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Capital Freedom, Financial Development and Provincial Economic Growth in China

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Abstract:

For more than three decades, China has managed to combine rapid economic growth with a heavily regulated financial sector. The discrepancy between economic and financial development has raised the question of whether China might be an exception to the so-called finance-growth nexus. This study examines the relationship between finance and growth at the provincial level in China using a new set of measures of capital freedom and financial development. The results indicate that capital freedom and financial development are associated with both higher income and growth rates. In particular, we find that the marketization of financial institutions and strengthening of legal and government institutions have a particularly strong impact on income and growth in low-income provinces.

JEL Codes: C23; E44; G28; O11; O43

Keywords: China; Economic growth; Financial institutions

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1. Introduction

Since the introduction of a set of market reforms in the late 1970s, China has experienced sustained and extraordinarily high growth levels. However, despite fundamental reforms in both the agricultural and manufacturing sectors, the financial sector is lagging behind.² Moreover, despite a series of financial sector reforms implemented since 1994, banks and other financial institutions are strictly regulated and the government exerts substantial control over how capital is allocated (Naughton, 2007). A large share of credit is channeled to inefficient state owned enterprises (SOEs), whereas private firms face considerable constraints in obtaining financing. As a consequence, non-performing loans have a tendency to accumulate in the economy. Additionally, in response to the lack of market-driven financial allocation, a large shadow banking system has emerged (Naughton, 2007).

The discrepancy between economic growth and the pace of financial reform in China raises questions regarding the causal relationship between the two. An extensive body of theoretical and empirical literature suggests that weak financial institutions are detrimental to growth (Goldsmith, 1969; Levine, 1998, 2005; Beck et al., 2002; Behnabib and Spiegel, 2000; Rajan and Zingales, 1998). The subsequent question is therefore whether the Chinese experience in recent decades represents an exception to the finance-growth nexus. Would Chinese growth have been more substantial if financial markets had been liberalized to a greater extent?

A recent strand of the literature that empirically examined the finance-growth nexus in China has obtained mixed results. Studies that highlight the detrimental effects of limited financial reform include Boyrey-Debray (2003), Aziz and Duenwald (2002), Chen and Degryse (2010) and Zhang et al. (2012). In contrast to these studies, Liu and Li (2001) and Chen et al. (2006) demonstrate that there is a positive relationship between finance and growth in China. At least some of the conflicting results are likely explained by differences in the definition of financial development. While certain scholars focus on the size of financial markets (e.g., the volume of total loans, bank deposits), others emphasize the impact of specific types of finance. There is also disagreement over the importance of market-driven forms of finance. While, for instance, Allen (2005) highlights the importance of market-driven financial institutions, Ayygara (2007) concludes that a regulated

² Some of the largest reforms to the Chinese banking sector include the 1994 reform, in which the PBC was transformed into a formal central bank; in 1994, the four large, state-owned banks were transformed into state-owned commercial banks; in 1995, a new bank law was introduced; and in 2003, the China Banking Regulatory Commission (CBRC) was established.

banking sector plays an important role, as opposed to informal sources of financing outside the reach of Chinese regulators.

The mixed empirical results obtained thus far and the design of the Chinese financial system indicate that simple measures of financial development might conceal the underlying structures of financial mechanisms that are important for economic growth. To perform a multifaceted analysis of the association between financial market development and growth in China, this study employs a new and uniquely rich data set on capital freedom and regional financial development at the provincial level. These data allow us to discern various measures of capital freedom and financial market development, thus enabling us to disentangle specific factors of financial development that are important for economic growth.

To further scrutinize the finance-growth nexus, we not only analyze how different measures of capital freedom and financial sector development impact growth, but we also analyze whether the effect is asymmetric across provinces with different income levels. This has implications for economic policies in less developed regions of China. Poorer provinces have been systematically targeted since the early 2000s in what is typically called the “Go West program” or “China Western Development program” (Goodman, 2004). Thus, the impact of institutional reform could potentially carry important policy implications that are relevant for the interior and western parts of China.

This study contributes to the literature in several dimensions. First, the indices considered capture a wide variety of the institutional aspects of financial markets, yielding a rich picture of how different features of capital freedom and financial development impact regional growth in China. Second, by analyzing the heterogeneous effect of capital freedom and financial development across the income distribution, we can analyze the extent to which improvements in a given type of institution benefits poor or rich provinces to the greatest extent.

