DO INSTITUTIONS MATTER? ESTIMATING THE EFFECTS OF INSTITUTIONS ON ECONOMICS PERFORMANCE IN CHINA

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Abstract

This paper estimates the effects of institutions on economic performance with the cross-city data of China. We argue that China's ongoing reform belongs to the long historical transition from antiquity to modern society, which started one and half centuries ago. Learning from Western countries is a central aspect of this historical process. The influence by the West at the early stage of this transition has persisted into current reform. We use the enrollment in Christian missionary lower primary schools in China in 1919 as the instrument for present institutions. Employing the two-stage least squares method, we find that the effect of institutions on economic performance in China is positive and significant. The result survives various robustness tests with additional controls, such as geographic factors and government policy related variables.

Key Words: Institutions, China, Christian, Geography, Policy.

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1 Introduction

China's phenomenal economic growth has been puzzling to many economists and presented a challenge to one fundamental belief in economics that institutions are the determining factor for economic development. On one hand, China's GDP per capita has been growing with an average above 8% for almost thirty years. While some suspect China's GDP numbers to be exaggerated, China's impressive economic growth is a widely-recognized statistical fact (Young, 2003). On the other hand, China's improvement in institutions seems to lag behind other transitional countries, such as Russia, India and Eastern-European countries. China seems to set an example for developing countries with the message that aggressive institutional change toward democracy may be not necessary to achieve very high growth rates.

In this paper we try to estimate the effects of institutions on China's economy with cross-city data. To the best of our knowledge, this paper is the first effort to shed the light on the effects of institutions on China's economic performance. Comparing China's current economic performance with that before the *reform*[1], the impact of institutions appears to be obvious. However, a quantitative estimate of the effect is still lacking.

The case of China can help economists understand a more general question in development economics: Which factor is the fundamental determinant for economic development? Many researchers believe that the reason behind economic perfor-

mance is rooted in millions of individuals' economic decisions. When making the economic decisions such as investment, education or R&D (research and development) investment, people respond to incentives, which are guided by the institutions of a society. Therefore, some believe that institutions are the most important determinant for economic development (North and Thomas, 1973; North, 1981 and 1990, Acemoglu, Johnson and Robinson, 2004). In contrast, some scholars argue that geography shapes human history and plays a fundamental role in economic growth (Diamond 1997, Sachs and Warner 1995, 1997). Others argue that human capital and government policies are the most important in development (Glaeser et al., 2004). The controversy surrounding this queston has cast shadow on China's future. There is a rising voice in China that the institutional improvement is the consequence of economic development and thus we do not need to propel the institutional reform actively.

We believe that China provides a perfect environment in which to answer the question by comparing the effects of institutions, geography and policies. A country of the size close to Europe and world's one fifth population, China contains more than 300 cities, across which there exist substantial variations in institutions, productivity, geography and government policies. This enables us to test alternative hypotheses for the determinant of economic development.

The difficulty in estimating the effects of institutions is mainly due to the widely recognized fact that institutions are endogenous. Richer economies can afford bet-

ter education, more lawyers and prosecutors, more educated government officials, and thus, better institutions. Moreover, there could be another factor, such as geography, that affects both institutions and economic performance. Because of the endogeneity of institutions, the OLS estimate is biased, making it impossible to determine the causal relationship between institutions and economic performance. In order to obtain the unbiased estimate, we need to find an instrumental variable for institutions.

Econometrically, to estimate the effects of institutions on economic performance has become a race of finding instruments for institutions. Mauro (1995) used ethnolinguistic fractionalization to instrument corruption and bureaucratic efficiency. Hall and Jones (1999) used the distances to equator across countries as the instrument for social infrastructure. Acemoglu et al (2001) employed European settler mortality rate to instrument institutions. However, there are some concerns regarding the validity of these instruments. Some authors argued that the ethnolinguistic fractionalization is influenced by economic performance (see Acemoglu et al., 2001). Distances from the equator can affect the economy through climate and geography rather than institutions (Bloom and Sachs 1998; Gallup et al., 1998). Glaeser et al. (2004) argued that the European settler mortality was correlated with current disease environment and human capital which could influence current economic performance directly rather than through institutions. The controversy over empirical evidence is partially due to measurements of institutions and exclusion restriction of

instruments used for institutions. For example, as Edward L. Glaeser, et al. (2004) argued, some measurements of institutions cannot code dictators who choose to respect property rights any differently than democratically elected leaders who have no choice but to respect them.

We propose an instrumental variable for China's institutions. We adopt the enrollment in Christian missionary lower primary schools in the early 20th century as an instrument to China's present institutions. Our main logic can be summarized into three arguments:

1. China's present reform can be viewed as a part of longer historical movement of "modernization", which can be traced back to one and a half centuries ago. The main feature of this movement is learning from the West and transforming China from conventional closed society to modern open society. Although this movement was interrupted after 1949, the historical experience has a persistent effect on today's economic performance.[2]

2. Those areas with more historical influence by the West have the institutions more favorable to the market economy and the protection of property rights.

3. The enrollment in Christian missionary lower primary schools in 1919 reflects the influence by the West in early 20th century in China.

With the instrument, we perform the Two Stage Least Squares (2SLS) estimation and find that institutions are significant in explaining China's variation in economic performance across cities in our sample. The results survive various robustness tests.

Our results show that institutions dominate geography and policy in explaining China's economic variation among cities.

The rest of the paper proceeds as follows. Section 2 introduces the historical background and our hypothesis in more details. Section 3 discusses our strategy to instrument China's institutions. In section 4 we estimate the effect of institutions on economic performance. We also perform various robustness tests in the same section. In section 5 we compare the effects of geography and policy with institutions. Section 6 serves as conclusion. We put the description of measurements and data in an appendix section.

