Home-bias Politics, Financial Deregulation and Economic Growth: A Causal Relationship

He, Qichun
Central University of Finance and Economics

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Qichun He†

Abstract

We re-examine the finance-growth nexus using the Chinese financial deregulation experience during the reform period 1981-1998. We use lagged home-bias political variables as instruments for financial deregulation. Dealing with weak instruments by LIML (limited-information maximum likelihood) estimation, we find that financial deregulation has a significant causal effect on economic growth. The result holds up when we control for conditional convergence, other growth determinants, and time and province effects.

JEL Classification: O2, C23

Keywords: Financial Deregulation; Home-bias Politics; Causality; Growth

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†China Economics and Management Academy, Central University of Finance and Economics, No. 39 South College Road, Haidian District, Beijing, China. 100081. Email: qichunhe@gmail.com, heqichun@cufe.edu.cn.

1 Introduction

There is a long-standing debate on the finance-growth nexus.[1] Authors such as Robinson (1952) and Lucas (1988) argue that finance does not cause growth (i.e., finance follows growth), while others including Schumpeter (1912), McKinnon (1973), King and Levine (1993) and Rajan and Zingales (1998) show that the role of finance in promoting growth cannot be ignored. Reviewing the literature on the finance-growth nexus, Levine (2005) concludes: "Much work is required to better understand the role of financial factors in the process of economic growth." Motivated by Levine, we use the appealing financial deregulation experience in the People's Republic of China (hereafter China) – detailed later – to study whether financial deregulation has a causal effect on growth.

China's financial deregulation is one of the most important economic events that have greatly affected the Chinese economy with the largest population and one of the largest territories in the world. Studying the Chinese experience not only helps to solve the finance-growth debate (i.e., whether Chinese financial deregulation simply follows growth as Robinson and Lucas conjecture or it has a large causal effect on growth), but may offer useful lessons for other countries. There are many other countries that have deregulated their financial service over the past several decades.[2] However, as a backward poor developing country that has achieved impressive growth in the financial deregulation process, the Chinese experience, especially its gradual approach to financial deregulation should offer useful lessons for other underdeveloped and transitional economies.

Unlike previous studies on China (see Wei and Wang, 1997; Lardy, 1998; Cull and Xu, 2003; Brandt and Zhu, 2007; Chow, 2004), we re-examine the finance-growth nexus. In so doing, our study improves over the finance-growth nexus literature in three aspects. First, we find a new identification strategy to deal with the potential endogeneity of financial deregulation policies. The finance-growth debate explains why people may suspect that Chinese financial deregulation is endogenous to the growth process. To establish a causal relationship between financial deregulation and growth, we use the instrumental variable (IV) approach and use political variables as instruments for financial deregulation. This identification strategy concurs with Levine (2005) who concludes that finance is influenced by political, cultural and legal factors. Politics is one of the many important factors that determine the path of Chinese financial deregulation (see e.g., Shirk, 2003). Our political variable is the number of national government department ministers born in each province. Most of the ministers in our sample have participated in the liberation and the founding of China. This means they are selected into office because of their performance in war (i.e., exogenous to the growth process). We argue that they have home-bias (i.e., they favor their birth-provinces) in determining the path of financial deregulation. We isolate

[1] Because of Levine's (2005) excellent discussion of it, we shall omit detailed references to the literature.

[2] Typical examples in developing countries are the financial reforms in Vietnam (Riedel and Turley, 1999) and Morocco and Tunisia (Jbili et al., 1997), and those in industrialized countries include European Union's Second Banking Directive in 1993 and Japan's "Big Bang" financial deregulation in 1996.

the variation of financial deregulation explained by home-bias politics and find that it has a significant causal effect on growth. The result is robust to controlling for conditional convergence, other growth determinants, and time and province effects.

Second, comparing to cross-country studies, our analysis uses financial reforms systematically implemented across Chinese provinces that are relative more homogenous and more meaningful to compare. We use dummy variables weighted by population to quantify China's financial deregulation policies – detailed later. Third, China's financial deregulation was conducted following the gradual approach, generating substantive variations across time and across provinces in the degree of financial deregulation, illustrated in figures 1 to 3. Our analysis exploits the substantive variations. The time variations allow controlling for unobserved province effects, presenting a robust result.

[Figures 1, 2 and 3 Here]

The estimated magnitude of IV regression is economically significant for our financial deregulation indicators. For example, all else equal, China's financial deregulation on average has contributed 1.31% to annual growth during our sample period 1981-1998, which is around 16% of the total average annual growth of China during the period.

The paper is organized as follows. After we briefly introduce the Chinese financial deregulation, in section 2 we derive the empirical formulation and construct the variables. Section 3 presents the estimation results. Section 4 concludes.

1.2 The Chinese Gradual Financial Reform

Before 1978, China was a command economy in which the financial intermediaries work under the command of the government. The financial system is underdeveloped with the government playing a dominant role (Lardy, 1998, ch. 3; Naughton, 1995, ch. 1). Interest rates were set administratively; monetary policy was conducted through direct allocation of credit and refinancing. Capital markets were nonexistent. The primary financial intermediaries were state banks. Believing in the gospel of rapid industrialization, the Chinese government obliged state banks to lend to the priority sector, the state-owned industrial sector, with little concern for its profitability (see Naughton, 1995; Shirk, 2003).

