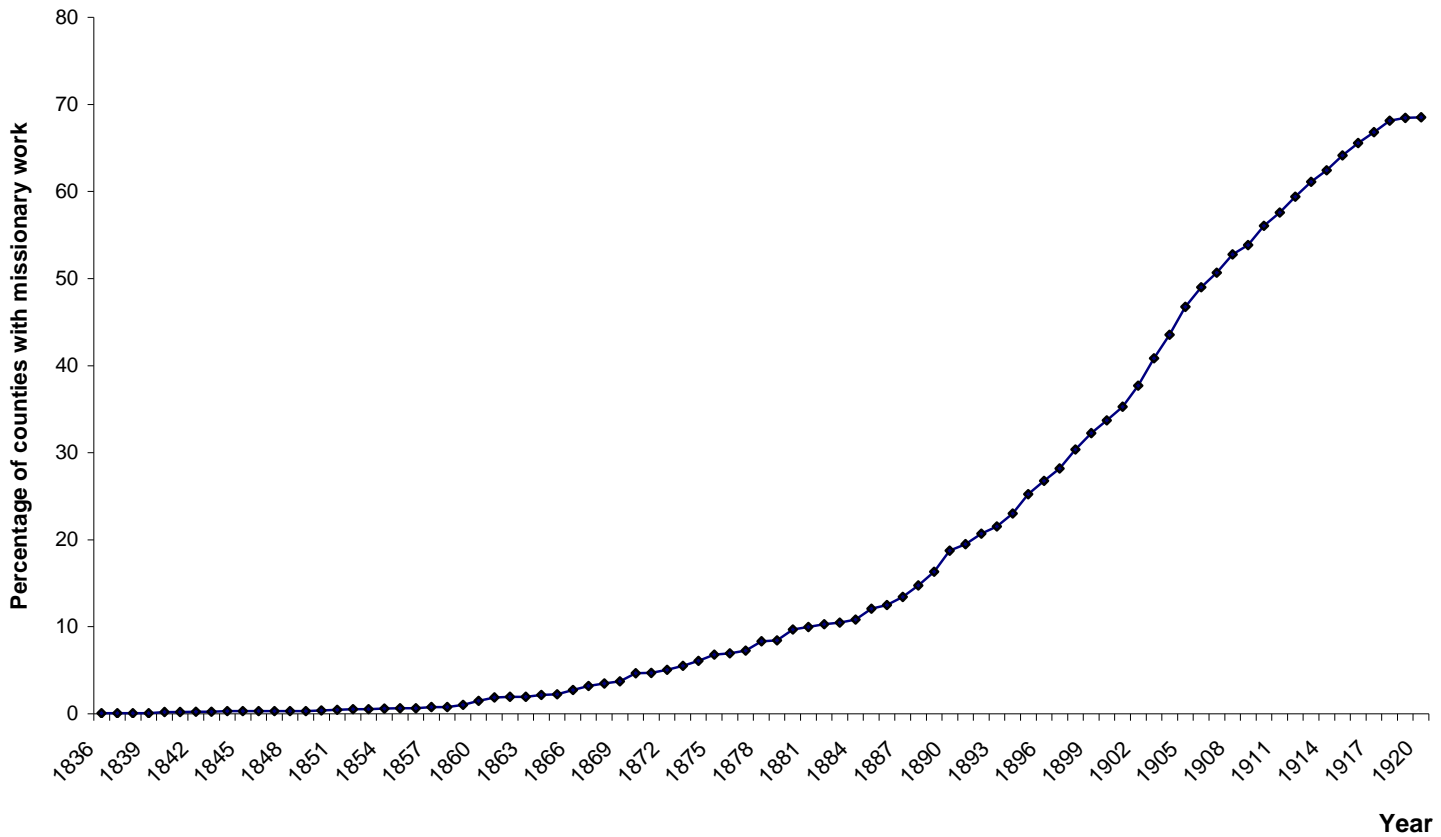
The Roadmap

- The Development of Protestantism
- Data and Variables Definition
- Association between Protestantism and Economic Outcome
- The Possible Channels of Protestantism on Economic Outcome
- Conclusion

The Development of Protestantism

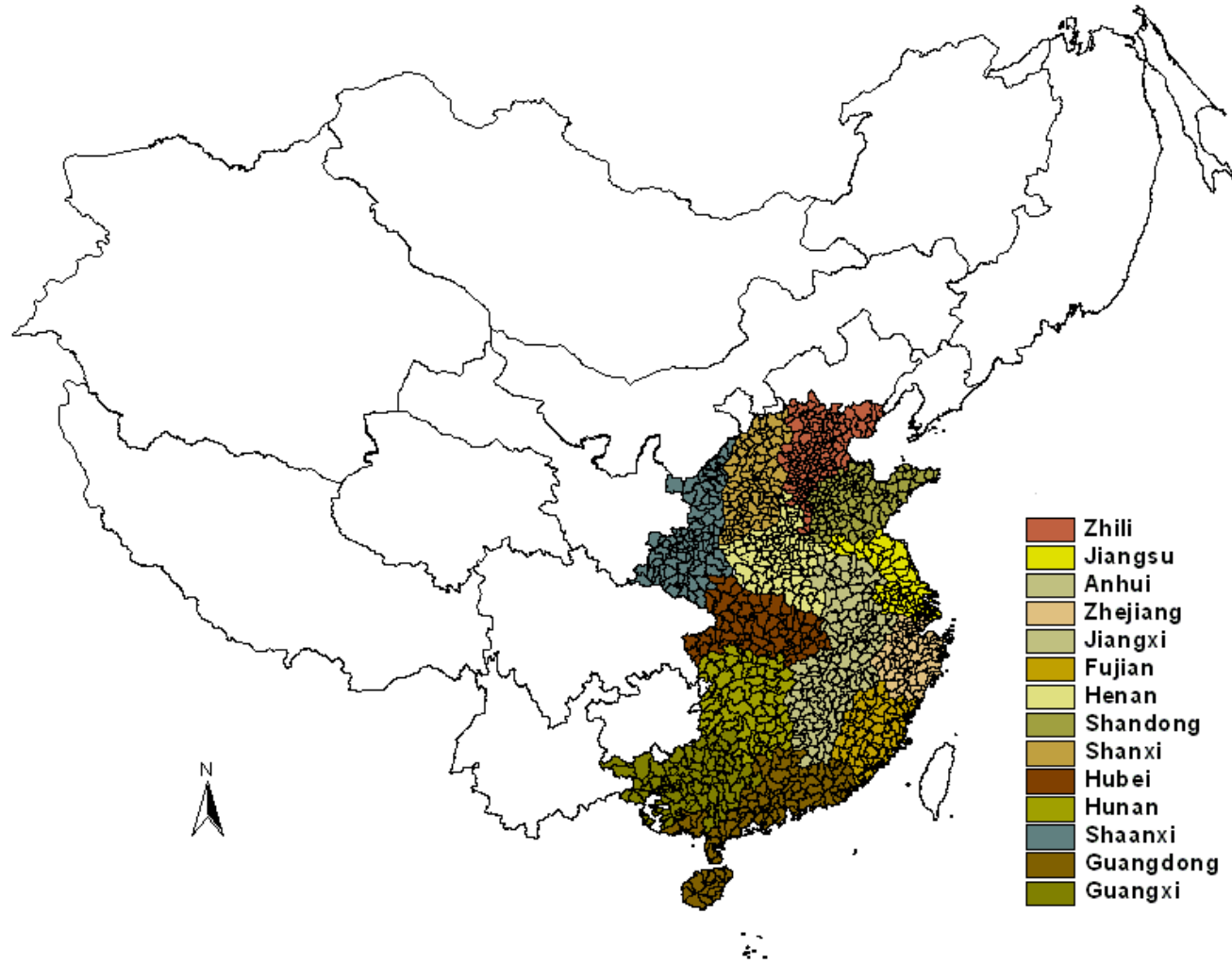
- Opium War (1839-1842)
 - marked the end of China's long-term isolation and the beginning of a new chapter in modern Chinese history
 - Christianity banned entirely in China since 1721 after Emperor *Kangxi* (1661—1722) disagreed with Pope Clement XI's decree over the Chinese Rites Controversy (tolerance of folk religious rites and offerings to the emperor [as idolatry])
 - led to a complete severance of ties with the Western Church
- Signing of various “Unequal Treaties” (e.g. Treaty of Nanjing)
 - *Qing* government was forced to admit Western missionaries into China beyond the treaty ports, after which Protestantism spread quickly
- Trend of missionary presence during 1840-1920
 - 1860-1894 initial growth, thereafter grew substantially
 - [Figure 1](#)