2 Historical Background

Although China's on-going reform started in 1978, many historians believe that it belongs to a transitional process that can be traced back one and half centuries ago (Ray Huang, 1988; Degang Tang, 1998). The process started in 1841 when China encountered the challenge from the West and was forced into a change that it had never experienced during the previous two thousand years. After a series of military defeats by the western countries, many Chinese realized that China had to learn from the western culture to modernize its social system. The process suffered many setbacks. However, after the settlement of the disastrous turmoil in 1900 that caused the occupation of Beijing by eight western countries, China seemed to begin a new era. The following remark is not from a recent *New York Times* issue on current

China, but a description by a Christian who was observing the 1919's China.

> The two decades have been distinctly revolutionary in tendency: this not in the old sense alone which resulted in the displacement of individuals, but deeper, in that during this period ancient principles and institutions have been moved aside for something new. ... More significant than any other change has been that in the temper of the people. After all, the changes already registered are precursors of wider ones. China will not only reflect the changes going on all over the world but will materially help to change the world. Four hundred million people cannot wake up and leave the rest of the world untouched. (Frank Rawlinson, Change and progress in the Christian movement in China during the last two decades 1900-1920, The Christian Occupation of China, 1922)

In 1911 the last dynasty in China's history, Qing Dynasty, was overturned and the Republic of China was built. Accordingly, China's economy rapidly transformed to Capitalism. While it is difficult to measure the economic growth during those years in terms of statistics, the following quote delivers a rough but impressive picture of the economy in early years of the Republic of China.

> The coming of modern industry to China has been described as "a terrific invasion." This modern revolution is taking place so quietly that

few people are aware that anything untoward is happening. To estimate the growth in terms of figures is not easy, since no authentic and complete list of factories has as yet been published. In the China Year Book of 1921 a list of "the more important trades" is given, showing that almost every type of industry is to be found in China, e.g. Arsenals, Canneries, Cement Work, Confectionery, Cotton, Chemicals, Breweries, Dockyards, Shipbuilding, Engineering, Flour Mills, Furniture, Glass, ...This list does not include certain industries with which the name of China is particularly associated, e.g. Carpets, Rugs, Porcelain, etc., etc. The above are listed under some 50 centers scattered over China. The secretary of the Chinese Maritime Customs says, "There are foreign-type articles of domestic consumption that are not now manufactured in China by factories on modern lines, the majority without foreign assistance." For proof of this mushroom-like growth, return visits to some of our factory districts after an interval of a few months will suffice, or reading the notes under 'Industry in China' which appear in the Far Eastern Review or in the Weekly Review of the Far East from time to time (The Christian Occupation of China, 1922).

However, the transition process was interrupted by Japanese invasion 1931-1945 and the followed civil war between government and Chinese Communist Party

(CCP) 1946-1949. When the war ended in 1949, Republic of China moved to Taiwan while on the mainland it was replaced by People's Republic of China. China kept learning from the West, however, this time from Karl Marx. The CCP successfully transformed the economy into a central planning one. Although the CCP government tried to promote China's manufacturing sector through high compulsory saving rate, low wages and distorted low prices of inputs, China's economic performance was rather poor in general. In 1978, when DENG Xiaoping became the chief of the party, China began to reform and open the door again, gradually changing into a market-oriented system.

In short, China's current reform can be viewed as a part of a long and winding road of "modernization" characterized by "learning from the West". Based on this historical view, we believe that the transition to capitalism during early decades of 20th century had a very significant influence on economic performance of current China.

When capitalist institutions were introduced to China for the first time, the transition was not uniform among different localities of China. The areas with deeper influence by western countries had developed the institutions more compatible with capitalist economy and market system. Although the central-planning-economy era of 1949-1979 changed the direction of the transition, the knowledge and tradition of a capitalist economy had already been deeply rooted in people's minds and the local social atmosphere[3]. Once the economic system changed to a market-oriented

economy again in 1978, those areas once with more western influence should be more favorable for the reform to market institution. Thus, the extent to which different areas were influenced by western countries in early 1900s can be considered as an exogenous source of today's variation in institutions across localities. If we can find a measure of the extent of influence by western countries during early decades of 20th century, then we can use it as an instrument for today's institution of property right protection.

We use the enrollment in Christian missionary lower primary schools to capture the extent of the influence by the West. The earliest Christian mission in China may be traced back to four hundred years ago. However, the organized missionary activities began after 1841, just paralleling the process of China's active learning from the western countries. During the Boxing turmoil in 1900 the Christian Church was heavily destroyed in some areas. But the Church recovered rapidly after the turmoil. During the early years of Republic of China, the Christian mission in China had been greatly developed. Almost every province had the Christian missionary centers and almost every mission station had a lower primary school. From China's point of view, the Christian were western culture. Hence, the extent of an area to be influenced by Christian can serve as a measurement of how much the area was influenced by the West. Together with our argument that an area's current institution of property rights protection is related to its influence by capitalism reform in early 1900s, the Christian influence can serve as an instrument for today's

institution of property right protection.

3 The Instrument for China's Institutions

Before we estimate the effects of institutions, we need to be aware of how to define institutions. The term "institutions" is a concept that can include many things from general law to cultural conventions. However, following North and Thomas (1973) and North (1981, 1990), our hypothesis is that the protection for property rights is the key to explain the economic performance. Thus, we consider the core of institutions as a set of social rules that protect the property rights. And also following North (1981), it is the real rules embodied in the enforcement rather than the words written on paper that really counts as the institution.