In 1978, the Chinese government embarked on gradual financial deregulation aimed at establishing a market-based financial system. The Chinese gradual financial deregulation studied by previous works (see Lardy, 1998; Naughton, 1995; Shirk, 2003; Brandt and Zhu, 2007) refers to the following. Across time, it involves a gradual implementation of piecemeal financial deregulation policies over a long period of time. Common themes of the piece-meal policies include the provision of more autonomy in credit allocation to state-owned banks, the removal of restrictions on their ownership structure, and the relaxation of geographical and legal restrictions on the entry of new financial intermediaries. Across

provinces, it refers to a process that allows some provinces to implement some piece-meal financial deregulation policies first. Specifically, each year, the government may choose some financial deregulation policies and designate some cities and rarely some province(s) to carry out such policies. After one year or more, the government may spread them to the whole province, further to several provinces, and finally to the whole country. After decades of reform, state banks have been built into joint-stock commercial banks; various markets like money, bond and equity markets have been created. The role of market in financial resource allocation has been enhanced. Nevertheless, the objectives of Chinese financial deregulation are far from being accomplished, and there are still many unresolved issues in the financial deregulation process (see Lardy, 1998; Naughton, 1998). China's ongoing financial deregulation will continue for a long time.

In China, exogenous political, cultural, institutional, and geographical factors determine the time and provincial variations in financial reform policies. Shirk (2003, p.129) argues that the path of financial reform in China since 1979 reflects a political logic. The political and cultural factors will be used to isolate the exogenous component of financial deregulation in explaining growth, as will be detailed in section 2.3.

2 The Data

2.1 Deriving the Empirical Specification

As is known to all, China has undertaken the market-oriented reform and opening-up in 1978. That is, China has not only made continuous efforts to reform its economic institutions, but also opened its borders to foreign investors and trade (see Deng, 1975). Therefore, the Chinese provinces can be treated as backward small open economies that rely on the absorption of technological expertise from abroad to achieve technological progress. Barro and Sala-i-Martin (2004, p. 350), for instance, have stated that the absorption of technological expertise from Hong Kong has been important for China's technological progress. Therefore, we use the technology diffusion and absorption model based on Acemoglu (2009, ch. 18) – detailed later – to derive the empirical formulation.

Acemoglu (2009, p. 614) argues that the absorptive capability of the backward economy varies across countries because of policy barriers affecting technology adoption. Following Acemoglu, we assume that the absorptive capability depends on financial deregulation. This is likely because China's financial deregulation, aiming at eliminating existing financial distortions and protectionist policies, encourages imitative entrepreneurial activities. For simplicity, we assume that the absorptive capability of the backward economy linearly depends on financial deregulation. Therefore, we use financial deregulation to measure the absorptive capability of the backward economy.

For a Chinese province, its aggregate production function for a unique final good is

$$Y_t = K_t^{\alpha} H_t^{\beta} \left(A_t L_t\right)^{1-\alpha-\beta}, \tag{1}$$

where K, H, and L are physical capital, human capital, and raw labor respectively. A_t is its level of technology, whose progress will be pinned down later. And $g = \frac{\dot{A}_t}{A_t}$ is the growth rate of technology. The output per effective labor at t is $y_t = k_t^{\alpha} h_t^{\beta}$, where the effective capital-labor ratio, k_t, and human capital-labor ratio, h_t, evolve according to

$$\dot{k} = s_k y_t - (n + g + \delta) k_t \tag{2}$$

$$\dot{h} = s_h y_t - (n + g + \delta) h_t, \tag{3}$$

where s_k, s_h are exogenous physical and human capital investment rates respectively. n and δ are exogenous population growth rate and depreciation rate respectively. And $g = \frac{\dot{A}_t}{A_t}$ is the growth rate of technology. The world technological frontier A_t^w is assumed to grow at an exogenous rate g^w. Following Acemoglu, we posit the following law of motion for technology:

$$\dot{A}_t = FD \cdot (A_t^w - A_t) + \gamma A_t, \tag{4}$$

where the first term on the right-hand-side (RHS) of equation (4) measures the absorption/imitation of world technology and the second term, γ, measures domestic innovations. Technology absorption depends on the product of the absorptive capability (measured by financial deregulation, FD) and the technology gap between world technology frontier and the domestic level of technology, $(A_t^w - A_t)$.

As in Acemoglu, we define the inverse of the distance to the world frontier, $a_t < 1$, as $a_t = \frac{A_t}{A_t^w}$. Using equation (4), we have

$$\dot{a}_t = FD - (FD + g^w - \gamma) a_t. \tag{5}$$

We begin with the steady state. In the steady state, the technological progress rate of the small economy, g, is equal to g^w. And in steady state, $\dot{k} = 0$ and $\dot{h} = 0$. Then steady state output per effective labor can be solve as

$$y^* = (s_k)^{\frac{\alpha}{1-\alpha-\beta}} (s_h)^{\frac{\beta}{1-\alpha-\beta}} (n + g^w + \delta)^{-\frac{\alpha+\beta}{1-\alpha-\beta}}. \tag{6}$$

Approximating around the steady state, the speed of convergence is $\lambda = (1 - \alpha - \beta)(n + g^w + \delta)$. Following the steps in Mankiw et al. (1992, p. 423), we end up with

$$\ln(y_t) - \ln(y_{t-1}) = -\left(1 - e^{-\lambda}\right) \ln(y_{t-1}) + \left(1 - e^{-\lambda}\right) \ln(y^*), \tag{7}$$

where $\ln(y^*)$ can be expressed as exogenous parameters as in equations (6). Since the above equation is output per effective labor, we transform it into output per labor. Output

per labor is $\frac{Y}{L}$, which is equal to yA. Hence we have

$$\ln\left(\frac{Y}{L}\right)_t - \ln\left(\frac{Y}{L}\right)_{t-1} = \left[\ln\left(y_t\right) - \ln\left(y_{t-1}\right)\right] + \left[\ln\left(A_t\right) - \ln\left(A_{t-1}\right)\right]. \tag{8}$$