Figure 1: The Development of Protestantism in China



Source: *The Christian occupation of China: a general survey of the numerical strength and geographical distribution of the Christian forces in China.*

Sample Counties



Date sources

- Stauffer, Milton T. 1922
 - *The Christian Occupation of China: A General Survey of the Numerical Strength and Geographical Distribution of the Christian Forces in China*

- Harvard Yenching Institute (January 2007)
 - "CHGIS, Version 4" Cambridge

- Rozman, Gilbert, 1973
 - *Urban Networks in Ch'ing China and Tokugawa Japan*

- Luo, Zhongping, 1955
 - *Selected Statistical Materials of Modern China Economy*

Definition of Variables

Variables	Variables Definition	Observation	Mean	S.D.
Urbanization	Share of urban population in total population	1175	4.309	(12.666)
Protestantism	Total Christian constituencies	1175	418.683	(1197.093)
	Total Christian constituencies (log-term)	1175	4.294	(2.271)
Western influence	Number of Catholic churches/population	1175	0.042	(0.084)
	Treaty ports	1175	0.179	(0.383)
	Railway	1175	0.345	(0.475)
Initial economic conditions	Small city (1840s)	1175	0.031	(0.175)
	Middle city (1840s)	1175	0.022	(0.147)
	Large city (1840s)	1175	0.007	(0.082)
Geographical factors	Prefectural government location	1175	0.150	(0.357)
	<i>Grand Canal</i>	1175	0.037	(0.188)
	<i>Changjiang River</i>	1175	0.048	(0.213)
	Coast	1175	0.108	(0.311)
	Population density	1175	189.399	(211.683)
	Population density (log-term)	1175	4.861	(0.917)
	Size	1175	1914.911	(1218.037)
	Size (log-term)	1175	7.348	(0.688)

The Association between Protestantism and Economic outcome

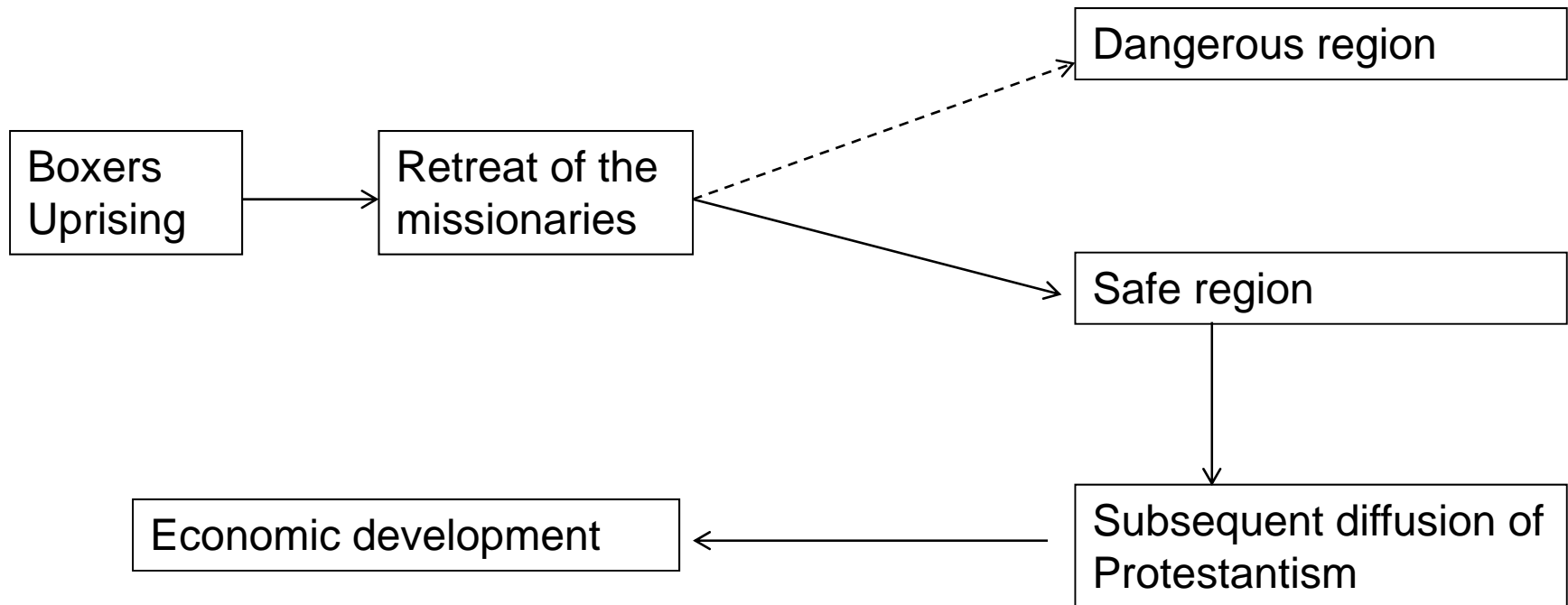
$$y_i = \rho P_i + W_i \gamma + \varepsilon_i$$

	(1)	(2)	(3)	(4)
Protestantism (log-term)	0.908*** (0.178)	0.872*** (0.180)	0.800*** (0.166)	0.768*** (0.168)
Catholicism		6.009 (4.173)		5.574 (3.890)
Small city			6.914*** (1.996)	6.904*** (1.995)
Middle city			18.942*** (2.331)	18.912*** (2.330)
Large city			45.682*** (3.883)	45.654*** (3.881)
Prefectural government location	10.191*** (0.968)	10.027*** (0.974)	4.629*** (1.092)	4.484*** (1.096)
Treaty ports	3.058*** (1.032)	3.070*** (1.031)	1.710* (0.968)	1.722* (0.967)
Railway	0.626 (0.875)	0.631 (0.874)	-0.023 (0.818)	-0.018 (0.818)
Coast	1.547 (1.263)	1.433 (1.265)	1.948* (1.178)	1.842 (1.180)
<i>Changjiang</i> River	0.519 (1.747)	0.387 (1.748)	-1.304 (1.637)	-1.424 (1.639)
Grand Canal	8.729*** (1.859)	8.572*** (1.861)	5.672*** (1.753)	5.530*** (1.755)
Population density (log-term)	1.274** (0.553)	1.565*** (0.589)	0.161 (0.523)	0.432 (0.556)
Size (log-term)	-0.673 (0.650)	-0.405 (0.676)	-1.252** (0.610)	-1.002 (0.634)
Province dummies	Yes	Yes	Yes	Yes
Observations	1175	1175	1175	1175
R-squared	0.22	0.22	0.32	0.33

Endogeneity Issues and Instrumental Variable

- Omitted variables/Reverse causality/Measurement error
- Correcting for the above potential biases using instruments
 - Instrument should be correlated with (subsequent) diffusion of Protestantism but not with urbanization
 - Boxer Uprising culminated in the mass killing of the missionaries in 26 prefectures (Imperial Civil Examination temporarily suspended as a result of the Qing government's decree in June 1901), who fled across China for their lives
 - Boxer Uprising itself not a good instrument but where it occurred can help predict where the missionaries may end up and joined by the new missionaries after peace resumed

Concern for Safety: where the idea of our instrument comes from



A Missionary's Retreat: an example (Saunders, 1900)

