

Institutional Change and Economic Growth:

Evidence from China, 1978-2008

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Abstract-China's economic growth since 1978 is a miracle. We argue that gradual and persistent institutional changes and policy reforms that have reduced distortions and improved incentives are the main reasons for the miracle. Specifically, liberalization, marketization, and privatization have intertwined to play their roles. We use a panel dataset covering 31 Chinese provinces over 1978-2008 to test the hypothesis. The share of private sector in the economy is used as a measure of institutional change and policy reforms. We find that China's GDP will grow by 0.5 percent if the private share increases by 1 percentage point.

Keywords: economic growth, liberalization, institutional change, policy reform

I. INTRODUCTION

The pace and scale of China's economic transformation since the late 1970s have no historical precedent. In 1978, China was one of the poorest countries in the world. The real per capital GDP in China was only one-fortieth of the U.S. level and one-tenth the Brazilian level. Since then, China's real per capita GDP has grown at an average rate exceeding 8 percent per year. As a result, after 30 years, China's real per capita GDP is almost one-fifth the U.S. level and at the same level as Brazil. This rapid and sustained economic growth has occurred in a country with more than 20 percent of the world's population and China is now the second largest economy in the world (Zhu, 2012).

In this paper, we argue that China's economic growth during the past three decades has been driven by gradual and persistent institutional change and policy reforms that have reduced distortions and improved economic incentives. China's institutional change and policy reform do not start from the cities, but from the rural area. By 1984, almost the entire rural area had changed from a collective-farming system to a household responsibility system. Under the new system, peasants have residual claim to the agricultural output after they meet the quotas of the state and the collective. This institutional change improved peasants' incentives and increased agricultural output significantly (Lin, 1992).

China's institutional change and policy reforms do not start from privatization, but from economic liberalization. That is, existing state-owned enterprises (SOEs) and collectively-owned enterprises (COEs) were not intended to be privatized in the beginning, but newly-established privately owned enterprises and foreign-invested enterprises (FIEs) were allowed to enter the market and sell their products. The share of private sector in the economy began to rise in the 1980s due to the new private businesses.

The growing of private businesses expanded the market, people's income increased, and market demand grew. While the expansion of the market created the need for more producers and sellers to meet the growing demand. The improved incentive and thus productivity in the agricultural sector released a lot of peasants to work in the township-village enterprises (TVEs), and more and more private proprietors emerged. This virtuous circle went on and consequently market was growing and competition was getting increasingly intense.

The increasingly competitive product market provides a "battlefield" for enterprises with different ownerships/property rights to compete. It also provides a laboratory for economists to test the efficiency implications of enterprises with different property rights arrangements. In the 1990s, the competition had made many SOEs and COEs insolvent and become fiscal burdens of local governments. Then more and more SOEs and COEs got privatized especially after the mid 1990s; more and more private enterprises grew up, some of them were previously individual proprietors. The growing of private sector in the economy since the 1990s has two sources, one is the ever growing of newly private businesses, the other is the privatization of previously SOEs and COEs.

The "victory" of private ownership has obvious efficiency implications. Efficiency implies productivity. If productivity growth has been the major driving force of China's economic success, then it must be attributable to institutional change, because institutional change implies incentive change, incentive change implies efficiency change. Based on the above reasoning, we believe that the change of

private share in the economy is a proper measure of institutional change and policy reform. And China's institutional change and policy reforms can be characterized to be a process of liberalization, marketization, and privatization, all leading to the growing of private share in the economy.

Our contribution in this paper is to use this measure of institutional change to test the effect of it on economic growth. We use a provincial-level panel dataset covering all the 31 provinces in mainland China over 1978-2008 to do this job. The rest of the paper is organized as follows. Section II presents explicitly our hypothesis on the role of institutional change and policy reforms in economic growth. Section III uses the panel dataset to test the hypothesis. And Section IV concludes the paper.

II. THE HYPOTHESIS: INSTITUTIONAL CHANGE LEADING TO ECONOMIC GROWTH

Nobody denies that institutions matter for economic performance. Before 1978, China failed to catch up with advanced nations because it adopted a public ownership, planned economy, closed-door, self-reliance, and import-substitution policy. A natural conjecture is a change of institutions changes China's economic performance. But what are the specific mechanisms?