Colorful as it is, China's ongoing changes can be viewed as a transition from planning economy to market economy, during which the property rights get more and more respect and protection. Although different localities of China share a uniform political and legal system on paper, actual institutions – the enforcement of the market system – have large variation across regions. And our data show that there exist large variation of institutions across cities in China (see table 1). We use the data from a survey performed by Ni et al in 2002 and 2004. The specific description of the data is in the appendix section.

Why do we observe the large variation in institutions in a country that share a uniform political and legal system? We argue that the difference in current institu-

tions is mainly due to the different levels of people's understanding and familiarity of market economy. Why do different localities in China have different understanding and familiarity of the market economy? One important reason is that people in different regions have different extent of historical influence from the western people. Since the market economy and the protection of property rights are institutional establishment from the western countries, we believe that the region with deeper influence by the West in the modern history should have more experience with market economy. The sketch of our logic is: the influence of the West $\Rightarrow$ institutions $\Rightarrow$ economic performances.

In order to catch the influence from the West, we use the enrollment across cities of Christian missionary lower primary schools in China in 1919 as an instrument for current institutions. The data of our instrument is described in the appendix. In panel A of table 2, we see that institutions are significant when regressed to log GDP per capita in 2003. However, due to the endogeneity of institutions, this result should be read as a relationship of correlation rather than causality. In panel B of table 2, we see that our instrument is significant when regressed to institutions.

The exclusion condition of the instrument assumes that the instrument affects current economic performance only through institutions. To investigate whether the condition holds, we consider two possible cases of violating the exclusion condition. One concern is: What if the historical enrollment of the Christian missionary lower primary schools could affect current distribution of Christian religion in China and

current Christian religion affects economic performance directly rather than through the institutions? Missionary schools taught not only some religious subjects but also the curricula about modern knowledge. Long before 1927, the number of required hours of Bible study in missionary primary schools had been reduced (Idabelle Lewis Main, 1934, p270). The new curricula focused more on citizenship training and Chinese language (Howson Lee, 1934). Kiang-wen Han (1934, p313) concluded that "on the whole, religion does not hold an important place in the life and thinking of the students in China." Meanwhile, due to the official atheism ideology after 1949 and the suppression toward religions during the Culture Revolution (1966-1976), we believe the historical Christian distribution has very few impacts on China's current Christian distribution.

More importantly, as Robert J. Barro and Rachel M. McCleary (2003, 2005) argued that it is the general religious beliefs in God, heaven, hell and afterworld, hell in particular, rather than the organized religious activities, that affects positively the economic performance. And particularly, Barro and McCleary (2003) found in cross-country data that the Protestant share of religious population plays a negative role on economic growth when beliefs in heaven or hell are controlled. Since Chinese people has a long history of beliefs in God, heaven hell and afterworld introduced by Buddhism or even long before Buddhism was introduced into China (Yu, 1964), there is no evidence that the enrollment in Christian missionary primary schools in 1919 could influence current Chinese belief about heaven or hell. Thus, we believe

our instrument could not affect current economic performance directly.

The other concern about the violation of exclusion condition is that the instrument is correlated with other unobserved determinants of economic performance. We test two possible underlying factors. First, if Christian missions were more prevalent in coastal areas than inland, then our instrument could be correlated with distance to coast. The distance to coast can possibly affect GDP per capita across regions through several other channels, such as the adoption of FDI and the access to international trade. However, it cannot be true when we look at the Christian geographic distribution in 1920s. The Treaty of Tientsin between China and France in 1860 could secure Christian missions to establish their missionary stations far from the coast. As Albert Feuerwerker (1983, p165-167) described, "Protected by general and specific extraterritorial provisions of treaties, they reached into nearly every corner of the country. As of 1899 all but 106 out of 1,704 counties or hsien in China proper and Manchuria reported some Protestant missionary activity." In any case, we regress our instrument on the distance to coast and report the result in panel C of table 2. We find that there is no significant correlation between the two. In panel B of table 2, we add distance to coast as an additional control in our regression of institutions, and find that our instrument is still significant in explaining the institutions when the distance to coast is controlled.

The second possible underlying factor is that the historical distribution of Christian primary pupils may affect the current economy through the channel of human

capital. If higher enrollment means better education conditions and higher human capital in the 1920s, then our instrument could influence current economic performance through historical human capital rather than institutions. However, we believe this cannot be the case for the following reasons. Missionary lower primary school pupils were only around 4% as many as those in government primary schools in the 1920s (Albert Feuerwerker, 1983). We check this by regressing our instrument on the total primary school enrollment, which we employ to capture human capital in the 1920s. The result is reported in panel C of table 2. There is no significant correlation between the two variables.

We perform an intuitive test on whether our instrument affects current log GDP per capita directly. If the historical enrollment in Christian missionary lower primary schools (our instrument) affects current log GDP per capita only through institutions, then our instrument should be significant when explaining log GDP alone but NOT significant when explaining log GDP along with institutions. In panel A of table 2, when we regress log GDP per capita in 2003 on our instrument (historical enrollment of missionary lower primary schools) alone, the coefficient of our instrument is 0.18 and significant at 5% level. However, when we regress log GDP per capita in 2003 on both average protection of property rights and historical enrollment of missionary lower primary schools, the coefficient of our instrument is not significant while institutions is still significant at 5% level.