The results of this study suggest that improving the conditions for capital freedom and financial sector development enhance growth and that the impact is most pronounced in relatively poor provinces. The positive impact is found to be particularly robust for policies that increase the marketization of financial intuitions and improve legal and governmental institutions. Thus, improving the financial system not only enhances growth in China but also decreases regional inequality. Considering the intensive debate on increasing regional inequality and Go-West policies, these results are easily translated into viable policy recommendations

2. Background

2.1 The Finance-Growth Nexus

A large strand of theoretical and empirical literature has examined the relationship between the development of financial markets and economic growth. Beginning with the early contributions of Goldsmith (1969), scholars have extended and deepened our understanding of the finance-growth nexus. Levine (2005) highlights a number of financial market functions that impact the allocation of resources and subsequent growth. The allocation issue includes functions such as producing information on possible investments, monitoring investments and exerting corporate governance after financing is provided, facilitating trade, diversification, risk management, mobilizing and pooling savings, and facilitating the exchange of goods and services.

Though Goldsmith (1969) successfully described the dynamics of how financial markets evolve, it was more challenging to provide evidence of a causal relationship between finance and growth. One factor complicating attempts to identify a causal relationship between financial markets and growth was a lack of data. King and Levine (1993) offered a significant contribution that empirically analyzed the finance-growth nexus. Key data problems in establishing a causal relationship between finance and growth encountered by King and Levine (1993) and others were the endogeneity of financial institutions and a lack of proper instruments. Based on cross-country data, and utilizing legal origins as an instrument, Levine (1998, 1999) provided evidence that financial development was a leading indicator of economic growth. Levine et al. (2000) also demonstrated that the results were robust to the application of a generalized method of moments (GMM) approach. Similar studies that succeeded in confirming this relationship using GMM estimators include Beck et al. (2000) and Behnabib and Speigel (2000). Rossuea and Wachtel (2000) suggested an alternative approach to this problem and applied a VAR model to examine the effect of liquidity in equity markets on output.

Following the evidence of a relationship between finance and growth, a number of studies examine the asymmetric effects of financial institutions on different country characteristics and the level of development. For instance, in two studies, Rioja and Wachtel (2004a, 2004b) found that the effect of financial institutions on growth differs between developed and developing economies and that countries at an intermediate stage of financial sophistication generally experience the largest growth effects from further financial development.

Though cross-country studies have numerous advantages, they are also subject to two complications. First, specific financial indicators might not be equally suitable for all countries, and second, there is an underlying risk of failing to control for country-specific effects. In response to this criticism, a number of country-level studies have been conducted that use more targeted measures of financial development and panel data. Jayratne and Strahan (1996) found that financial deregulation, in the form of the intrastate branch reform in the US, had a positive impact on growth, primarily through the quality of bank lending and not through increased lending volumes. Other studies that highlight the importance of financial development for growth in the US include Rousseau and Sylla (2003) and Deheija and Lleras-Muney (2003).

Finally, the finance-growth nexus has also been analyzed from an industry perspective using industry-level data. Seminal contributions in this respect include Rajan and Zingales (1998), who demonstrated that firms in industries that are highly dependent on external financing grow more rapidly in countries with more developed financial institutions. Other contributions include Ceterolle and Gambera (2001), who focus on the effect of the banking structure. These authors demonstrate that while the bank concentration limits the amount of credit, it also has an asymmetrically positive effect on industries that are relatively dependent on external financing and that this effect could compensate for the negative effects in other parts of the economy.

2.2 China's financial system

When studying the finance-growth nexus in China, it is important to highlight certain specific characteristics of the Chinese financial system. In the transition from a planned to a market oriented economy, a series of important changes have taken place. Despite multiple market-oriented reforms, China's financial sector remains dominated by a few large banks, which are regulated by the government and differ from the financial systems of Western economies. The state-owned bias in the Chinese banking system has disadvantageously affected access to capital for private firms by favoring state-owned companies, leading to a reduced supply of risk capital to private firms. The lack of credit to private firms has in turn led to the emergence of a shadow banking system (Naughton, 2007). Specifically, Naughton (2007) divides China's financial sector into four parts: state-owned commercial banks, joint-stock commercial banks, city banks and other financial institutions including policy banks and rural credit cooperatives. Before 1978, the financial system exclusively consisted of the People's Bank of China (PBC), which served as both a central bank and a commercial bank. After 1978, the commercial side of the PBC was divided into the so-called "Big