Modern economic theories suggest that capital accumulation and technological progress are driving forces of economic growth (Solow, 1957). But just as North (1981) pointed out, capital accumulation and technological progress are not so much the causes of economic growth as economic growth itself. Solow does not answer why some countries can achieve faster capital accumulation and technological progress and others cannot.

We believe that the more fundamental reason is institutional arrangement. Economic growth is a change, we should use other changes to explain this change. So we conjecture that institutional change and related policy reforms are the key to China's economic miracle. They lead to faster capital accumulation and technological progress. Institutional change and policy reforms are multidimensional, but all the changes lead to the change of private share in the economy.

In retrospect, the development of a private sector or privatization of existing SOEs and COEs was not the initial intention of China's reformers in the 1980s (Zhang, 2010). The first phase of China's reform, which covers the entire 1980s, could be properly called "economic liberalization." By economic liberalization, we mean non-SOEs, including COEs, small-scale individual businesses, and FIEs in the special economic zones, were allowed to enter previously forbidden industries, buying and selling inputs and outputs at market prices.

So the second phase of China's economic reform can be labeled as "marketization," which means the

prices of more and more products were determined by the market, and the market size was kept growing. This period is very short, and by the mid 1990s prices of most basic goods were determined by the market. Starting from the mid 1990s, especially after the 15th National Congress of the Chinese Communist Party (CCP) held in 1997, massive privatization began. At this Congress, a so-called "grasping the large and letting go of the small" policy was enacted, which was an implicit way of allowing local governments to privatize the small and medium-sized SOEs within this jurisdictions.

Liberalization, marketization, and privatization - the trilogy of China's economic reform - are interrelated. Without economic liberalization, price marketization was unnecessary. If all goods are rationed rather than marketed, money price just plays the function of "unit of account," it cannot assume the function of transmitting information on scarcity of goods. Without liberalization and marketization, there would be no need for privatization. Local governments have no pressure to privatize their SOEs if there is no competition from other firms.

Liberalization, marketization, and privatization lead to a common change, the growing of private sector itself and the growing share of private sector in the economy. Given that institutions matter, we naturally hypothesize that private sector contributes more to the national economic growth. Economic performance is determined by people's behavior, people's behavior is determined by incentive mechanism, incentive mechanism is determined by property rights arrangements. So a change in property rights arrangement eventually leads to the change of economic performance.

Based on the above arguments, we propose our hypothesis: The private sector has contributed more to China's economic growth over the past three decades. That is, the share of private sector in the economy should have a significant positive effect on GDP. The logic chain is here: The growing of the private sector has been the result of China's gradual and persistent institutional change and policy reforms, which were characterized by liberalization, marketization, and privatization. Growing private share in the economy has reduced distortions and improved incentives, which in turn stimulated capital accumulation and technological progress, and then enhanced efficiency and productivity, and finally led to economic success.

III. ECONOMETRIC MODEL AND REGRESSION RESULTS

A. *Model Specification*

Our econometric model is as follows:

$$Y_{it} = \beta_0 + \beta_1 K_{it} + \beta_2 L_{it} + \beta_3 PRIVATE_{it} + \beta_4 HC_{it} + \beta_5 TRAN_{it} + \beta_6 EXCH_{it} + \beta_7 EXP_{it} + \beta_8 INVEST_{it} + u_{it} \quad (1)$$

where i ($i=1, \dots, 31$) and t ($t=1978, \dots, 2008$) denote province i and year t . Y , K , and L are GDP, capital stock, and labor in natural logarithms. $PRIVATE$ is the share of private sector in the provincial economy. HC denotes human capital, measured as the ratio of number of students enrolled in higher education to population. $TRAN$ is transportation infrastructure, measured as the equivalent highway mileage per 10,000 square kilometers of land area. $EXCH$ is the exchange rate between RMB and U.S. dollar. EXP is the ratio of export to GDP, and $INVEST$ is the ratio of fixed investment to GDP.

Capital (K) and Labor (L) are indispensable inputs in any production. K is calculated by following Zhao (2013). NBS (2010) provides the annual number of workers of each province. With the growth of labor, the structure of labor also changed dramatically. Fan (2010) estimates that about 200 million peasants have left their rural homes and moved to the urban industrial and service sectors over the past three decades.

The share of private sector in the economy is our measure of institutional change and policy reforms. It is not perfect, but almost all policy reforms can be characterized as liberalization, marketization, or privatization, which all lead to the growing share of the private sector.