Combining equations (7) and (8) yields

$$\ln\left(\frac{Y}{L}\right)_t - \ln\left(\frac{Y}{L}\right)_{t-1} = -\left(1-e^{-\lambda}\right)\ln\left(y_{t-1}\right) + \left(1-e^{-\lambda}\right)\ln\left(y^*\right) + g. \tag{9}$$

The technological growth rate of the small economy, g, is

$$g = \frac{\dot{A}_t}{A_t} = \frac{\dot{a}_t}{a_t} + g^w = \left(\frac{1}{a_t} - 1\right) FD + \gamma. \tag{10}$$

According to equation (10), a higher degree of financial deregulation (FD) will increase the technological growth rate of the small economy because $\left(\frac{1}{a_t} - 1\right) > 0$.

Substituting out g using equation (10) and $\ln\left(y^*\right)$ using equation (6) from equation (9), we have our final empirical specification as

$$\begin{aligned}
\ln\left(\frac{Y}{L}\right)_t - \ln\left(\frac{Y}{L}\right)_{t-1} \;=\; & \left(\frac{1}{a_t} - 1\right) FD + \gamma - \left(1-e^{-\lambda}\right)\ln\left(y_{t-1}\right) \\
& + \left(1-e^{-\lambda}\right)\frac{\alpha}{1-\alpha-\beta}\ln\left(s_k\right) + \left(1-e^{-\lambda}\right)\frac{\beta}{1-\alpha-\beta}\ln\left(s_h\right) \\
& - \left(1-e^{-\lambda}\right)\frac{\alpha+\beta}{1-\alpha-\beta}\ln\left(n+g^w+\delta\right).
\end{aligned} \tag{11}$$

In equation (11), the last four terms are exactly the same as those in augmented Solow model (see Mankiw et al., 1992). The first two terms on the RHS of equation (11) are new and capture the technological progress of the backward economy. A higher degree of financial deregulation (FD) would raise the technological absorptive capability of the backward economy, ending up raising its growth rate. Although it is not emphasized, the same argument applies to γ (the domestic technological advances). A higher degree of financial deregulation (FD) would also raise the domestic technological advances of the backward economy and thereby speed up the growth of the backward economy.

Specifically, we use the following formulation for empirical assessment:

$$\begin{aligned}
growth_{it} \;=\; & \beta_0 + \beta_1 FD_{it} + \beta_2 \ln\left(\frac{GDP}{L}\right)_{i,t-1} + \beta_3 \ln(\frac{I}{GDP})_{it} \\
& + \beta_4 \ln(SCHOOL)_{it} + \beta_5 \ln(n+g^w+\delta)_{it} + u_i + T_t + \varepsilon_{it}
\end{aligned} \tag{12}$$

where $growth_{it}$ is the average annual growth of real GDP per worker for i^{th} province at period t; FD is the measure of financial deregulation, which is constructed below; $\ln\left(\frac{GDP}{L}\right)_{i,t-1}$, real GDP per worker at the beginning of period t, controls for conditional

convergence. $\frac{I}{GDP}$ and $SCHOOL$ measure physical capital investment rate and human capital investment rate respectively. $(n + g^w + \delta)$ measures labor force growth. u_i and T_t stand for fixed province and time effects respectively.[3]

We use China's cross-province time series data on 27 provinces from 1981 to 1998. Following the common practice in the empirical growth literature, we take six-year averages of the data to avoid the influence from business cycle phenomena.

2.2 Constructing Financial Deregulation Indicators

We locate China's financial deregulation policies from the book "The Big Economic Events since China's Reform and Opening-up (1978-1998)".[4] The international symposium organized by the Chinese Economists Society at the University of Southern California in 1997 divides China's financial deregulation policies as follows:

1. Domestic Financial Deregulation
   (a) Reforms of the banking sector:
      i. Reforming commercial banks and policy banks;
      ii. Regulations of banking institutions in China;
      iii. Entry of foreign banks in enhancing competition;
      iv. Possibilities of more domestic private banks.
   (b) Non-bank Financial Institutions and Regulations:
      i. Insurance market;
      ii. Non-bank deposit market, and non-bank deposit-taking institutions;
      iii. Regulations on gray and black credit market for small loans.
2. Capital Market Development
   (a) On Equity and Bond market;
   (b) On Foreign Exchange Market.

We quantify all the financial deregulation policies into one single indicator, denoted as FD. Following the previous literature that studies banking sector and stock market separately (Levine and Zervos, 1998; Demirguc-Kunt and Levine, 2001), we further divide the financial deregulation policies into banking/non-bank policies (the policies belong to the domestic financial deregulation above), denoted as $BANK$, and stock market ones (the policies belong to the above capital market development), referred to as $STOCK$.

[3] Solow (2003) discusses the use of the empirical formulation in cross-country regressions (e.g., Barro, 2003) for China.

[4] There are other books documenting the gradual financial deregulation policies in China during the period 1978-1998, but the big events are similar across these books.