4 Estimates

4.1 The Model

Although institutions are significant in the OLS regression reported in panel A of table 2, it should be read as no more than correlation. We cannot infer a causal relationship between institutions and economic performance from OLS estimates. Moreover, due to the endogeneity of institutions, the OLS estimate is biased. Hence, we use the two-stage least squares (2SLS) method to estimate the institutional effect on economic performance. The basic model is

$$y_i = a + \beta S_i + \theta X_i + \epsilon_i \tag{1}$$

$$S_i = b + \gamma E_i + \delta X_i + \nu_i \tag{2}$$

where y_i, S_i and E_i respectively denote log GDP per capita in 2003, average protection of property rights and historical enrollment of missionary lower primary schools for city i. We use X_i to denote other covariants. In the first stage we regress the observed current institution S_i on our instrument E_i. The ν_i is the error term. In the second stage we regress the economic performance y_i on the predicted institutions S_i, with ϵ_i is the error term. Covariants X_i which appear in the second stage regression are also included in the first stage regression. The parameter of interest is the coefficient β, the effect of institutions on economic performance. Our identification strategy is that the historical enrollment distribution of missionary lower primary schools is not correlated with the error term ϵ_i in the second stage.

4.2 Main Results

Table 3 lists our main results of estimating the effect of institutions on economic outcomes. Panel A lists the estimating results from the second stage regression with log GDP per capita in 2003 as dependent variable. Panel B lists results from the first stage regression with average protection of property rights as dependent variable. Table 3 is our main specification with the enrollment in Christian missionary lower primary schools as the instrument to institutions. The 2SLS estimate of institutions is 4.23 and significant at the 5% level for a two-sided t-statistic.

Compared to the OLS estimate in panel A of table 2, there are two points worthy of notice. First, the coefficient of institution is significant in both regressions. The coefficient in the 2SLS regression is 4.23, which implies that the city's GDP per capita will increase by 4.23% if its average index of property rights protection increases by 0.01. For example, if Tianjin could improve its property rights to Beijing's level, from 0.64 to 0.68, then its GDP per capita could increase by about 17%. Second, the value of the coefficient in the 2SLS is much larger than that in the OLS regression. From this perspective our result is similar to Acemoglu et al. (2001), in which their 2SLS result is twice that in OLS. This shows that the OLS estimate of institutions is underestimated, which is the case when institutions are endogenous with respect to economic performance.

We also report the value of Anderson canonical correlation likelihood ratio (LR) test (Alastair Hall, et al., 1996). The null hypothesis of the test is that the first stage regression is underidentified, i.e., that the instrument is not relevant. Under the null hypothesis, the test converges to a Chi-square distribution with degree of freedom one. The Anderson canonical correlation LR test reported in column (1) is 7.491. The small p-value 0.006 means we can significantly reject the null hypothesis.

4.3 Robustness

4.3.1 Checking the Exclusion Condition

We have discussed in section 3 the concerns about validity of the exclusion condition for our instrument with several intuitive OLS regressions. As an robustness test, we add the variables in those concerns into our 2SLS as additional controls. If our exclusion assumption is valid, the coefficient of institutions in the second stage regression should not change remarkably when additional controls are added into the regression. The results are reported in table 4. In column (1) we add the distance to coast as an additional control that enters both stages. In the first stage, both historical enrollment of missionary lower primary schools and the distance to coast are significant. In the second stage, the coefficient of institutions is 3.779 and is still significant, but the coefficient of the distance to coast is not significant. This shows that the distance to coast is not significant in explaining the log GDP per capita when institutions are considered.

Column (2) examines the concern whether or not our instrument is correlated to historical geographic distribution of human capital and then affects current economic performance. We measure the historical human capital by the total enrollment of primary school, which includes the historical enrollment of lower and higher primary schools of both missionary and government per 1,000 persons in 1919. In the first stage, we find that only the enrollment of missionary lower primary schools is helpful to explain the variation of institutions across regions. The total enrollment is not significant. In the second stage, the coefficient of institutions is 4.304 and significant at 5% level, while the control variable is not significant.

In column (3) we examine the concern whether or not the historical geographic distribution of enrollment in missionary lower primary schools is correlated with the

initial conditions of different cities before the reform. We use the earliest cross-city data of approximative national income[4] we can find as the measurement for the initial condition, and that is the year of 1985[5]. The first stage regression shows that both our instrument and initial conditions before the reform are significant. In the second stage regression, the coefficient of institutions is 4.115 and is still significant at 5% level while the initial conditions is not significant. In column (4) we consider both the distance to coast and initial conditions together as the control variables at the same time. The 2SLS shows that none of the two controls is significant while institutions are still significant. Overall, our estimates of institutions are rather stable in all specifications, which supports our arguments about exclusion restrictions that our instrument is valid.

4.3.2 Different Measurements of Institutions

We also test whether our result is robust to the measurement of institutions. One difficulty of estimating the impact of institutions lies in how to measure the institutions, more specifically for our purpose, how to measure the institution of protecting the property rights. The measurement of the institution is always a controversial question in the literature. Whatever measurement we adopt, there will always be some unsatisfactory aspects. There are two ways in the literature to measure the institutions. One is the subjective measurement, usually constructed based on the results of questionnaire survey. The other is the objective measurement, trying to calculate the variables about institutions, such as the waiting time for government to approve a new business starting, the contract settlement by the legal system, and so on.

As we have explained in the appendix, in our main specification, we use the average of the index of protection to property rights to measure institutions in the two

surveys by Ni et al (2004, 2005). In the survey by Ni et al (2004), they also provide some other index about institutions, such as the comprehensive index of institutions and the index for government refrains of informal fees. The comprehensive index of institutions is the general index based on a series subindices to measure the law, government, enterprise system issues. The index showing the prevalence of informal fees measures the extent to which the government imposes informal charges on private business. In table 5 we report the result when those different variables are used to measure for institutions. Panel A reports the effects of institutions on log GDP when the measurements listed on the left are used. Institutions are significant with all three different measurements. Panel B reports the result of first stage when institutions are the dependent measured by the variables listed on the left. In all cases, our instrument is significant in explaining institutions.