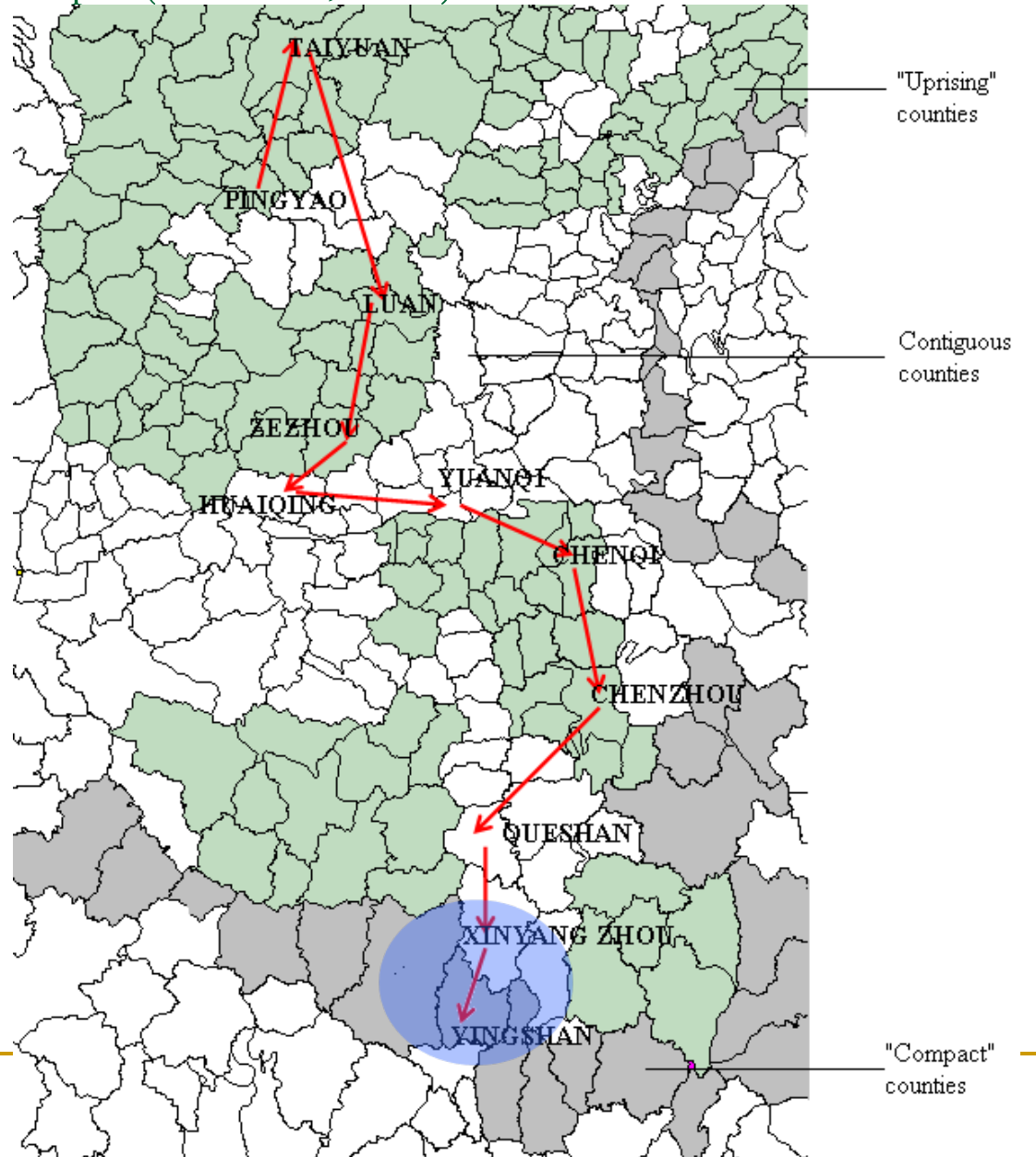
“Uprising” counties



Contiguous counties



“Compact” counties



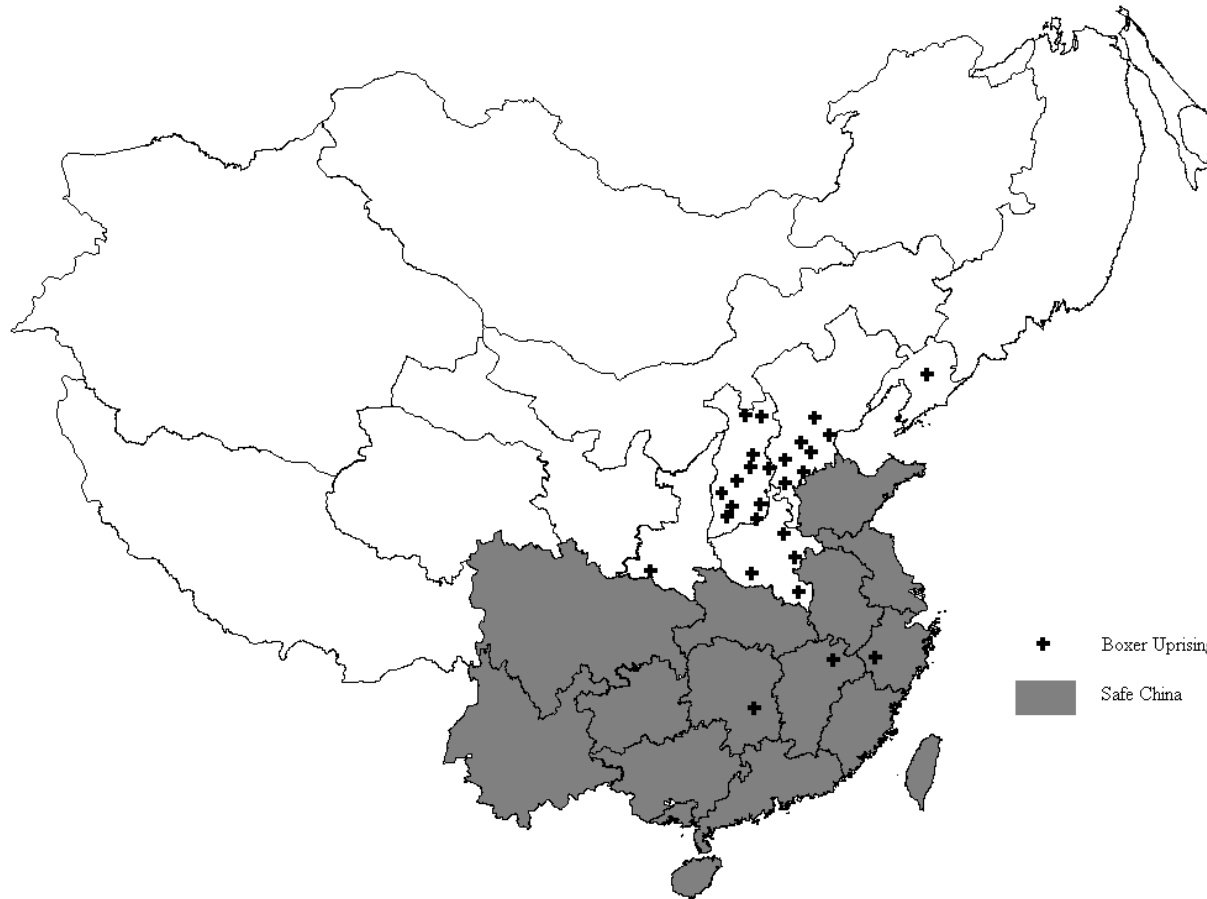
How Safety Varied

- Zezhou (Uprising): “We passed through many towns and villages and it was in this district our suffering reached its climax” (Saunders, 1920, p. 20)
- Huaqing and Yuanqi (Contiguous): “We were treated tolerably well by the officials there”
- Chenzhou (Uprising): “We were sent on by cart, but as common criminals”
- Queshan (Contiguous): “we were taken to a temple, and the Mandarin’s wife sent round sweetmeats for the children”
- Yingshan (Compact): “We found that it was our greatest protection from the wrath of the people to let them know that we were Protestants...”
- Hankou (Compact): “Now we had come to the Hu-pen Province, ruled over by Chang-chih Tung, and we were treated well by all the officials, and instead of travelling as before, in carts...and the rest of our journey to Han-kow was accomplished in comparative comfort. We arrived at our mission house on Tuesday morning, August 14th, in all 49 days since we left Ping-iao.”