We include human capital (HC) in the regression equation as an independent variable because labor just measures the quantity of the factor, but does not reflect the change of its quality. Many papers treat human capital as an important determinant of growth, such as Frank and Bernanke (2009) in explaining Japan and Germany's catch-up after World War II. Empirically human capital can be defined in different ways. In the literature, it is usually defined as ratio of the number of students enrolled in higher education to population, or the ratio of the number of students enrolled in secondary education to population, or the number of students enrolled in higher education to the number of students enrolled in secondary education. In this paper, we choose the ratio of the number of students enrolled in higher education to population, given that secondary education has been popularized across China and thus its ratio has a much smaller variation.

We include transportation infrastructure ($TRAN$) to take into account the role of infrastructure on China's growth. China's infrastructure has improved dramatically during the past three decades. For example, China's first highway was built in 1988, which was only 100 kilometers long, connecting Beijing and Tianjin. By the end of 2008, the total length of China's railway has reached 60,000

kilometers (NBS, 2010).

Of course, highway is not the only form of transportation. In this paper, we measure transportation as the equivalent mileages of railway, highway, and waterway per 10,000 square kilometers of land. The simplest way is to add the total lengths of railway, highway, and waterway for each province, as Fleisher and Chen (1997) did. However, the transportation capacity of one kilometer of railway is different from that of one kilometer of highway or waterway. Therefore, it is necessary to convert them into one form of transportation. We choose to convert railway and waterway into equivalent highway. The conversion ratios are calculated from the volumes of transport per kilometer by each of the three means of transport at the national level. Based on the 2008 data, the ratios are 8.07:1.00:4.67. That is to say, we multiply railway by 8.07 and waterway by 4.67 to get their equivalent lengths of highway.

We include exchange rate ($EXCH$) and "ratio of export to GDP" (EXP) in the regression equation because it is widely believed that China's economic growth has been driven by foreign demand (exchange rate affects export). Exchange rate is time-variant but location invariant, since exchange rate policy is homogenous across all provinces. Given that RMB follows U.S. dollar (USD) very closely, and USD is the dominant currency for international trade settlement. We use the exchange rate between RMB and USD (units of RMB per dollar) to represent $EXCH$. Everything else being equal, a higher $EXCH$ implies that RMB is depreciating, which makes Chinese products be more competitive in the international market and stimulates China's production. So we expect that $EXCH$ will positively affect GDP.

Chinese economy has long been acknowledged to be investment driven. Of course, investment plays its role through the formation of capital stock, and this effect is measured by capital stock in the model. We include "the ratio of investment to GDP" ($INVEST$) in the model to further test whether a higher investment-GDP ratio will lead to higher economic growth. It is included as a ratio so that multicollinearity can be properly avoided.

B. Regression Results

Because Eq.(1) has passed the panel cointegration test, the long-run model will not be spurious even though all the explanatory variables are non-stationary. The Hausman test result supports a fixed effect model. Eq.(1) will be estimated with OLS reporting different standard errors. The first model is fixed effect model reporting the default standard errors, the second model reports heteroskedasticity-robust standard errors, and the third model reports Driscoll-Kraay standard errors.

TABLE I. PANEL DATA REGRESSION RESULTS (31 PROVINCES, 1978-2008)

Dependent Variable: ln(GDP)	Model (1)		Model (2)		Model (3)	
	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio
Constant	-11.923***	-4.86	-11.93	-1.38	-11.93***	-3.08
ln(Capital stock)	0.541***	29.54	0.541***	12.42	0.541***	11.36
ln(Labor)	0.317***	7.84	0.317***	3.33	0.317***	4.19
Private share (%)	0.005***	17.01	0.005***	9.25	0.005***	4.87
ln(Human capital)	0.057***	4.46	0.057***	3.15	0.057***	3.00
ln(Transportation)	0.037*	1.85	0.037	1.00	0.037	1.31
ln(Exchange rate)	0.145***	9.25	0.145***	4.86	0.145***	4.33
ln(Export/GDP)	-0.0004	-0.09	-0.0004	-0.04	-0.0004	-0.05
Investment/GDP (%)	-0.002***	-5.26	-0.002***	-3.16	-0.002**	-2.33
Time trend	Controlled		Controlled		Controlled	
Specification	Fixed Effect		Fixed Effect		Fixed Effect	
Number of obs.	961		961		961	
Within R-squared	0.9956		0.9956		-	

Notes: The individual coefficient is statistically significant at the *10%, **5% or ***1% significance level. Model (1) is regression with the default standard errors. Model (2) is regression with robust standard errors. Model (3) is regression with Driscoll-Kraay standard errors.