5 Institutions, Geography and Policy

5.1 Institutions versus Geography

As we mentioned in the introduction, geography may play a role in background that influences economic development. Table 6 reports the results of adding geographic controls. One of most popular geographic variables used in the literature is latitude. In column (1), latitude is added into the regression. The inclusion of latitude does not change the result very much. The coefficient of institutions is still significant and takes value of 3.559. The latitude is not significant in the second stage regression and is not helpful to interpret the variation of institutions in the first stage regression. Other geographic variables include average temperature and rainfall. Column (2) adds average temperature as the additional control. In the second stage, we find that coefficients of institutions and average temperature are 3.400 and 0.027 respec-

tively and both estimators are significant. However, the average temperature is not significant in the first stage regression, i.e., it is not helpful to interpret the variation of institutions across regions. In column (3), rainfalls are added into the regression. The coefficient of institutions is significant and takes value of 3.949. Rainfalls are not significant in both stages.

Besides institutions, another channel that may have an effect on present economy is through the geographically related cultural nature of people. Therefore we should test our argument by controlling the cultural nature across localities. Among the complicated cultural differences across localities in China, the most prominent is the cultural difference between the North and South divided by Yangzi River. This is also mentioned in Jared Diamond (1997). So in column (4) we use north-south dummy as another additional control variable. If the city is located south to Yangzi River, we set the dummy as 1 and otherwise 0. The coefficient of institutions is 3.950 and is significant at 5% level. The south-north dummy is not significant in both stages and is not helpful to interpret the variation of institutions across localities. In column (5), we add all these geographically related variables into the regression. The coefficient of institutions is significant and takes value of 3.479. All others are not significant.

Overall, adding geographically related variables cannot change the estimate of institutions very much. The estimates of institutions instrumented by historical distribution of missionary lower primary schools are rather stable and always significant in table 6.

5.2 Institutions versus Policies

Some economists argue that government policy is more important than institutions to promote economic growth (Edward Glaeser, et al., 2004). To test this argument

in the case of China, we add into the main specification of 2SLS regression some policy variables as control variables. One policy variable we use is the dummy variable of central government policy. For a long time since 1978, although not so pronounced nowadays, China's central government has divided all the provinces into three different policy zones: east, middle and west. For different policy zones the government performs different policies. For example, the east zone enjoys a more favorable policy on industry development, while the west for a long time focused on agriculture. We use two dummies to capture a city's policy zone: east and west. If a city falls into the east zone, its east dummy is set as 1 and its west dummy is set as 0. If a city falls into the west zone, its east dummy is 0 and west 1. If a city falls into middle zone, then both dummies are set equal to 0. Results are reported in column (1) of table 7. None of the east and west dummies is significant in the second stage, while average protection of property rights is still significant and the coefficient is 3.866. In the first stage, our instrument is still significant to interpret the variation of institutions across regions and the coefficient is relatively stable. The west dummy is not significant in the first stage. The east dummy is significant and the value is 0.107 in the first stage. It seems to us that the central government development policy is not the main explanation for the difference in GDP across the cities in our sample.

In column (2) of table 7, we add a dummy for coastal open cities as an additional control. These coastal open cities benefited from more favorable policies on economic reform and development. When the dummy for coastal open cities are controlled, the coefficient of institutions is 4.405 and significant at 5% level in the second stage regression. The coefficient of the dummy for coastal open cities is not significant in both stages.

China's cities have different administrative ranks. The top rank is provincial-level cities or *zhixiashi*, including Beijing, Tianjin, Shanghai and Chongqing. The second rank is deputy-provincial level or *fushengji* cities. The third rank is prefectural-level cities or *dijishi,* excluding those already in above levels. The fourth rank is county-level cities or *xian* cities. The 47 cities in our sample are all of the top three administrative ranks. Higher administrative rank usually means larger political power competing for economic resources and favorable policies from the central government. In column (3) of table 7, we construct a dummy for provincial-level and deputy-provincial level cities and add it into the regression as an additional control. The dummy takes value of one when a city belongs to a provincial-level or deputy-provincial level. When the dummy for provincial-level and deputy-provincial level is controlled, the coefficient of institutions is 4.249 and significant at 1% level. The dummy for provincial-level and deputy-provincial level is not significant in both stages. In column (4), we control the above two dummies in the regression at the same time. We find that only the coefficient of institutions is significant. The estimated coefficient of institutions is 4.393.

In the literature of empirical economic growth, the ratio between government consumption and real GDP is a variable used to measure the extent of government involvement (Robert Barro, 2000). In column (5), the ratio between government consumption and real GDP is added as an additional control. The coefficient of institutions is significant and with a value of 4.035. The ratio between government consumption and real GDP is not significant in both stages.

Investment rate is deemed to be an important issue for developing countries. We also consider the investment ratio to GDP as the underlying factor. However, when we regress our instrument on the investment rate in 2004, we find that there is no

significant correlation between the two. And when investment rate is added as an explanatory variable for institutions, we find that our instrument is still significant in explaining the institutions at the significance level of 1%. In column (6) report the result of adding investment rate as additional control. We find that both institutions and investment rate are significant in explaining the economic performance.

The results in table 7 do not support the argument that policy plays a more important role than institutions in economic development. On the contrary, our results show that it is the institutions rather than the government economic policy that accounts for China's economic performance.

6 Conclusion

Many economists believe that institutional change is a fundamental reason for China's impressive economic performance during the last twenty years. However, since institutions are widely believed to be endogenous, it is difficult to evaluate the effect of institutions. Following the method developed by Mauro (1995), Hall and Jones (1999), and Acemoglu et al (2001), we try to isolate the exogenous part of the variation in the institution of property rights protection across cities in China. We choose the enrollment in Christian missionary lower primary schools in 1919 as the instrument for China's present institutions. We believe that the enrollment in Christian missionary lower primary schools captures the extent of influence by Western countries in early 20th century. Since the central aspect of China's institutional transition is learning from the West, the historical influence by the West in early 20th century can persist into China's current institutional change.