The “Yangzi Compact”

- Initiated by Sheng Xuanhuai (the then Ministry of Transportation), YC was an agreement made explicitly between those political elites who did not support the imperial edict of attacking the Western powers, and the foreign consuls who were eager to protect their nationals
 - Sheng disregarded the imperial proclamation and urged the provincial heads in the south—from whom he received tremendous support—not to give it circulation
 - instrumental in formulating a dual policy of neutrality toward affairs in the north and loyalty to the Manchu court
- Occurred when the anti-foreign outbreaks threatened to spread from the north into the Yangzi provinces (located on the southeastern coastal seaboard)
- Quickly “followed by the authorities in the other southern provinces with the result that the fighting and the destruction in the north were effectively kept out of South China” (Feuerwerker, 1958, p. 73)

The “Yangzi Compact” and Two Chinas (in terms of safety)



How Contiguity also mattered

“Uprising” counties



Contiguous counties

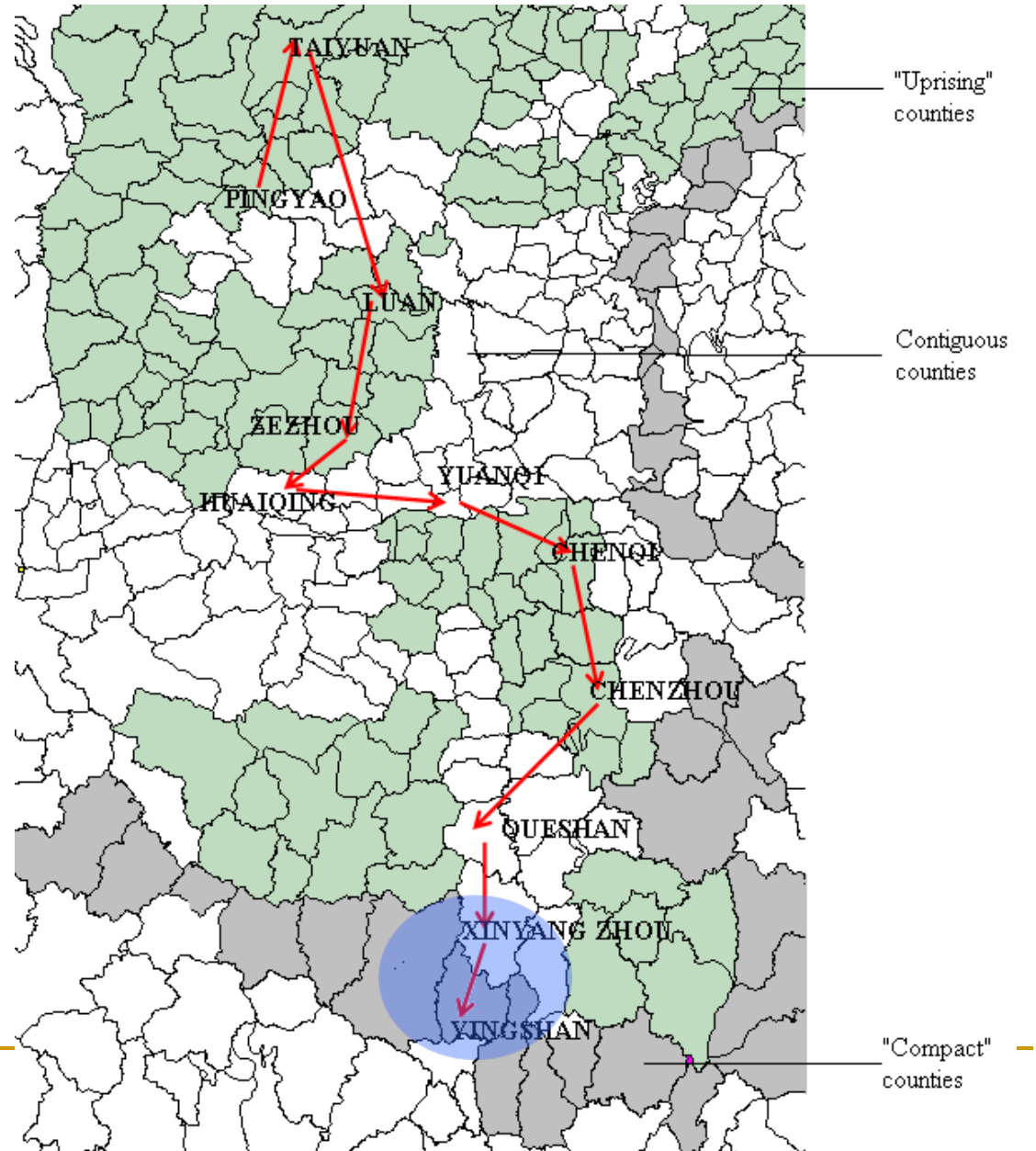


“Compact” counties

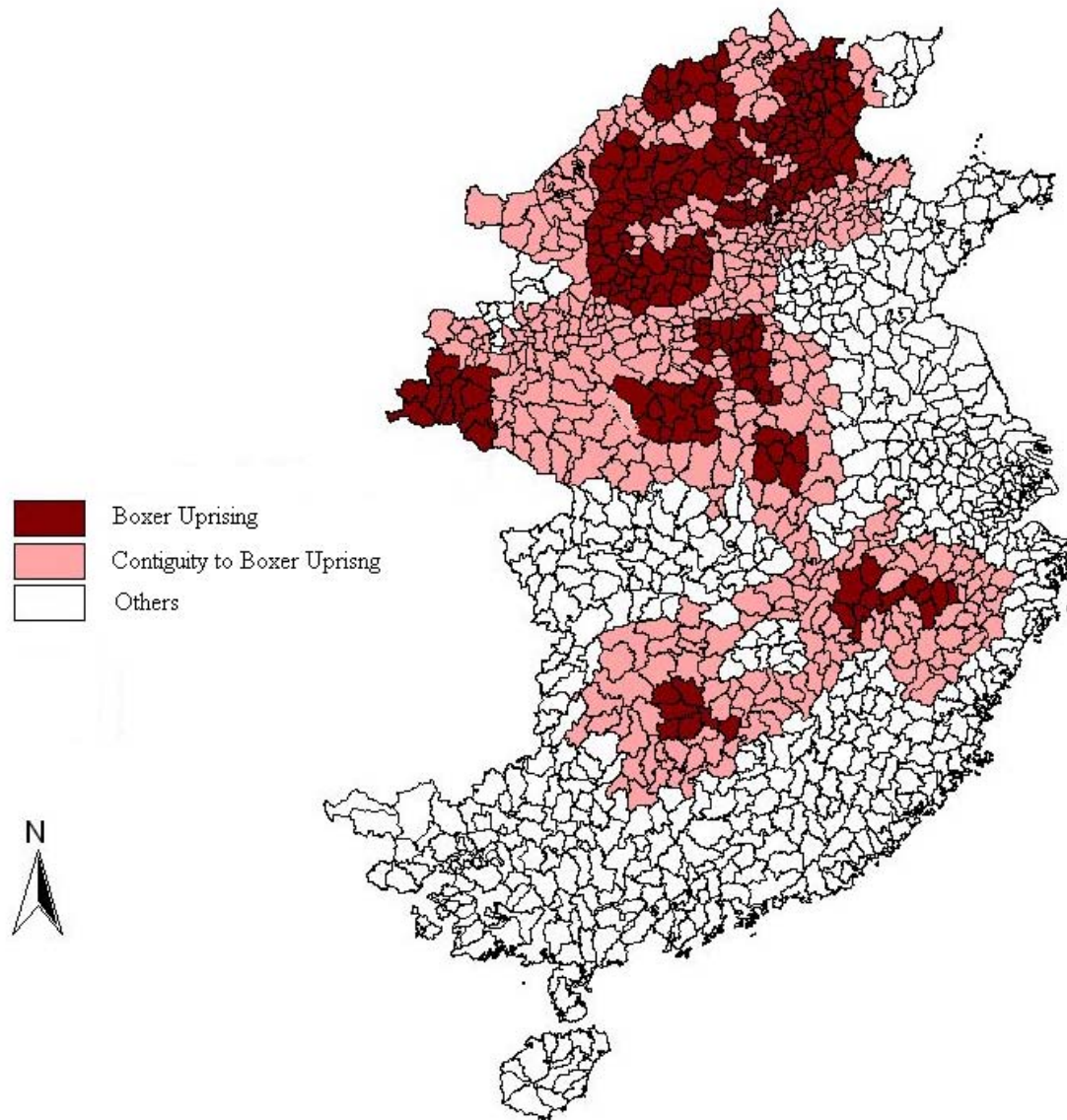
Instrument:

Contiguous counties *

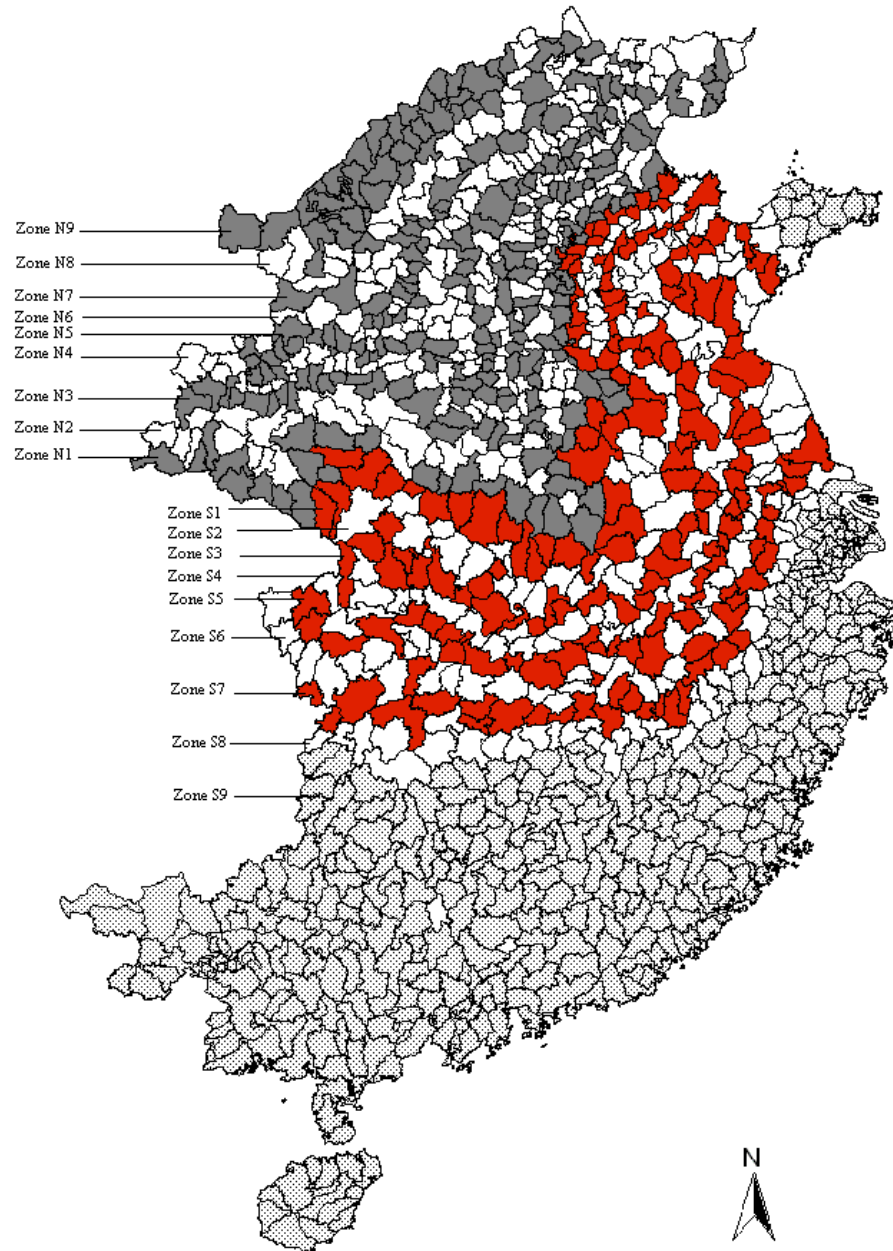
“Compact” counties



Contiguity to Boxer Uprising (C)



Classification of Zones based on “Yangzi Compact”



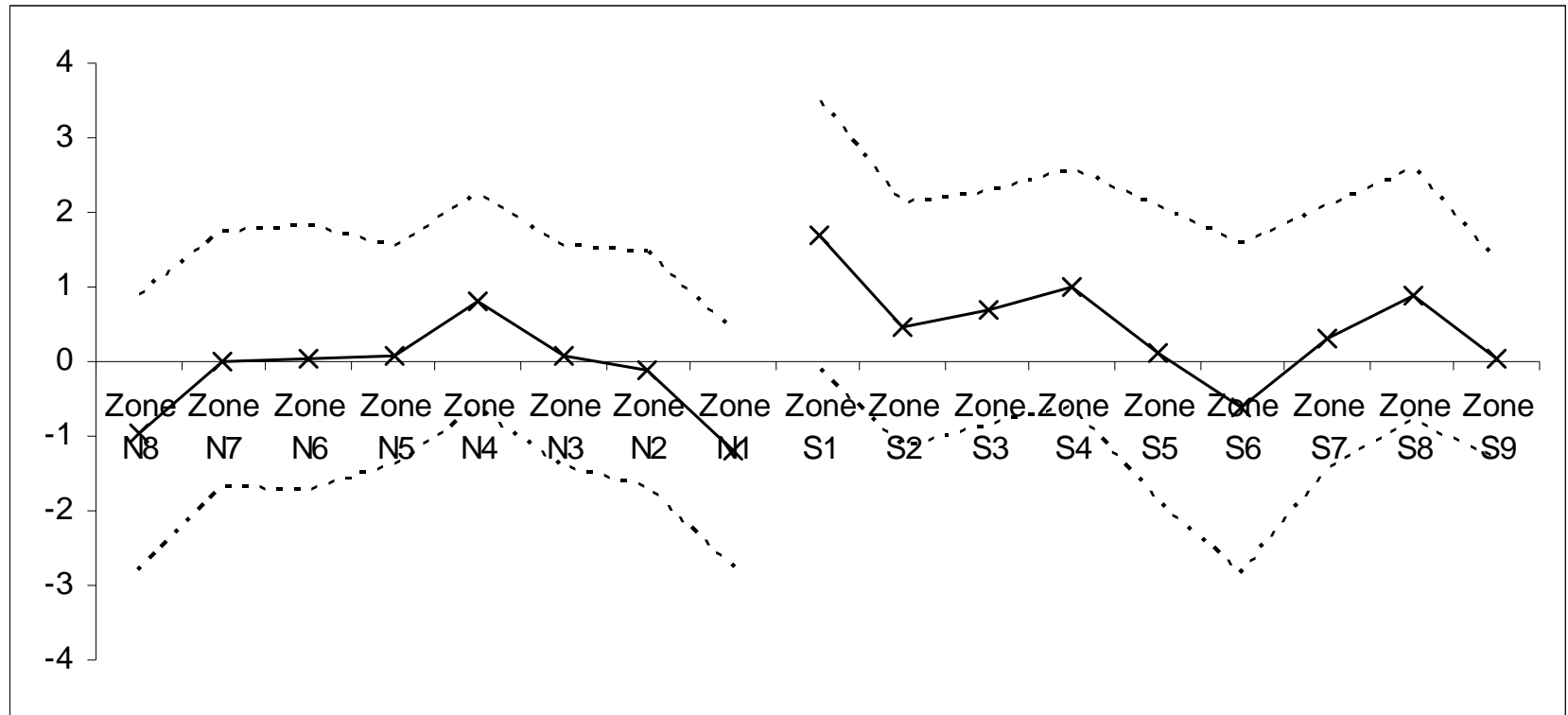
Validity of Instrument

- The interaction between contiguity and zones dummies is our instrument

$$P = \phi C + \sum_{j=N8, N7, \dots, S9} \phi_j CZ_j + \sum_{j=N8, N7, \dots, S9} \phi_j Z_j + W\gamma + v$$