Since most financial deregulation policies are at the city level, we first construct the city level dummy variables. Then we aggregate them to the provincial level, using the ratios of the cities' population to their provincial population as weights:

$$Index = \sum_{j}(\sum_{i} \frac{Total\ Population\ of\ City\ i\ in\ 1996}{Total\ Population\ of\ the\ Province\ in\ 1996} \cdot I_{ci}^{t} + I_{p}^{t}) \qquad (13)$$

where I_{ci}^{t} is a dummy variable that equals one if city i receives a financial deregulation policy j in year t; I_{p}^{t} is an indicator variable that equals one if a financial deregulation policy j is conducted in the province. Adding together all policies (the $j^{'}s$) in and before year t for all the cities within a province yields its policy index for year t. The data on the cities' population are from the Statistical Yearbook on China's Cities.

Using population rather than GDP (gross domestic product) as weight is to lessen the endogeneity problem of financial deregulation indicators. An ideal weight should further consider the quality of the enforcement of the policies. However, finding a quality measure is a daunting task, hence we leave it to future research. Figures 1 to 3 illustrate the substantive provincial and time variations in our financial deregulation index $BANK$. Table 1 presents the summary statistics for our financial deregulation indexes.

[Table 1 Here]

2.3 Endogeneity and Identification Strategy

Given the debate on the finance-growth nexus, it is not surprising that some suspect that the logic for the government to conduct financial deregulation is based on the anticipation of future growth. To address the potential endogeneity problem of financial deregulation, we adopt the IV approach and use political and cultural factors as instruments. Our identification strategy concurs with Levine (2005) who reviews that many studies suggest that finance is influenced by legal, political and cultural factors.

As argued, in China, political, cultural, institutional, and geographical factors determine the path and logic of financial deregulation. Shirk (2003, p.129), for instance, argues that the path of financial reform in China since 1979 reflects a political logic: "The actual pattern of economic reform did not reflect economic theories so much as it did 'the conflict of various kinds of interests, that is the conflict, coordination, and balancing of interests between various trades and industries, between urban and rural areas, between localities, and between localities and the central authorities'." Therefore, politics is one important factor in driving the path and logic of financial deregulation. Moreover, culture plays an important role in determining the path of financial deregulation. The Chinese culture is that policy makers tend to give preferential policies to their hometown. We term this as the home-bias of politicians. We combine the political and cultural factors to build our home-bias political variable (detailed below).

Following the literature on politician turnovers and economics growth in China, we find the book entitled "Annals of the Officials of the People's Republic of China". It lists China's government officials and their tenure in office for all the national government departments from its founding in 1949 to year 2003. We argue that the bargaining and coordination of these government officials of the highest rank, i.e. the ministers of all the national government departments, plays an important role in determining what provinces receive the preferential treatment in the process of financial deregulation. We choose the ministers, rather than the vice-ministers, of all the national government departments to represent the distribution of political powers. This is because in the Chinese institutional framework in which the minister has absolute power over the vice-ministers in making the final decisions. Therefore, we find over 200 ministers for over 100 national government departments (some of them were closed after 1978 and some were set up after 1978) during the reform period 1978-1998.

During our sample period 1981-1998, the majority of the national government department ministers are generals or officers of the People's Liberation Army or important members of the Chinese Communist Party. They earn their power in war and in the founding of China. After the founding of China in 1949 when their age was mainly in the range of 20-40, they continue to work as the national government department ministers until retirement. Therefore, their selection into office was mainly based on their role in war, which is exogenous to the growth process.

We use culture to assign the national government department ministers to the provinces. As argued, the ministers are influenced by the Chinese culture in choosing the designated cities or provinces to conduct financial deregulation: they tend to favor the province where they were born (the aforementioned home-bias of the politicians). Therefore, we find the birth-provinces for all the national government department ministers. We build the province level time series political variable as follows. For instance, during the 1993-1998 period, the minister of the Ministry of Communications is Zhendong Huang who was born in Jiangsu province. Therefore, we assign a value 1 to Jiangsu province and zeros to all the other provinces for our sample period 1993-1998. We repeat the dummy variable operations for all the national government department ministers. However, suppose minister Huang was in office for the period March 1993 to December 1995, then we would assign Jiangsu province a value that equals the ratio of the number of years he is in office to the number of years in the period 1993-1998 (i.e., 6), which is roughly 0.5 in this case. Finally, we add up all the dummy variables to get the provincial level political variable. We repeat the same steps for other two sub-periods. To avoid potential endogeneity problem, we use the lagged values of the political variable. For example, the value of period 1987-1992 is given to period 1993-1998. This makes more sense because it may take a while for the national government department ministers to bargain over and finally set up the deregulation policies. Moreover, it takes time to carry out the deregulation

policies. The substantial province and time variations in our political variable, denoted by $POLITICS$, are also illustrated in figures 1 to 3. One can observe that our political variable is significantly correlated with our financial deregulation indicator, $BANK$.

2.3 Measuring Other Variables

The Chinese GDP data are reliable as Holtz (2003) finds that there is no evidence of data falsification at the national level. Our dependent variable is the average annual growth of real GDP per labor. However, there is a large statistical adjustment in 1990 on labor force (detailed in Young, 2003, 1233-1234). Around half of Chinese provinces made the changed in 1990, which is just the change in statistical caliber as detailed in Young. Fortunately, Statistical Yearbook of China (SYC) has maintained the original statistical caliber and provided the data on provincial labor force. Therefore, this more consistent series provided by SYC allow us to cover the periods before and after 1990 to avoid "spurious labor force growth" (Young, p. 1234).