With the cross-city data in China, we use the two stage least square method (2SLS) to estimate the effects of institutions on China's economic performance. The results show that there exists high correlation between the 1919 enrollment in

Christian missionary lower primary schools and present institutions. The 2SLS estimate shows that institutions are significant in explaining the variation of economic performance among our sample of 47 Chinese cities. Out estimate has the similar property to the result of Acemoglu et al (2001) in that the 2SLS estimate is much greater than the OLS estimate. The significance of institutions survives robustness tests by controlling the variables such as distance to the coast, historical human capital and initial conditions for different cities.

The paper also sheds the light on the topic that which element plays the most important role in economic performance. We compare the effect of institutions and that of geography and government policy. By controlling the geographic variables such as latitude, temperature, rainfall and dummy for north-south differentiation, we find that institutions are significant, while geography is not significant in explaining the variation of economic performance in our sample. When we control the variables of government policy such as China's zone development policy, coastal city policy and government consumption ratio to local GDP, the institutions are still significant, while government policies are not. Our results support the hypothesis that institutions play more important role.

7 Appendix: Measurements and Data

Our sample consists of 47 cities listed in table A2. China's local governments can be categorized into four administrative levels. The highest are provinces, the number of which is 31. The second level is city. The total number of cities is more than 280. The third level is county. And the lowest level is town and village. By using city-level data we can obtain more observations than provincial data. There are at most 31 observations in provincial data. Particularly, in early 1900s China had only 18 provinces, some provinces have been divided and merged into others. One

complicated issue of the historical city data is that during the last 100 years the map of cities has changed a lot. Since the territories of cities have changed a lot, it does not make much sense if we regress current cross-city data of institutions on the cross-city data of the enrollment of Christian missionary primary schools in early 1900s. Fortunately, our historical data is the cross-county data and the map of counties is relatively stable for the whole 20th century. Thus, we can match those counties in the 1920 Christian survey into the 47 cities in our sample and construct the historical data for our sample.

The data of institutions that we used in this paper is from a cross-city survey conducted by Pengfei Ni, et al. (2003 and 2004). Their survey covered 47 perfectural-level or higher level cities. For each city, they sent out 2000 questionnaires to scholars, entrepreneurs and randomly sampled citizens, asking them to grade the city's performance for a list of items. For each listed item, the questioned should select from five options ranging from highest favorable to the lowest. The highest favorable option is set as 1.5 points while the lowest -1.5. The mean points of the item was calculated. Then they construct the index among the 47 sampled cities for the item ranging from 0 to 1. The questionnaire covered a wide range of items. We are interested in the items on property rights. According to the way we define the institution, we adopt their index about the protection of property rights. The index of this item includes three sub-indices: the extent to which the government are not using the informal levy, protection of the intellectual property rights, and the protection of the contract enforcement by legal system. We take average of their index of the protection of property rights between 2002 and 2003 as our measurement of institutions. In Ni's survey, they also have an index, the comprehensive institutional index, to measure the general institutions rather than

property rights. We use the comprehensive institutional index and the extent to which the government are not using the informal levy to check the robustness of our results to various measurements of institutions.

The data of historical enrollment of missionary lower primary schools is from a general Christian survey conducted by the Continuation Committee in 1920. The results of the survey was beautifully edited into the book titled "The Christian Occupation of China". The survey had all the county-level data about the enrollment of missionary lower and higher primary schools in 1919. We do not use the data of higher primary school because they are not so complete as those of lower primary schools. For example, there were only 306 reported higher primary schools out of the 693 Protestant residential centers (Albert Feuerwerker, 1982). The survey also reported the population for each county. So we can calculate the enrollment of missionary lower primary schools per 1,000 persons, which is our instrument for institutions.

Finally, to measure the economic performance across regions, we use log GDP per capita of all cites in 2003, following Hall and Jones (1999). The data is obtained from Urban Statistical Yearbook of China 2004, in terms of the Chinese currency, or *yuan*. In table A1 we describe all other variables used in this paper and list the data sources.

Table 1 provides descriptive statistics of our main data. The average of log GDP per capita for all 47 cities in 2003 is 10.048 and the standard deviation in the sample is 0.4842. The maximum observation is 11.004 while the minimum is 8.996, which means that the GDP per capita of the richest city in our sample was almost 7.5 times large as that of the poorest city in 2003. The sample mean of average protection of property rights is 0.6509 and the standard deviation is 0.0979. The city with

the best institutions has an average score of 0.896 and the lowest average score in the sample is 0.5035. The average of the enrollment in missionary lower primary schools is 72.258 per 1,000 population and the standard deviation is 84.656. The maximum observation is 420.223 per 1,000 population. The minimum observation is only 1.3828 per 1,000 population.

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Notes

[1] In 1978 the Chinese government began to reform the economy toward a market system.

[2] Acemoglu, et al. (2001,2002) and Banerjee and Iyer (2005) show how history plays an important role in determining current institutions.

[3] Ironically, to get rid of this Captalist Mind from the deepest bottom of people's soul was claimed to be one of the goals of Culture Revolution 1966-1976. And it seems that the mission never accomplished.

[4] The "national income" is constructed as the sum of gross agricutural values and values added in industry for each city. The "national income per capita" is the "national income" divided by each city's population in 1985.

[5] The urban economic reform in China had not been launched in large scale until 1985.