Four” – the four principal government banks that serve different tasks and continue to dominate the financial sector. The Big Four consist of the Industrial and Commercial Bank of China (ICBC), which focuses on lending and deposits in cities; the China Construction Bank (CCB), which primarily finances infrastructure projects; the Bank of China (BOC), which is responsible for foreign trade and exchange; and the Agricultural Bank of China (ABC), which has a similar task to that of the ICBC but in rural areas. Thus, the PBC has exclusively served as the central bank since this reform (Naughton, 2007).

While all of the Big Four banks have been publicly traded since 2010, the Chinese government remains the largest shareholder. A major concern regarding the Big Four is their bias towards state-owned enterprises when channeling credit. Although China has undergone significant reforms to liberalize its financial sector, the Big Four continue to discriminate against private companies because of their shorter credit histories, lower likelihood of being bailed out by the government (Guariglia and Poncet, 2008) and lack of political clout (Borst, 2011). Apart from being an impediment to the growth of the private sector, the excessive financing provided to SOEs causes non-performing loans to accumulate.

As a result of the 1994 reforms, three policy banks were separated from the commercial banks (Naughton, 2007) and assumed responsibility for financing government projects. The China Development Bank finances large-scale infrastructure projects, the Export-Import Bank of China promotes exports and the Agricultural Development Bank of China operates in rural areas.

Another group of banks in China are the joint-stock commercial banks and city banks. City banks were transformed from urban credit cooperatives in the 1990s to provide funds for small-scale urban companies. Between 1986 and 2001, a number of joint-stock commercial banks were established. Naughton (2007) argues that these institutions brought competition into the banking system. This was primarily because they were less dependent on the central government and had younger and more highly trained staff. This led these types of banks to accumulate fewer bad loans relative to the Big Four. Until 2013, these banks were transformed into private joint stock companies with shares owned by local government, investment companies and individuals. These banks are smaller in size and primarily focus on financing local businesses. The joint-stock commercial banks and city banks also rely less on regular bank lending and more on other forms of finance (Martin, 2012).

The last category consists of rural credit cooperatives (RCCs). These cooperatives were created in the 1950s and were not integrated into the People’s Bank of China. Their primary purpose was to

stimulate the development and productivity of farmers in the rural areas by financing township and village enterprises (TVEs). While the TVEs proved highly successful in the 1980s, many of these firms experienced difficulties during the 1990s, which caused the RCC to accumulate large amounts of non-performing loans. This resulted in a bailout from the central government in the early 2000s, which was followed by a vast restructuring of these banks (Naughton, 2007).

Due to China's strictly regulated banking system, which is dominated by few large institutions, a large fraction of private firms are unable to secure financing and, as a result, are searching for other sources of funds. The lack of financing for private firms and the fact that real interest rates in China are low, or even negative, have contributed to the growth of a parallel, shadow banking sector. The shadow banking system provides finance in a number of ways, including off-balance-sheet lending, underground banking, pawnshops and offshore borrowing (Borst, 2011). Though this counters the effects of the financial discrimination that private firms face, the shadow banking system also creates fundamental vulnerabilities in the financial system, primarily because this sector is difficult to regulate and operates in an environment with a substantially weaker institutional framework. Although it is difficult to estimate the size of the shadow banking sector, Borst (2011) provides the following estimates:

Table 1. Estimates of the shadow banking sector in China.

Source	Estimate (in RMB) State
Information Center	2 trillion annual flow
Barclays Capital	3.1 trillion annual flow, 22% of new financing
Bernstein Research	2.7 trillion, 5 percent of loans
Credit Suisse	4 trillion
Nomura Securities	8.5 trillion
Financial Times China Confidential	10 trillion
ANZ Bank	10 trillion

Source: (Borst, 2011). Compiled by the Peterson Institute for International Economics.

In summary, the conclusion drawn from the literature is that China's financial system is underdeveloped relative to most Western economies and subject to extensive government intervention. This causes a number of problems including the emergence of shadow banking and the allocation of resources to inefficient SOEs, which causes non-performing loans to accumulate. Nevertheless, China has managed to sustain rapid growth, which has led some scholars to conclude that China is an exception to the so-called finance-growth nexus by being able to provide for private market financing and growth within a system dominated by state-owned banks and government intervention.