Initial real GDP per worker takes the value of the beginning year of each sub-period. $SCHOOL$ is measured as secondary school enrollment (student enrollments for middle schools, grades 7 to 9, and high schools, grades 10 to 12) divided by labor force following Mankiw et al. (1992). For labor force growth, $ln(n + g^w + \delta)$, we use 0.08 for $(g^w + \delta)$. That is, we assume a 2% world annual growth and a 6% depreciation rate for China. As in Mankiw et al. (1992), our result is insensitive to the assumed number for $(g^w + \delta)$. $\frac{I}{GDP}$ is the nominal physical capital investment rate, which is to avoid the deflator problem for investment in China (see Young, 2003). The data are all from SYC.

In sum, our data sample comprises panel data of 27 provinces and 18 years.[5] Following the standard approach in the empirical growth literature, we take six-year averages of the Chinese panel data to avoid the influence from business cycle phenomena, producing three time periods. Table 1 lists the summary statistics of our data.

[Table 1 Here]

3 Estimation Results

3.1 LSDV (Least squares dummy variables) Estimation

We first use LSDV estimation to test the relationship between growth and financial deregulation with the three financial deregulation indexes. That is, we use OLS (Ordinary least

[5] Among China's 31 provincial governments, four are municipalities and four are autonomous regions. We delegate the usage 'province' to all. Four provinces are dropped due to lack of complete data. Specifically, before 1997, Chongqing was a city of Sichuan province, hence both of them are excluded from the sample. Hainan was part of Guangdong before it became an independent province. Since there is a complete set of data for Guangdong, it is kept in the data sample while Hainan is dropped. Tibet is excluded because there are many missing data.

squares) estimation that includes 27 province dummies and 3 time dummies. Table 2 summarizes the results.

Column 2.1 in Table 2 reports the OLS results with the banking/nonbank deregulation index, $BANK$. One can see that the estimated coefficient on $BANK$ is positive and significant at the 5% level. It means a high degree of banking/nonbank deregulation is associated with a high rate of economic growth. The estimated coefficient on initial real output per worker is negative and significant at the 1% level, showing strong evidence of conditional convergence. The estimated coefficient on ln(SCHOOL) is positive and significant at the 1% level. The estimated coefficient on $ln\left(\frac{I}{Y}\right)$ is positive but insignificant at the 10% level, as in Weeks and Yao (2003). The estimated coefficient on $ln\left(n+g+\delta\right)$ is negative and significant at the 10% level. The model fits the Chinese data well.

Column 2.2 in Table 2 reports the OLS results with the financial deregulation index (FD) that quantifies all the financial deregulation policies. One can see that its estimated coefficient is positive. It means a high degree of financial deregulation is associated with a high rate of economic growth. However this relationship is insignificant at the 10% level.

Column 2.3 in Table 2 reports the OLS results with the stock market deregulation index ($STOCK$). One can see that the estimated coefficient on STOCK is positive, which is insignificant at the 10% level.

[Table 2 Here]

3.2 Endogeneity and LIML Regression

As discussed, the measures of financial deregulation may be endogenous to the growth process. To address the endogeneity problem, we adopt the IV approach and use the home-bias political variable, $POLITICS$, and $POLITICS$-squared as instruments.

In the presence of weak instruments, Hahn and Hausman (2005) show that the ratio between the finite sample biases of 2SLS (two-stage least squares) and OLS with a troublesome explanator is (see Murray 2006)

$$\frac{\text{Bias}\left(\beta_1^{2SLS}\right)}{\text{Bias}\left(\beta_1^{OLS}\right)} \approx \frac{l}{n\widetilde{R}^2},$$

where l is the number of instruments, n is sample size and $\widetilde{R}^2$ is the first-stage partial R-squared of excluded instruments. From the first-stage results in column 3.1 to column 3.3 in Table 3, our $n\widetilde{R}^2$ is always much larger than the number of instruments. These show that 2SLS regression is favored over OLS. Further, Hahn and Hausman (2005) show that when the first-stage partial R-squared of excluded instruments ($\widetilde{R}^2$) is larger than 0.1, 2SLS is favored over OLS regressions. Our $\widetilde{R}^2$ is larger than 0.1 in columns 3.2 and 3.3. In column 3.1 with banking/nonbank deregulation BANK, the $\widetilde{R}^2$ is slightly smaller than 0.1. However, from the corresponding second-stage results, the endogeneity test of

BANK yields a p-value 0.033. It shows the strong endogeneity of financial deregulation. Therefore, 2SLS is also favored over OLS.

[Table 3 Here]

The above also shows that the instruments are possibly weak. Andrews and Stock (2005) state that now the common approach is to use 2SLS if instruments are strong and to adopt a robust strategy if instruments are weak. In the presence of many instruments, Stock and Yogo (2002) show that LIML (limited-information maximum likelihood) estimation is far superior to 2SLS. Therefore, we proceed with LIML estimation.

The first-stage results of LIML estimation are reported in Table 3. One can see that although $POLITICS$ has a significant effect on $BANK$, the F-test on the joint significance of $POLITICS$ and its square shows that they jointly have an insignificant effect on $BANK$ at the 10% level. This confirms the presence of weak instruments. The F-tests on the joint significance of $POLITICS$ and its square on FD and $STOCK$ yield a p-value below 0.1, meaning the political variables jointly has a significant effect on FD and $STOCK$ at the 10% level. These justify our use of LIML estimation.