Table 1 presents the regression results. The slope estimates of most explanatory variables have the anticipated signs. We pay attention to the parameter of interest: the coefficient on PRIVATE. In all three models, the coefficient is positive and statistically significant below 1 percent level, and it is robust for different standard errors. As the increase of private share in the national economy is the overall outcome of China's institutional change and policy reforms, this result provides strong evidence to support our hypothesis. Practically, everything else being equal, China's GDP will increase by 0.5 percent if the private share in the economy increases by 1 percentage point.

This result echoes many previous findings through growth accounting decomposition. Previous studies have shown that productivity growth has been the main source of China's economic growth since 1978. Productivity growth is the result of technological progress and efficiency improvement, which are the consequence of institutional changes. Zhu (2012) reports that 78 percent of China's per capital GDP growth over 1978-2007 is attributed to total factor productivity growth. Examining the data between 1978 and 1998, Young (2003) also comes to the conclusion that capital deepening was *not* the source of China's growth. Neoclassical growth model tells us that persistent economic growth can only come from productivity growth (Solow, 1957). More than three decades of rapid economic growth in China would be impossible without significant growth in productivity.

Besides private share, other variables like human capital, transportation, and exchange rate all have a positive and statistically significant impact on GDP. Specifically, China's GDP will increase by 0.057 percent if the college students enrollment in the population increases by 1 percent. Given that higher education has developed dramatically since the late 1970s and especially after the mid-1990s, human

capital improvement must have played a vital role in China's economic success.

China's GDP will grow by 0.037 percent if the mileage of equivalent highway increases by 1 percent. The equivalent mileage of highway is a proxy for China's infrastructure. During the past three decades, China has invested heavily in infrastructure construction. Modern factories, world-class highways, railways, ports, and airports have been built with unprecedented speed and scale. The improvement of infrastructure greatly facilitates production and distribution of resources and products, which contributes to China's economic growth.

Everything else being equal, China's GDP will grow by 0.145 if the exchange rate rises (RMB depreciates) by 1 percent. The effect is statistically significant. A depreciating RMB will stimulate China's exports, will be contribute to China's GDP growth. Since 2005, RMB has kept appreciating, but this negative effect on GDP has been more than offset by other factors. The ratio of export to GDP has no significant effect on output. This may be because, on the one hand, the effect of export has been captured by the variable of exchange rate, on the other hand, export does not play a greater role in GDP growth than domestic demand.

The ratio of investment to GDP, however, shows a statistically negative effect on GDP. This result may seem surprising because it runs in the face of a popular view that China has followed an investment-driven growth model. We believe this result is reasonable for two reasons. One, the main effect of investment is to increase capital stock, so its effect to economic growth has largely been captured by capital stock. Two, larger ratio of investment to GDP may bring significant GDP growth in the short run (say the current year), but it may not bring long-run economic growth if the investment is not market-oriented. For example, many large investment projects by the government had been kept idle for

many years due to lack of market demand, this is a waste of resources, and thus is detrimental to economic growth. As Zhu (2012) notices, China capital investment since 1978 has been keeping up with its rapid rate of output growth but not leading it.

IV. CONCLUDING REMARKS

Economic growth is a change in economic performance, which is endogenous; to explain such a change, we must find other changes as exogenous variables. In this paper, we argue that the major driving force behind China's spectacular and prolonged growth is persistent institutional change and policy reforms. We believe that property rights is at the core of any country's institutions. So we use the change of property rights as a measure of institutional change. To go one step further, we use the change of the private share in the economy to show the change of property rights, considering that public ownership accounted for almost 100 percent of the national economy at the beginning of China's reform in the late 1970s.

The growing of private sector in the economy is not isolated. China's institutional change started from economic liberalization, which makes more Chinese people with entrepreneurial abilities have opportunities to start their own businesses. Opportunities are given to people, and incentives are put right. The following marketization and privatization reforms become logical and coherent. The empirical finding of this paper strongly supports our hypothesis. China's institutional change and market-oriented reforms have greatly improved incentives of agents, leading to faster capital accumulation and technological progress, which in turn leading to rapid economic growth. In this sense, China's economic success is a miracle, but not a puzzle. China's growth experience is not at odds with previous economic wisdom, but again confirms that institutions do matter.

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