2.3 China's Finance-Growth Nexus

Though a series of cross-country and individual-country studies have provided empirical evidence for a positive relationship between financial development and growth, China presents a somewhat puzzling case. The discrepancy between long-lasting growth and a slow pace of financial reform raises the question of whether China might represent an exception to the general relationship between finance and growth.

Liu and Li (2001) provided an early empirical contribution on the relationship between finance and growth in China. The authors examined the efficiency of four sources of financial development on provincial output during the period between 1985 and 1998. This included state budget appropriations, national bank loans, self-raised funds, and foreign investment. While obtaining positive results for the relationship between finance and growth, their study concludes that non-state sources of funding are generally more efficient in promoting output than are state-owned sources. In contrast, Aziz and Duenwald (2002) found no relationship between financial development and growth. They proxied for financial development using figures on bank lending and provincial output growth. Aziz and Duenwald (2002) also conclude that non-state lending plays a minor role in increasing growth and that it is likely overshadowed by the large share of funding allocated through SOEs. In addition, the authors highlight the importance of FDI as a significant source of provincial output growth.

Boyreau-Debray (2003) reports negative effects of extended credit by banks on growth, which is attributed to the burden of supporting inefficient SOEs rather than poor performance of the banks themselves. The study also demonstrates that provinces with a more diverse banking sector appear to grow more rapidly. Allen (2005) argues that China is somewhat of an exception, in the sense that private credit intermediation is the most fundamental component of growth, despite this sector of the economy's reliance on a weaker legal system. However, though the legal institutions concerning private credit are weak in China, Allen (2005) stresses that the mechanisms, including relationship-building and reputational concerns, to circumvent institutional deficiencies are not yet well understood.

In contrast to Boyreau-Debray (2003), Chen et al (2006) found that expansion of bank credit has a positive effect on growth, primarily by substituting for financing via state appropriations. Cheng and Degryse (2010) dispute this finding by emphasizing the difference between formal and non-formal sources of finance and that the financial reforms implemented thus far affected these sources to different degrees. The results of their study indicate that expanded bank credit, measured as the

share of bank loans to GDP, increased growth at the provincial level while non-bank finance had no significant effect on output. The authors attribute this to the lack of financial reform within the non-bank sector and the observation that most banks benefited from deregulation and commercialization. As a consequence, these institutions have been able to insulate themselves from extensive government interference, attract better personnel and become more viable for foreign firms. In contrast, the non-bank component of the financial market has been unable to enjoy similar changes and thus has not been instrumental in facilitating growth. Cheng and Degryse (2010) conclude that financial reform and the development of credit markets are crucial for growth.

Based on Chinese firm-level data, Ayygara et al. (2007) emphasize the importance of bank lending as opposed to more informal sources of credit. While informal financing is more available to the private firms, when controlling for the self-selection of firms into different lending channels, they find the firms employing bank lending grow significantly more rapidly than those that do not. This finding calls in to question the efficiency of the non-regulated component of the financial sector and whether relationship building and reputation are sufficient mechanisms to substitute for the more rigorous institutional framework associated with bank credit.

Guargalia and Poncet (2008) demonstrate that indicators of state intervention are related to lower growth at the provincial level and that market-driven finance has a positive impact on economic growth. Their study also demonstrates that both of these effects have declined over time, suggesting that FDI has become an increasingly important substitute for domestic finance.

Zhang et al. (2012) reported that traditional measures of financial development have a positive impact on growth and the state-controlled banking sector facilitates growth. The authors argue that the positive results are largely driven by the selection of an observation period following China's accession to the WTO and by reforms implemented over the last decade having been effective.

Finally, using data from 1978-2010, Chen et al. (2013) explore the asymmetric effects of financial development on provincial growth across different income segments. Their results indicate that financial development has a strong, positive relationship with growth in high-income provinces while the opposite is true for low-income provinces. Chen et al. (2013) also show that the state sector produces a large share of output in low-income provinces, which causes bank loans to have a negative impact on growth. In addition, their study disputes the findings of Zhang et al. (2012) by demonstrating that bank financing channeled to SOEs has a negative impact on growth.