Table 1: Descriptive Statistics

	Sample Mean	Minimum	Maximum
Log GDP per capita in 2003	10.048 (0.4842)	8.996	11.004
Institutions (Average protection of property rights 2002-2003)	0.6509 （0.0979）	0.5035	0.896
Christian lower primary school enrollment (Enrollment in Christian missionary lower primary schools in 1919)	0.7225 （0.8465）	0.0138	4.2022

Note: The sample size for all variables is 47. The standard deviations are reported in the parentheses under the means.

Table 2: Instrument the Institutions in China

Panel A. OLS: The Dependent is log GDP per capita			
Institutions	1.921***		1.522**
	(0.678)		(0.726)
Christian lower primary school enrollment		0.18**	0.120
		(0.08)	(0.084)
R^2	0.15	0.10	0.18
Panel B. OLS: The Dependent is Institutions			
Christian lower primary school enrollment	0.044***	0.036**	0.051***
	(0.015)	(0.015)	(0.015)
Distance to coast		-0.007**	
		(0.002)	
Investment rate in 2004			0.272*
			(0.137)
R^2	0.14	0.25	0.21
Panel C. OLS: The Dependent is Christian Lower Primary School Enrollment			
Distance to coast	-0.0374		
	(0.027)		
Total primary school enrollment		0.005	
		(0.02)	
Investment rate in 2004			-1.961
			(1.257)
R^2	0.038	0.001	0.05

Note: Standard errors of estimated coefficients are in parentheses.

***: significant at 1%

**: significant at 5%

*: significant at 10%

Table 3: The Effects of Institutions on Economic Performance

Panel A: 2SLS	
Institutions	4.230**
	(1.940)
Panel B: The First Stage	
Christian lower primary school enrollment	0.044***
	(0.015)
R^2	0.14
F	7.77
Anderson canonical correlation LR test	7.491
p-Value	[0.006]

Notes: Panel A reports 2SLS estimates with log GDP per capita in 2003 as dependent variable, and Panel B reports the corresponding first stage. Standard errors of estimated coefficients are in parentheses and the p-values are in brackets. The result from overidentification test reports the Sargan's statistic.

***: significant at 1%

**: significant at 5%

*: significant at 10%

Table 4: Robustness Test with Additional Controls

	(1)	(2)	(3)	(4)
Panel A: 2SLS				
Institutions	3.599*	4.304**	4.115**	3.621*
	(2.184)	(1.983)	(1.954)	(2.119)
Distance to coast	-0.027			-0.021
	(0.024)			(0.021)
Total primary school enrollment		-0.010		
		(0.013)		
Initial condition (in 1985)			0.566	0.550
			(0.542)	(0498)
Panel B: The First Stage				
Christian lower primary school enrollment	0.036**	0.043***	0.042***	0.037**
	(0.015)	(0.015)	(0.014)	(0.014)
Distance to coast	-0.007**			-0.005**
	(0.002)			(0.002)
Total primary school enrollment		0.003		
		(0.002)		
Initial condition (in 1985)			0.196***	0.167***
			(0.064)	(0.064)
R^2	0.25	0.19	0.29	0.35

Notes: Panel A reports 2SLS estimates with log GDP per capita in 2003 as dependent variable, and Panel B reports the corresponding first stage. Standard errors of estimated coefficients are in parentheses.

***: significant at 1%

**: significant at 5%

*: significant at 10%

Table 5: Robustness Tests with Different measurement of Institutions

	(1)	(2)	(3)
Panel A: 2SLS			
Average Protection of Property Rights	4.23**		
(main specification)	(1.94)		
Comprehensive Institutional Index		5.546*	
		(2.89)	
Index for government refrains of informal fees			2.42*
			(1.24)
Panel B: The First Stage			
Average Protection of Property Rights	0.044***		
(main specification)	(0.015)		
Comprehensive Institutional Index		0.033*	
		(0.018)	
Index for government refrains of informal fees			0.077**
			(0.029)
R^2	0.14	0.06	0.12

Notes: Panel A reports 2SLS estimates with log GDP per capita in 2003 as dependent variable, and Panel B reports the first stage with the listed measurement of institutions as dependent variable for each specification. In Panel B the explanatory variable is the instrument: the enrollment in Christian missionary lower primary schools in 1919. Standard errors of estimated coefficients are in parentheses. The first column is our main specification in Table 3.

***: significant at 1%

**: significant at 5%

*: significant at 10%

Table 6: Geography versus Institutions

	(1)	(2)	(3)	(4)	(5)
Panel A: 2SLS					
Institutions	3.559*	3.400*	3.949**	3.950**	3.479*
	(1.874)	(1.923)	(1.867)	(2.057)	(1.932)
Latitude	-0.016				0.034
	(0.011)				(0.060)
Temperature		0.027*			0.712
		(0.016)			(0.079)
Rainfalls			0.026		0.004
			(0.020)		(0.032)
North-south dummy				0.142	0.016
				(0.178)	(0.300)
Panel B: First Stage for Institutions					
Christian lower primary school enrollment	0.043**	0.042**	0.045***	0.040**	0.042**
	(0.016)	(0.016)	(0.016)	(0.015)	(0.016)
Latitude	-0.035				0.016
	(0.225)				(0.010)
Temperature		0.001			0.018
		(0.003)			(0.013)
Rainfalls			-0.002		-0.006
			(0.003)		(0.005)
North-south dummy				0.039	0.104**
				(0.027)	(0.046)
R^2	0.14	0.14	0.15	0.14	0.28

Notes: Panel A reports 2SLS estimates with log GDP per capita in 2003 as dependent variable, and Panel B reports the corresponding first stage. Standard errors of estimated coefficients are in parentheses. The north-south dummy takes value of one when a city locates in northern China and zero when it locates in southern China.