Moreover, from the first-stage results in Table 3, one can observe that the estimated coefficient on initial real GDP per worker is insignificant. This actually means that having better initial conditions (like being richer and having better infrastructure) would not bring more financial deregulation policies. In contrast, the estimated coefficient on physical capital investment rate is significant at the 1% level. This is not surprising given that Chinese investment was mainly conducted by the state sectors. Therefore, political factors, rather than efficiency motives, may drive the physical capital investment of the provinces (see also Cull and Xu, 2003; Wei and Wang, 1997). Since both physical capital investment and financial deregulation are conducted on a political logic, the significant effect of physical capital investment rate on financial deregulation may be due to omitting other important political factors that are unrelated with our home-bias political variables.

The second stage results of LIML estimation are presented in Table 4. The endogeneity test always yields a p-value below 5%, showing strong evidence of the endogeneity of financial deregulation indicators.

In regression 4.1 in Table 4, the estimated coefficient on $BANK$ remains positive and significant at the 5% level. Therefore, the positive relationship between banking deregulation and growth is causal. Comparing with the OLS result in column 2.1 in Table 2, the estimated coefficient on $BANK$ becomes much larger in magnitude. This means the OLS regression under-estimates the significantly positive effect of $BANK$ on growth. The weak identification (Cragg-Donald) test statistic is smaller than the Stock-Yogo critical value for the 25% maximal LIML size, meaning we have the existence of weak instruments. This further justifies our use of LIML regression. The over-identification test yields a p-value 0.60, which is much larger than 10%. Therefore, we accept the null that the instruments are valid.

In regression 4.2 in Table 4, the estimated coefficient on FD remains positive but becomes significant at the 5% level. Therefore, financial deregulation has a significant causal effect on growth. Comparing with the OLS result in column 2.2 in Table 2, the estimated coefficient on FD becomes much larger in magnitude. This means the OLS regression under-estimates the significantly positive effect of FD on growth. The weak identification test statistic is smaller than the Stock-Yogo critical value for the 25% maximal LIML size, further justifying our use of LIML regression. The over-identification test yields a p-value 0.32, which supports the validity of the instruments.

In regression 4.3 in Table 4, the estimated coefficient on $STOCK$ remains positive but becomes significant at the 10% level. Therefore, stock market deregulation has a causal effect on growth, which is significant at the 10% level. Its estimated coefficient also becomes much larger in magnitude. The over-identification test yields a p-value 0.15, which supports the validity of the instruments.

[Table 4 Here]

The estimated magnitude of IV regression is economically significant for the financial deregulation indicators. For example, using regression 4.1, all else equal, the banking/nonbank deregulation on average has contributed 1.91% to annual growth during the period 1981-1998, which is around 24% of the total annual growth of China during the same period. Similarly, using regressions 4.2 and 4.3, all else equal, financial deregulation and stock market deregulation on average have contributed 1.31% and 0.54% respectively to annual growth during the period 1981-1998.

3.3 Robustness Check

It is not hard to accept that home bias in political decision-making is likely to influence the extent of financial deregulation within any province. However, there may be concern that the same home bias in decision-making will also influence other policies that generate faster economic growth. That is, the instrument may pick up not just the effects of financial deregulation on growth but other effects as well. Omitting other effects may produce a bias on our estimated coefficients and even weaken the validity of our instruments. This concern is valid and applies to other areas of economics that try to isolate the effect of one particular group of policies like tariff reduction on the interested variable. It also makes any study on the Chinese experience very hard. One can never fully get around this issue, but we try to minimize the concern by another IV strategy.

As stated in Murray (2006), if one can find another group of instruments that are grounded on different rationales, then she may be able to check the robustness of her results, provided that all the instruments are valid. Finding one group of instruments is already tough, finding two groups is much tougher. What we can do is to follow the review conclusions in (Levine, 2005): "This broad spectrum of work suggests that finance

maybe influenced by political, legal, cultural, and even geographical factors." That is, we try to find some geographical factors as instruments. We have one contemporary weather indicator, namely, the variation of monthly temperature calculated using the Weather Yearbook of China and the Natural Resources Database of China Academy of Sciences.

The problem with geographical factors as instruments is that previous literature has shown that geography may influence growth via other channels. Moreover, the variation of temperature has little effect on financial deregulation, as can be seen from the first-stage results in column 3.4 in Table 3. The second-stage results on indicator BANK are reported in columns 4.4 of Table 4. The estimated coefficient on BANK is significant at the 5% level, with a slightly larger magnitude. Our results are also robust to the combination of other weather indicators (not reported here) and our political variables as instruments. Moreover, the result is robust with system GMM (Generalized method of moments) estimation that overcomes the potential endogeneity of all explanatory variables by using the political variables, more weather variables to avoid under-identification, and the time dummies. Arellano and Bover (1995) and Blundell and Bond (1998) show that system GMM estimator can dramatically improve efficiency and avoid the weak instruments problem in the first-difference GMM estimator.

Therefore, we argue that, all instruments could influence growth via other channels, but the component of financial deregulation explained by political variables, geographical variables and time variables must be highly correlated with the potential omitted growth determinant(s) to keep the results robust. It is not unlikely, but it is hard to argue that this omitted variable bias alone is driving this relationship. At least, one may be able to say that China's market-oriented deregulation (could be finance, could be other dimensions, and could be every one of them) has a significant causal effect on growth. Nevertheless, we deem our study as the first step towards achieving the final mission of isolating the effect of financial deregulation on growth.

4 Conclusions

In this paper we use the Chinese gradual financial deregulation experience to re-examine the finance-growth nexus. Using home-bias political variables to overcome the endogeneity of financial deregulation, we find a significant causal effect of financial deregulation on economic growth. The results are robust to controlling for conditional convergence, other growth determinants, and time and province effects. Despite that our measurement of main indicators and the empirical strategy may not be perfect, our study is the first step in uncovering the role of China's financial deregulation in promoting growth.