To conclude, the empirical literature on the finance-growth nexus in China reports mixed results. However, it is likely that some of the contradictory findings could be explained by differences in the measurement of financial development. In addition, the existing literature on finance and growth in China largely focuses on the impact of non-state vs. state credit intermediation and the degree of distortions in the financial system. This focus highlights the question of how to define financial development and whether one should emphasize the amount of available credit or the quality of financial intermediation. Generally, a greater availability of financing is associated with improvements in the quality of the system, partly by including a broader variety of sources of credit. Due to substantial governmental interference, the positive relationship between the amount of available finance and the quality of the financial system may not hold for China. Thus certain scholars emphasize an increased availability of credit as a vehicle for economic growth while others emphasize the quality of the financial system and its role in improving the efficiency of capital allocation as crucial to fostering growth in China.

3. Empirical approach

3.1 Model Specification and Econometric Considerations

Our econometric analysis consists of a set of three models, highlighting the relationship between finance and growth from different perspectives. In equation 1, we build on Liu and Yoon (2000), Griliches and Mairesse, (1997) and Frankel and Romer (1999) and estimate a production function based model, analyzing the relationship between per capita income and financial institutions. The estimated model is formulated as follows:

$$\ln (y)_{it} = B_1 \ln (pop)_{it} + B_2 \ln (K/L)_{it} + B_3 (H)_{it} + B_4 (Finance)_{it} + v_i + \gamma_t + \varepsilon_{it} \quad (1)$$

Where y_{it} is per capita income in province i at time t , pop is population, K/L is fixed capital per capita, H is the share of population with higher education, $Finance$ is a set of proxies for capital freedom and the quality of financial institutions, v_i represents province fixed effects, γ_t is a period dummy and ε_{it} is the error term. The results from these estimations are presented in Table 3.

In equation 2, we estimate a regional growth model.³ The results from estimating the growth model are presented in Table 4. The growth model estimations are based on the following model:

$$\ln(y)_{it} = B_0 \ln(y)_{it-1} + B_1 \ln(pop)_{it} + B_2 \ln(K/L)_{it} + B_3(H)_{it} + B_4(Finance)_{it} + v_i + \gamma_t + \varepsilon_{it}. \quad (2)$$

Equation (2) is associated with some econometric issues. First, introducing a lagged dependent variable produces a bias in the within-group estimator. Moreover, when the time series are persistent, the first-differenced Arellano Bond estimator behaves poorly, as lagged levels of the series provide weak instruments for subsequent first differences. In our estimations, the estimated lag coefficient falls in the range 0.8-0.9, and we therefore apply the system GMM model suggested by Blundell and Bond (1998).⁴ When estimating eq. 2; per capita income, the development of financial institutions and capital intensity are treated as endogenous variables. To test the validity of our internal instruments and for the presence of serial correlation, we perform a Sargan test of overidentifying restrictions and a test of serial correlation (Guariglia and Poncet, 2008).

A common feature of the models described above is that they present results evaluated at the mean of the distribution. If the impact of financial institutions varies across provinces with respect to per capita income, an analysis based on the mean will provide an incomplete picture of the relationship between financial institutions and provincial output. To examine the heterogeneous effects of financial institutions on growth, we estimate a number of fixed effects quantile regression models, which are presented in Table 5. The quantile regression approach is well suited to our needs because it offers a way to model financial institutions' heterogeneous responses to income at different points in the conditional distribution of the dependent variable (Koenker and Bassett, 1978). Following Canay (2011), we apply a two-step estimator that enables us to cope with fixed effects and a varying slope along the dependent variables conditional on a probability distribution. Specifically, we first estimate a fixed effects model to derive estimates of the individual fixed effects $\hat{\mu}_i$, and in the second step, we subtract the fixed effect from the dependent variable, $\hat{y}_{it} \equiv y_{it} - \hat{\mu}_i$. Using the transformed dependent variable, we then proceed to estimate our fixed effects quantile regression models using eq (1).

³ See Caselli et al. (1996).

⁴ See also Roodman (2009).

$$\ln(\hat{Y})_{it} = B_1 \ln(pop)_{it} + B_2 \ln(K/L)_{it} + B_3(H)_{it} + B_4(Finance)_{it} + \gamma_t + \varepsilon_{it} \quad (3)$$

Using the quantile regression approach, we are able to explore systematic differences in the effects of institutional quality across provinces at different income levels.