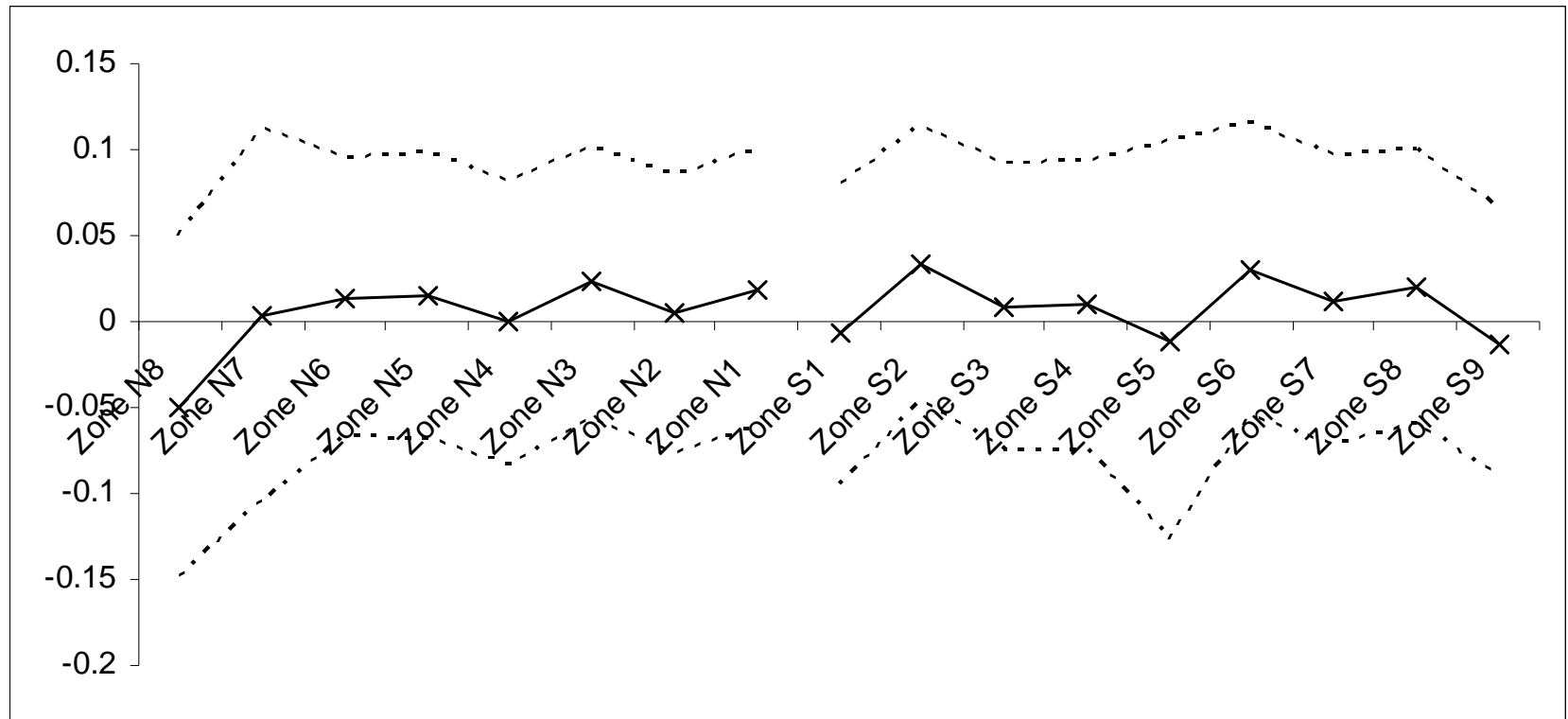
- Testing the effect of contiguity on Protestantism, by zones
 - Null: only the coefficients of the interaction term between *N1* and *S1* should be different
- Testing the effect of contiguity on Catholicism and initial economic condition, by zones
 - No significant difference between the coefficients of the interaction term

The effect of contiguity on Protestantism, by zones



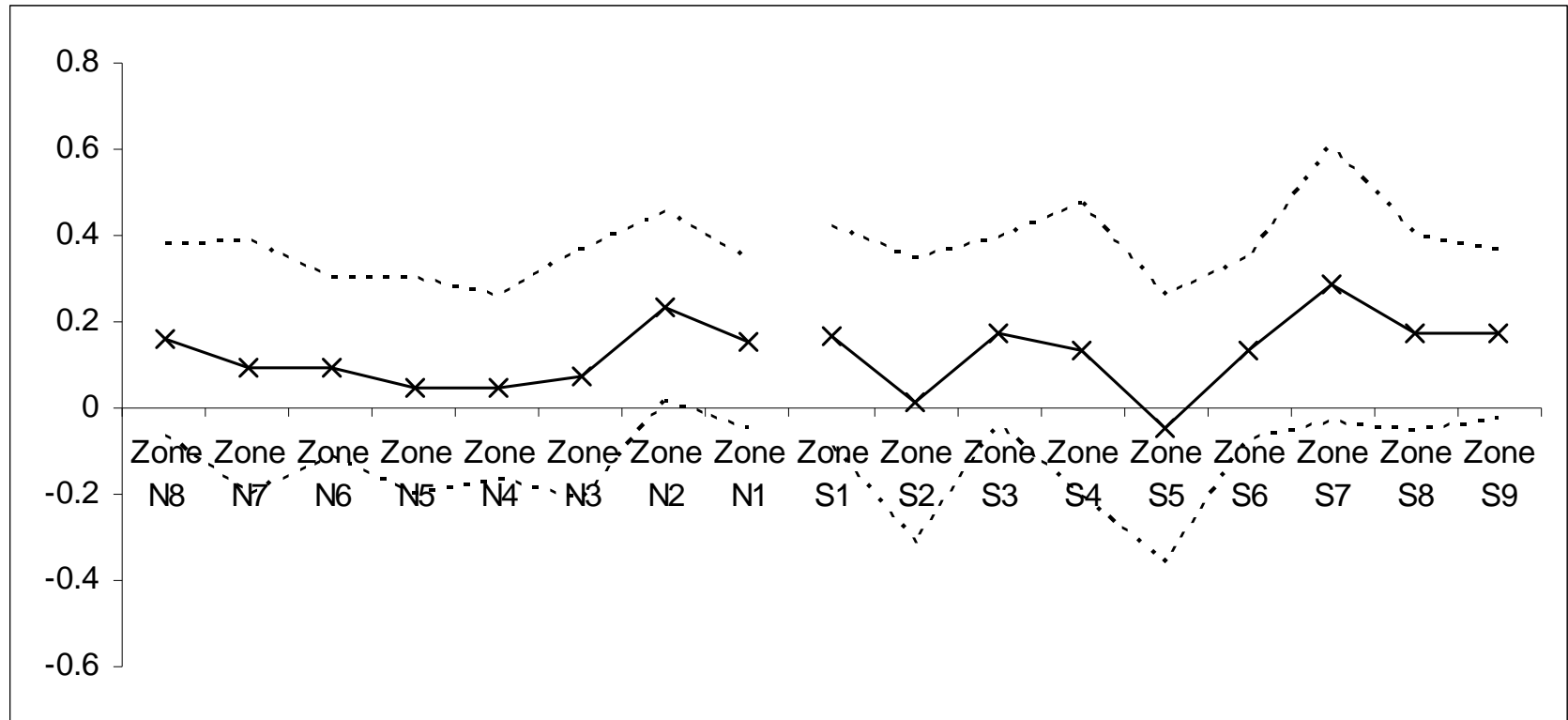
The effect of contiguity are significantly different on the two sides of the boundary between zone *N1* and zone *S1*

The effect of contiguity on Catholicism, by zones



The effect of contiguity is insignificantly different between pairs of zones

The effect of contiguity on initial economic conditions, by zones



The effect of contiguity are insignificantly different between pairs of zones

Instrumented Evidence

- Two-stage Least Squares

$$y = \rho P + \tilde{\beta}_0 C + \sum_{j=N8, N7, \dots, S9} \tilde{\beta}_j Z_j + \alpha + W\beta + \varepsilon$$

$$P = \phi C + \sum_{j=N8, N7, \dots, S9} \phi_j CZ_j + \sum_{j=N8, N7, \dots, S9} \varphi_j Z_j + W\gamma + v$$

Instrumented Evidence

	(1)	(2)	(3)	(4)
Protestantism (log-term)	1.933* (1.084)	2.050* (1.103)	2.026* (1.063)	2.124** (1.083)
Catholicism		1.772 (4.713)		0.971 (4.781)
Small city			6.679** (3.281)	6.677** (3.279)
Middle city			18.602*** (4.101)	18.572*** (4.096)
Large city			44.104*** (8.437)	43.993*** (8.443)
Control Variables	Yes	Yes	Yes	Yes
Observations	1175	1175	1175	1175
R-Squared	0.21	0.21	0.30	0.30