***: significant at 1%

**: significant at 5%

*: significant at 10%

Table 7: Policy versus Institutions

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: 2SLS						
Institutions	3.866*	4.405**	4.249***	4.393**	4.035*	3.383**
	(2.294)	(2.098)	(2.167)	(2.302)	(2.291)	(1.534)
West dummy	-0.413					
	(0.320)					
East dummy	0.056					
	(0.338)					
Dummy for coastal open cities		-0.119		-0.119		
		(0.197)		(0.198)		
Dummy for provincial level and deputy provincial level cities			-0.004	0.002		
			(0.166)	(0.165)		
Government consumption/GDP					0.999	
					(3.524)	
Investment rate in 2004						-1.438**
						(0.717)
Panel B: First Stage						
Christian lower primary school enrollment	0.035**	0.041**	0.042**	0.040**	0.038**	0.051***
	(0.015)	(0.015)	(0.016)	(0.016)	(0.016)	(0.015)
West dummy	0.055					
	(0.053)					
East dummy	0.107***					
	(0.035)					
Dummy for coastal open cities		0.040		0.039		
		(0.030)		(0.031)		
Dummy for provincial level and deputy provincial level cities			0.012	0.009		
			(0.028)	(0.028)		
Government consumption/GDP					0.699	
					(0.510)	
Investment rate in 2004						0.272*
						(0.137)
R^2	0.30	0.17	0.15	0.18	0.18	0.21

Notes: Panel A reports 2SLS estimates with log GDP per capita in 2003 as dependent variable, and Panel B reports the corresponding first stage. Standard errors of estimated coefficients are in parentheses. In column (1), the dummy for cities in middle China is omitted in the regression.

*** significant at 1%, ** significant at 5%, * significant at 10%.

A1: Data Descriptions and Sources

Data Descriptions	Sources
Log GDP per capita in 2003	From Urban statistical Yearbook of China (2004)
Institutions (Average protection of property rights, 2002-2003)	From Ni (2004 and 2005)
Christian lower primary school enrollment (Enrollment in Christian missionary lower primary schools per 1,000 population in 1919)	From the Continuation Committee (1922)
Distant to coast	From Au and Henderson (2002)
Total primary school enrollment (Enrollment in missionary and government primary schools per 1,000 population in 1919)	From the Continuation Committee (1922)
Initial condition (Log national income per capita in 1985[1])	From Urban statistical Yearbook of China (1986)
Christian higher primary school enrollment (Enrollment in Christian missionary higher primary schools per 1,000 population in 1919)	From the Continuation Committee (1922)
Latitude	From Au and Henderson (2002)
Temperature (Average in centigrade)	From various Provincial Statistical Yearbook of China (2004)
Rainfalls (in millimeter)	From various Provincial Statistical Yearbook of China (2004)
The ratio between government consumption and GDP in 2003[(2)]	From Urban statistical Yearbook of China (2004)

Note: (1) national income = gross agriculture value + value added in industry

(2) Government consumption is government spending net of expenditures on education, science and social security.

A2: Main Data Used in the Paper

Cities	Log GDP per capita in 2003	Institutions (Average protection of property rights 2002-2003)	Instrument (Enrolment in Christian missionary lower primary schools per 1,000 population in 1919)	Cities	Log GDP per capita in 2003	Institutions (Average protection of property rights 2002-2003)	Instrument (Enrolment in Christian missionary lower primary schools per 1,000 population in 1919)
Shenzhen	10.90678	0.716	3.354157	Guangzhou	10.78668	0.5265	0.81036
Wenzhou	9.714625	0.703	0.363966	Yantai	9.914477	0.656	1.352353
Ningbo	10.39326	0.874	0.605413	Chongqing	8.996776	0.612	0.207788
Shanghai	10.75188	0.8575	0.867647	Chengdu	9.800956	0.662	0.657268
Jiaxing	10.15782	0.768	0.236241	Weihai	10.42709	0.5495	0.389025
Huzhou	9.857548	0.672	0.375335	Zhuhai	10.984	0.68	0.744186
Shaoxing	10.13122	0.8105	0.342742	Nanchang	9.573733	0.625	0.304401
Zhongshan	10.50819	0.6675	0.744186	Hefei	9.279866	0.5585	0.123119
Taizhou	9.800402	0.6095	0.202358	Shijiazhuang	9.628261	0.614	0.033106
Suzhou	10.77254	0.7565	0.566417	Dalian	10.28213	0.632	0.204756
Xiamen	10.46336	0.896	4.202231	Changsha	9.603058	0.5515	0.580194
Hangzhou	10.39876	0.716	0.807204	Haikou	9.724959	0.5675	0.322727
Qingdao	10.06041	0.824	2.674683	Xi'an	9.411892	0.646	0.520519
Beijing	10.3754	0.679	1.222187	Kunming	9.699656	0.5295	0.640646
Dongguan	11.00473	0.6365	0.707389	Tianjin	10.18611	0.641	0.415557
Zhoushan	9.780133	0.699	0.216511	Wuhan	9.973806	0.5035	1.198144
Nantong	9.466841	0.7255	0.013829	Fuzhou	9.929155	0.5805	2.4713
Changzhou	10.17157	0.641	0.303127	Shenyang	10.05496	0.5195	0.597351
Wuxi	10.67255	0.6825	0.32671	Changchun	9.836546	0.58	0.133644
Quanzhou	9.820867	0.608	1.233659	Qinhuangdao	9.563529	0.689	0.637698
Foshan	10.60767	0.646	0.141509	Haerbin	9.607236	0.5325	0.26263
Nanjing	10.2149	0.7195	0.875139	Zhengzhou	9.744668	0.517	0.19503
Jinan	10.06858	0.633	0.336659	Xuzhou	9.20954	0.524	0.292204
Huizhou	9.940687	0.558	0.148392				