4. Data and descriptive statistics

4.1 Indicators of Financial Development and Capital Freedom

The main index, and sub-indices, used to proxy for capital freedom and the regional quality of financial institutions in China stem from the index developed by the China Institute of Public Affairs (CIPA) (Feng & Shoulong, 2011). The design of the index was inspired by the Economic Freedom of the World index, created by the Fraser Institute. The index designed by CIPA consists of four sub-indices: (i) Government and legal institutional factors, (ii) Economic factors, (iii) Money supply and financial development, and (iv) The level of marketization in the financial market. Each sub-index is constructed from a set of lower level indices. In total, we have access to 21 indices that are aggregated to form these four sub-indices and one aggregate index; for details, see Feng & Shoulong (2011) and Hepeng et al. (2012).

In contrast to many previous studies, this aggregate index and its sub-components allow us to capture a wide variety of different aspects of the financial system at the provincial level. For example, if a large share of available credit were earmarked for SOEs, an index that only captures the amount of credit and not how it is channeled would be a somewhat misleading indicator of financial development. Using our data, however, we are able to capture both the overall availability of credit and the extent of marketization of financial markets. Below, we provide a brief description of the indices (for an exhaustive description of all components, see Feng & Shoulong, 2011 and Hepeng et al., 2012).

Index group 1. Government and Legal Institutional (GLI)

This index is intended to reveal the amount of government involvement in the market, largely consisting of measurements of government spending, subsidies, local protection and legal institutions at the provincial level.

Index group 2. Economic Factors (EF)

This index attempts to capture the entrepreneurial segment of the market. It contains measurements

of the number of enterprises, the size of the non-state sector, and foreign investment in the local economy.

Index group 3. Money Supply and Financial Development (MSFD)

The components of this sub-index include measurements of financial stability such as the inflation rate, the return on savings, deposits and amount of cash held by households.

Index group 4. Degree of Marketization of the Financial Market (MFM)

This index focuses on the openness and development of financial markets, including intra-bank competition, the soundness of stock market institutions and the share of non-state-controlled listed companies.

All of the indices were constructed using the same methodology. The base year is 2001. We selected this year to ensure comparability between scores in later years and earlier years. The province with the highest score in the base year is given a 10 as its index value for 2001, and the one with the lowest receives a value of 0. The scores of the provinces in between are then compared with those of the highest and lowest scoring provinces in the following manner, where i indicate the province in question:

$$Index\ value_i = \frac{V_i - V_{min}}{V_{max} - V_{min}} \quad (4)$$

To allow all of the scores to change over time, the observed score is again compared to the base year. Consequentially, the index scores after 2001 can exceed 10 and fall below 0. This procedure can be illustrated as follows:

$$Index\ value_{i,t} = \frac{V_{i,t} - V_{min,2001}}{V_{max,2001} - V_{min,2001}} \quad (5)$$

The aggregated index is based on an unweighted average of all four sub-indices.

4.2 Additional data

Additional data on Chinese provinces are obtained from the Chinese National Bureau of Statistics and China Statistics Yearbook spanning the period 2001-2009. The data include GDP, fixed capital and employment measured as the number of employed individuals in each province, which is used as a proxy for labor input. Nominal variables are deflated to year 2001 constant prices. To control for human capital, a variable for the level of education is included, measured as the share of population with tertiary education or higher.

4.3 Descriptive Statistics

Before proceeding to the main analysis, descriptive statistics are presented below. Table 2 provides a summary of the dependent and independent variables.

Table 2. Descriptive statistics

Variable	Mean	Std. Dev.	Obs.
<i>ln</i> (Per capita income)	9.42	0.62	240
Total index of financial freedom	5.60	1.33	240
Government size and legal institutions	7.56	1.51	240
Economic Factors	4.67	2.38	240
Money Supply	4.70	1.52	240
Marketization of financial institutions	5.47	1.81	240
<i>ln</i> (population)	8.12	0.77	240
<i>ln</i> (Capital intensity)	-0.60	0.68	240
Human capital	46.90	32.76	240

A deeper examination of the data reveals that among the Chinese provinces, the highest overall growth rates are recorded for Inner Mongolia, Beijing and Shanghai, which have all maintained annual growth rates of approximately 15 percent. For Inner Mongolia, this can be attributed to the low starting point and recently discovered natural resources. However, while provincial per capita income data exhibit individual fluctuations, the internal ranking of the richest and poorest provinces remain relatively stable over time. Shanghai is the wealthiest province, with a per capita income that is 12.9 times larger than Guizhou, which was the poorest region in 2001. In 2008 the gap was reduced from 12.9 to a factor of 8.3.