Appendix: Data on Average Annual Growth Rate, Financial Deregulation and Home-bias Politics

Province	Annual Growth	BANK	FD	POLITICS	Province	Annual Growth	BANK	FD	POLITICS
Beijing (1981-86)	6.0	1.25	1.25	0	Shandong	7.2	0.19	0.19	6
Beijing (1987-92)	5.0	6.76	7.92	1.5	Shandong	5.7	1.07	1.07	8.2
Beijing (1993-98)	9.5	8.76	11.05	2.3	Shandong	9.5	2.71	2.71	7.9
Tianjin	5.6	1.54	1.54	0	Henan	5.9	0.02	0.02	2
Tianjin	4.2	6.24	7.08	0.4	Henan	3.8	0.16	0.16	2.6
Tianjin	12.0	6.33	7.33	1.2	Henan	7.8	0.12	0.12	2.8
Hebei	6.2	0.42	0.42	9	Hubei	7.5	0.45	0.45	3
Hebei	5.6	1.29	1.29	5	Hubei	4.6	1.81	1.99	1.2
Hebei	9.5	1.26	1.26	5.9	Hubei	10.2	1.97	2.18	5.2
Shanxi	7.7	0.01	0.05	3	Hunan	5.4	0.03	0.03	1
Shanxi	3.5	0.10	0.31	2.1	Hunan	3.4	0.22	0.22	0.4
Shanxi	7.8	0.05	0.27	4.8	Hunan	7.6	0.18	0.18	3.4
Inner Mongolia	7.5	0	0	1	Guangdong	7.7	0.85	0.86	1
Inner Mongolia	4.6	0	0	0	Guangdong	8.9	3.48	3.60	1.5
Inner Mongolia	8.1	0	0	0	Guangdong	9.0	4.70	4.85	3
Liaoning	6.0	0.51	0.55	4	Guangxi	3.6	0.01	0.01	0
Liaoning	4.3	2.40	2.81	1	Guangxi	5.2	0.03	0.03	1
Liaoning	8.2	3.39	3.83	2.6	Guangxi	6.9	0.03	0.03	0.2
Jilin	4.2	0.01	0.01	0	Guizhou	6.5	0	0	1
Jilin	2.6	1.03	1.03	0	Guizhou	2.4	0	0	0.2
Jilin	10.3	2.14	2.14	1.4	Guizhou	5.2	0	0	0
Heilongjiang	2.9	0.03	0.03	0	Yunnan	6.1	0	0	0
Heilongjiang	3.7	0.82	0.95	0	Yunnan	5.1	0	0	0
Heilongjiang	4.9	1.76	1.91	1	Yunnan	6.8	0	0	0
Shanghai	6.3	1.79	3.29	2	Shaanxi	6.6	0.14	0.14	1
Shanghai	6.6	8.40	15.73	3.2	Shaanxi	4.3	0.97	0.97	0.6
Shanghai	11.7	11.49	20.49	7.5	Shaanxi	6.3	0.93	0.93	2.5
Jiangsu	7.9	0.49	0.49	8	Gansu	5.1	0	0	1
Jiangsu	7.9	1.86	1.86	6.6	Gansu	4.7	0.10	0.10	0.5
Jiangsu	11.0	2.86	2.93	10.3	Gansu	6.5	0.06	0.06	0
Zhejiang	8.2	0.57	0.57	3	Qinghai	6.5	0	0	0
Zhejiang	6.8	2.08	2.08	5.4	Qinghai	2.2	0.24	0.24	0
Zhejiang	11.0	3.13	3.13	6.1	Qinghai	5.8	0.24	0.24	0
Anhui	6.9	0	0	4	Ningxia	6.7	0	0	0
Anhui	2.0	0.29	0.29	1.8	Ningxia	3.2	0.11	0.11	0
Anhui	9.6	1.25	1.25	5.1	Ningxia	5.0	0.11	0.11	0
Fujian	6.0	0.60	1.43	3	Xinjiang	8.7	0.01	0.01	0
Fujian	6.9	2.95	2.95	2.26	Xinjiang	7.2	0.17	0.17	0.5
Fujian	10.7	5.11	5.16	1.7	Xinjiang	6.3	0.13	0.13	1
Jiangxi	6.0	0.33	0.33	2					
Jiangxi	5.2	1.29	1.29	0					
Jiangxi	6.5	2.25	2.25	0.6					

Note: Growth rates are in percentage.

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Table 1: Descriptive statistics

	Mean	Standard deviation	Minimum	Maximum
growth (annual, %)	6.47	2.26	2.00	12.00
BANK	1.41	2.24	0	11.49
FD	1.73	3.34	0	20.49
STOCK	0.33	1.31	0	9
POLITICS	2.19	2.53	0	10.3
$\ln(\mathrm{Y/L})_{t-1}$	7.39	0.62	6.21	9.42
ln(SCHOOL)	2.25	0.24	1.76	2.84
ln(I/Y)	3.67	0.22	3.14	4.32
$\ln(n + g^{w} + \delta)$	2.32	0.14	1.93	2.61

Observations: 81. The data are six-year averages for 27 provinces.
Except for growth, BANK, FD, STOCK and $ln(\frac{Y}{L})_{t-1}$, all other variables are multiplied by 100 and then taken logarithms.