Protestantism has a significant and positive effect on urbanization

Instrumental Evidence – Robustness Check

- We replicate our analysis on a subsample that consists of only two zones on the boundary, which capture only variations between *N1* and *S1*

$$y = \rho P + \tilde{\beta}_0 C + \tilde{\beta}_1 S + \alpha + W\beta + \varepsilon$$

$$P = \theta_2 CS + \theta_1 C + \theta_3 S + \theta_0 + W\gamma^0 + v$$

Instrumental Evidence – Robustness Check

Baseline	(1)	(2)	(3)	(4)
Protestantism (log-term)	0.745*	0.743*	0.652*	0.644*
	(0.414)	(0.415)	(0.363)	(0.358)
Observations	96	96	96	96
R-squared	0.44	0.44	0.54	0.54
Instrumental Evidence	(1)	(2)	(3)	(4)
	2 nd -stage	2 nd -stage	2 nd -stage	2 nd -stage
Protestantism (log-term)	1.736**	1.674**	1.920**	1.871**
	(0.844)	(0.809)	(0.811)	(0.799)
Observations	96	96	96	96
R-squared	0.40	0.41	0.46	0.47

The results based on a small sample are robust

Testing Weber's thesis: The Channel of Protestantism on Economic Outcome

- Protestant Ethic:

- If Protestant ethic really works in China, Calvinism (the reformed churches and Presbyterianism) should have a larger, dominating effect on economic prosperity than denominations for whom “worldly achievements” do not carry the same importance
 - Lutheranism
 - Anglicanism
 - Wesleyanism
 - Baptist
- Distinctly strong emphasis on “double predestination” (salvation and damnation), the Calvinists believe that it is imperative for them to attain worldly achievements (think business success) in order to “get rid of the fear of damnation” (Weber, 1930, p.115)

- Knowledge diffusion:

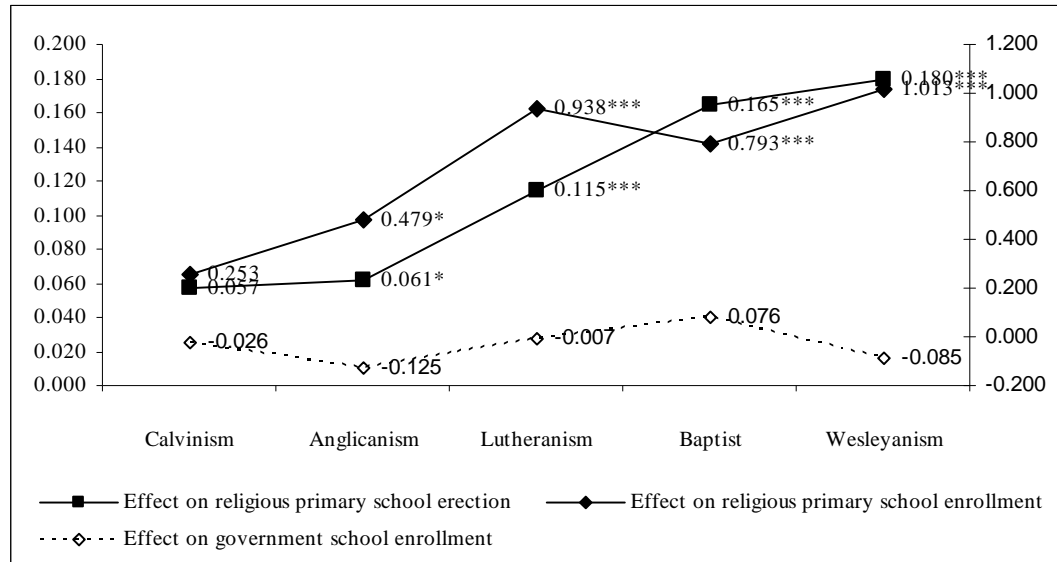
- Denominations with significantly greater involvement in schools and hospitals should have a larger effect on economic prosperity

Who had invested more? Identifying the effects of individual denomination on knowledge diffusion

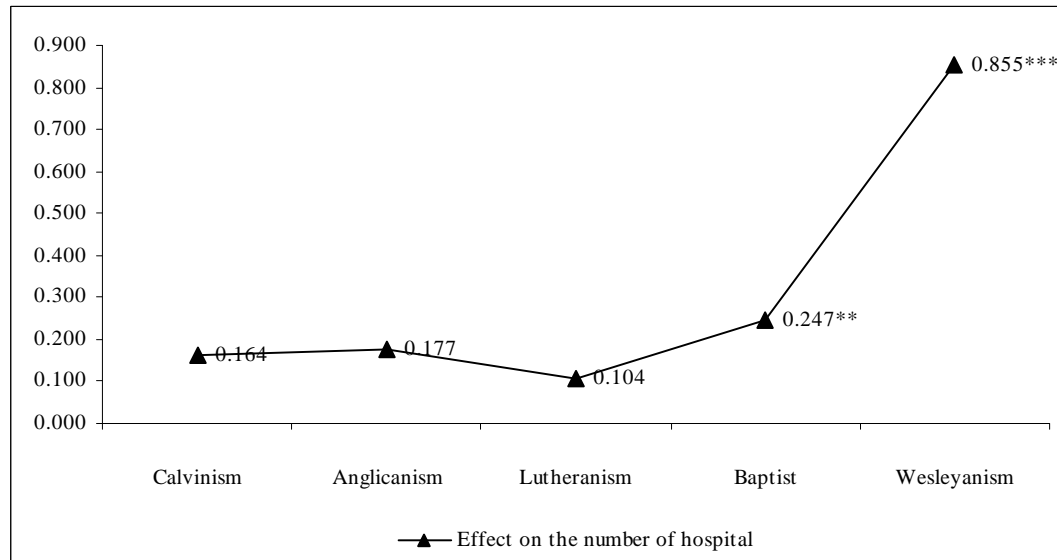
$$K = \kappa_1 Cal + \kappa_2 Ang + \kappa_3 Lut + \kappa_4 Bap + \kappa_5 Wes \\ + \kappa_6 USA + \alpha + W\beta + \varepsilon_i$$

- Estimate the effects of the five denominations on knowledge diffusion
- China Inland Mission (largest non-sectarian missionary group founded by the Englishman Hudson Taylor in 1865 in China) and other non-denominational missionaries are the reference group
- Also regress enrollment of government primary school having adopted the new national curriculum) to make sure that results are not driven by some unobserved variables

The Effect of Protestant Denominations on Primary Schools (number and enrollment)



The Effect of Protestant Denominations on Hospitals (number)



Where Economic Growth is identifying the effects of individual denomination on economic development

$$y = \rho_0 P + \rho_{Cal} S_{Cal} P + \rho_{Ang} S_{Ang} P + \rho_{Lut} S_{Lut} P + \rho_{Bap} S_{Bap} P + \rho_{Wes} S_{Wes} P \\ + \beta_{Cal} S_{Cal} + \beta_{Ang} S_{Ang} + \beta_{Lut} S_{Lut} + \beta_{Bap} S_{Bap} + \beta_{Wes} S_{Wes} \\ + \rho_{USA} S_{USA} P + \beta_{USA} S_{USA} + \alpha + W \beta + \varepsilon_i$$

- Estimate the effects of the five denominations on economic prosperity
- generate a share of the contributions made by each of the five denominations to the total number of missionaries in each county
- Interact with the entire Christian constituency (P) to obtain additional effects of the five denominations in comparison with the reference group—the China Inland Mission

The Effects of Protestantism on Urbanization, by Protestant Denominations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Protestantism	0.113 (0.228)	0.461** (0.225)	0.409* (0.225)	0.322 (0.230)	0.373* (0.223)	0.411* (0.224)	0.401* (0.225)	0.135 (0.227)
Calvinism* Protestantism	0.639 (0.399)	0.140 (0.383)					0.339 (0.387)	
Anglican* Protestantism	0.774* (0.425)		0.894** (0.417)				0.973** (0.423)	
Lutheran* Protestantism	1.257*** (0.452)			1.191*** (0.457)				1.198*** (0.449)
Baptist* Protestantism	1.729*** (0.397)				1.655*** (0.397)			1.687*** (0.395)
Wesleyan* Protestantism	1.843*** (0.467)					1.701*** (0.448)		1.750*** (0.447)
USA missionary* Protestantism	-0.591 (0.371)	0.555* (0.330)	0.448 (0.293)	0.606** (0.286)	0.305 (0.291)	0.192 (0.303)	0.288 (0.341)	-0.389 (0.319)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geographical factors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1175	1175	1175	1175	1175	1175	1175	1175
R-squared	0.36	0.33	0.33	0.33	0.34	0.34	0.33	0.36