Table 2. LSDV Regressions between Financial Deregulation and Economic Growth

Dep. Var.: Average Annual Growth Rate of Real GDP per worker 1981-86, 1987-92, 1993-98

	Regression number		
Independent Variable	2.1	2.2	2.3
$BANK$	0.40^{**}		
	(0.17)		
FD		0.18	
		(0.11)	
$STOCK$			0.07
			(0.26)
$\ln\left(\frac{Y}{L}\right)_{i,t-1}$	-5.24^{***}	-4.76^{**}	-4.71^{**}
	(1.85)	(1.90)	(1.98)
$\ln(SCHOOL)$	4.67^{***}	4.76^{***}	5.12^{***}
	(1.69)	(1.75)	(1.80)
$\ln\left(\frac{I}{Y}\right)$	0.40	1.10	2.77
	(2.50)	(2.60)	(2.61)
$\ln(n+g+\delta)$	-4.82^{**}	-5.26^{**}	-5.58^{**}
	(2.15)	(2.20)	(2.25)
Time Fixed Effects	Yes	Yes	Yes
Province Fixed Effects	Yes	Yes	Yes
R^2	0.84	0.83	0.82
Observations	81	81	81

***Significant at the 0.01 level, ** at the 0.05 level, * at the 0.10 level

(standard errors in parentheses)

Table 3. Regressions between Financial Deregulation and Economic Growth
First-stage results.

	Regression number			
	3.1	3.2	3.3	3.4
	First-stage dependent variable as			
Independent Variable	$BANK$	FD	$STOCK$	$BANK$
$POLITICS$	0.43*	0.65*	0.23	0.44*
	(0.24)	(0.37)	(0.16)	(0.24)
$POLITICS$-squared	−0.02	−0.03	−0.001	−0.02
	(0.02)	(0.04)	(0.02)	(0.02)
$\ln\left(\frac{Y}{L}\right)_{i,t-1}$	1.22	−0.27	−1.49	1.39
	(1.60)	(2.45)	(1.08)	(1.64)
$\ln(SCHOOL)$	1.24	2.13	0.89	1.26
	(1.43)	(2.19)	(0.96)	(1.44)
$\ln\left(\frac{I}{Y}\right)$	5.97***	9.76***	3.79***	5.98***
	(1.92)	(2.94)	(1.29)	(1.94)
$\ln(n+g+\delta)$	−1.66	−1.25	0.41	−1.63
	(1.80)	(2.76)	(1.21)	(1.82)
Variation of Monthly Temperature				0.01
				(0.02)
Time Fixed Effects	Yes	Yes	Yes	Yes
Province Fixed Effects	Yes	Yes	Yes	Yes
Partial R-squared of excluded instruments	0.0807	0.1049	0.1139	0.0874
$\frac{\text{Bias}\left(\beta_1^{2SLS}\right)}{\text{Bias}\left(\beta_1^{OLS}\right)} \approx \frac{l}{n\widetilde{R}^2}$	$\frac{2}{6.54}$=0.31	$\frac{2}{8.50}$=0.24	$\frac{2}{9.23}$=0.22	$\frac{3}{7.08}$=0.42
F-test on excluded instruments:	2.02	2.69	2.96	1.44
(prob. of F)	(0.144)	(0.078)	(0.062)	(0.245)
R^2(centered)	0.89	0.88	0.85	0.89
Observations	81	81	81	81

***Significant at the 0.01 level, ** at the 0.05 level, * at the 0.10 level

(standard errors in parentheses)

Table 4. LIML Regressions between Financial Deregulation and Economic Growth
Second-stage Results.

	Regression number			
Independent Variable	4.1	4.2	4.3	4.4
$BANK$	1.36^{**}			1.42^{**}
	(0.60)			(0.59)
FD		0.76^{**}		
		(0.35)		
$STOCK$			1.63^{*}	
			(0.87)	
$\ln\left(\frac{Y}{L}\right)_{i,t-1}$	-6.27^{***}	-4.61^{**}	-2.63	-6.33^{***}
	(1.94)	(1.820)	(2.30)	(1.98)
$\ln(School)$	3.38^{*}	3.32^{*}	3.37^{*}	3.29^{*}
	(1.84)	(1.86)	(2.05)	(1.88)
$\ln\left(\frac{I}{Y}\right)$	-6.01	-5.27	-3.84	-6.42
	(4.56)	(4.40)	(4.40)	(4.56)
$\ln(n+g+\delta)$	-3.03	-4.29^{**}	-5.89^{***}	-2.91
	(2.39)	(2.18)	(2.29)	(2.43)
Time Fixed Effects	Yes	Yes	Yes	Yes
Province Fixed Effects	Yes	Yes	Yes	Yes
Endogeneity test (p value)	0.033	0.038	0.028	0.019
Weak Identification Test	2.02	2.70	2.96	1.44
Stock-Yogo Critical value:				
25% maximal LIML size	3.92	3.92	3.92	3.32
Over-identification test p-value	0.60	0.32	0.15	0.84
R^2(centered)	0.73	0.73	0.68	0.71
Observations	81	81	81	81

Note: Endogenous variable in 4.1, 4.2 and 4.3 are BANK, FD and STOCK respectively.
Instruments used in 4.1-4.3: POLITICS and POLITICS-squared.
Instruments used in 4.4: POLITICS and POLITICS-squared and the variance of temperature.
***Significant at the 0.01 level, ** at the 0.05 level, * at the 0.10 level
(standard errors in parentheses)

Figure 1. Provincial Variation in Banking Deregulation and POLITICS (1981-86)
Figure 2. Provincial Variation in Banking Deregulation and POLITICS (1987-92)
Figure 3. Provincial Variation in Banking Deregulation and POLITICS (1993-98)