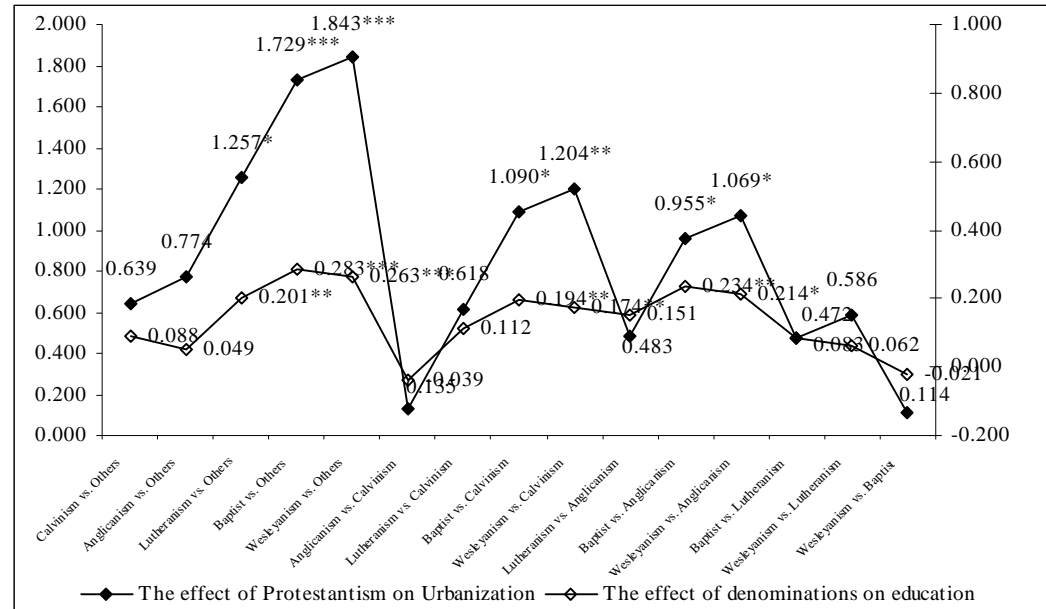
Comparing the effects of denomination on knowledge diffusion

(1) Education

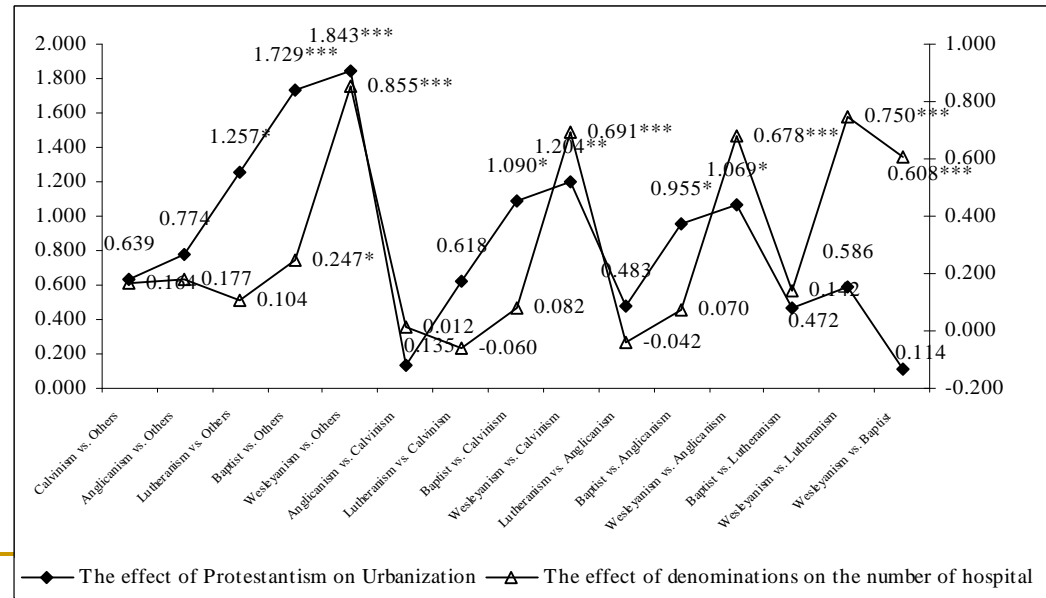
(2) Hospital

with the effect on economic prosperity

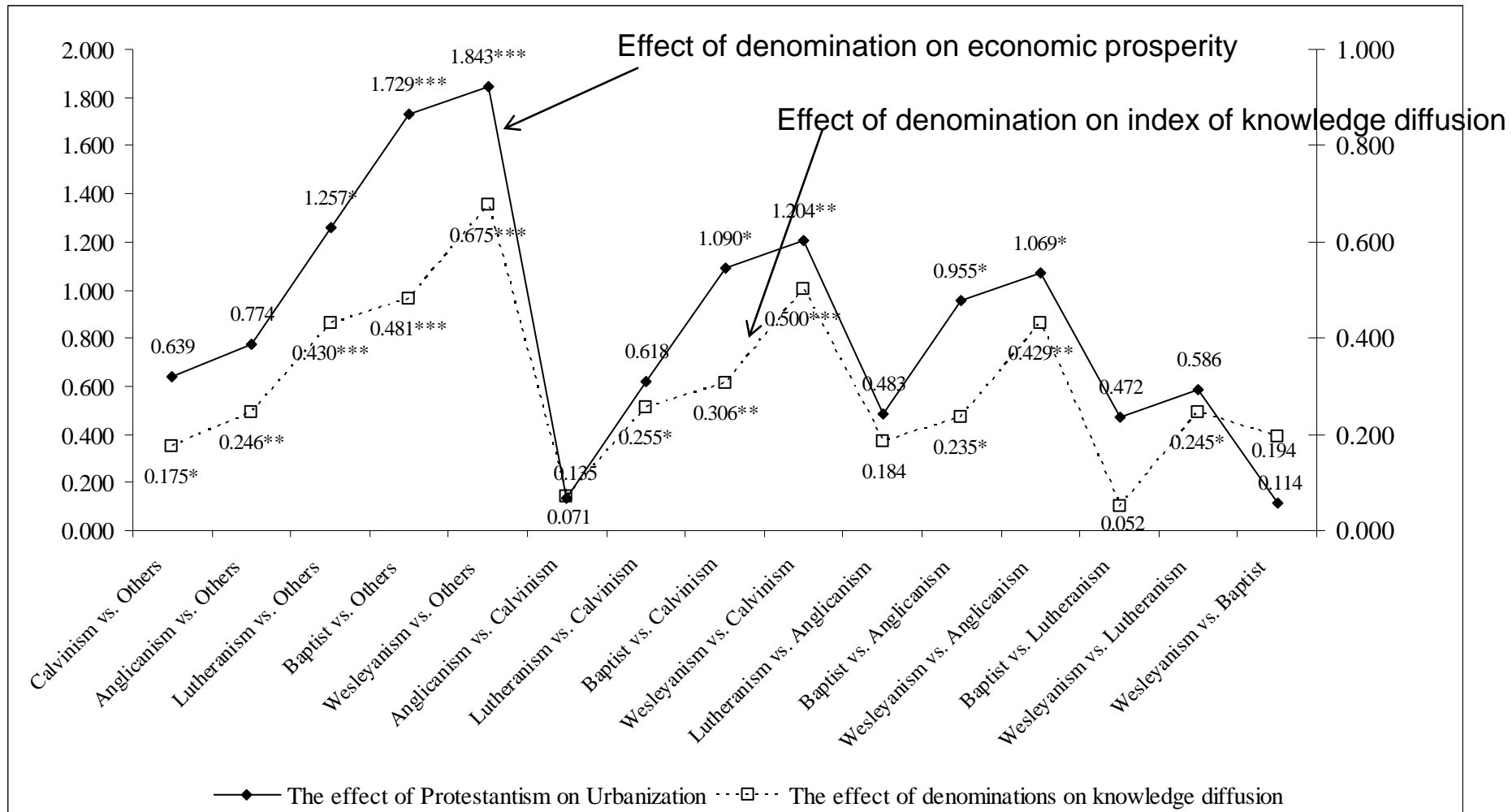
Knowledge diffusion - Education



Knowledge diffusion - Hospital



Comparing denominational effects on economic prosperity with knowledge diffusion



Brief Conclusion

- Protestantism did stimulate economic growth in 1840-1920's China
- But the likely channel of this effect was not Protestant ethic, but more likely the diffusion of “useful knowledge” (Kuznets, 1965) in the realms of education and health

Thanks !