Turning to the indices of capital freedom and financial development, the sub-indices exhibit a low degree of correlation, indicating that they capture different aspects of financial development (see Table A1). Furthermore, the aggregate index of capital freedom and financial development is

trending upward, moving from 4.4 in 2001 to 6.29 in 2009, which suggests improvements in financial freedom throughout the period of observation.

5. Results

As noted above, there is mixed evidence on the finance-growth nexus in China (Guariglia and Poncet, 2008; Aziz and Duenwald, 2002; Allen, 2005). A potential reason for the mixed evidence is the choice of the proxy used to capture financial development. In addition to the wide variety of financial development measures, frequently highlighted explanations for the heterogeneity of results are the role of private vs. non-private financial organizations and that the role of state owned banks may differ between the wealthy coastal provinces and the poorer interior provinces (which lack non-state funding sources).

With this as a background, we apply a wide-ranging, province-level index of capital freedom and financial development and thereafter disaggregate this index into narrower categories. The movement from a broad index to detailed sub-indices allows us to analyze the heterogeneous impacts of different indicators of capital freedom and financial development on income and growth in some detail. To address the question of whether the impact of a given policy varies across wealthy and poor provinces, we conclude the analysis by allowing the impacts of different measures of capital freedom and financial development to vary across wealthy and poor provinces.

In Table 3, we begin the analysis by presenting results from fixed effects estimations of equation 1 that emphasize the relationship between financial market development and income. Table 3 examines the determinants of provincial per capita income using our indices measuring capital freedom and financial development as our main variables of interest.

Regarding the control variables, both human and physical capital have robust, positive and significant impacts on per capita income. Most estimations support the hypothesis that a larger population is correlated with a higher income level. To some extent, this result may be driven by the fact that the wealthy provinces are also those with the major cities and large populations.

Turning to the variables of interest, estimations 1-3 in Table 3 indicate that the broad index of capital freedom and financial development has a positive impact on per capita income. Specifically, a one-unit increase in the broad index of capital freedom and financial development is associated with an increase in income of 1.3-1.8 percent. The index has an observed range of 2.6-9.2, suggesting that the province with the highest score (Zhejiang) would have 8.6-11.9 percent lower per capita income if the index value were identical to that of the lowest-scoring province (Guizhou).⁵

Table 3. Capital freedom, financial development and per capita income. Dependent variable, per capita income, 2001-2009, fixed effects estimations

	Financial development, total index			Analysis per sub-index of financial development			
	1. ^(a) FE	2. ^(b) Outlier weighted	3. ^(b) FE	4. ^(c) FE	5. ^(c) FE	6. ^(c) FE	7. ^(c) FE
Applied financial index	Total index	Total index	Total index	Government size and institutions	Economic Factors	Money Supply	Marketization of financial institutions
Financial index (see resp. col.)	0.0143 (0.015)	0.0133 (0.008)*	0.0175 (0.010)*	0.0187 (0.006)***	0.0006 (0.004)	-0.0064 (0.003)**	0.0070 (0.003)***
ln(population)	0.2634 (0.183)	0.1319 (0.0879)	0.1357 (0.080)*	0.1321 (0.076)*	0.1658 (0.074)**	0.1679 (0.064)***	0.1630 (0.068)**
ln(K/L)	0.2723 (0.086)***	0.1551 (0.019)***	0.1457 (0.023)***	0.1514 (0.020)***	0.1612 (0.022)***	0.1476 (0.020)***	0.1506 (0.022)***
Human capital	0.0006 (6.4e-04)	0.0014 (2.3e-04)***	0.0015 (2.5e-05)***	0.0015 (2.9e-05)***	0.0015 (2.2e-04)***	0.0012 (2.4e-05)***	0.0014 (2.4e-04)***
Period dummies	yes	yes	yes	yes	yes	yes	yes
R2-overall	0.46	n.a	0.42	0.40	0.39	0.39	0.38
Obs.	240	240	219	219	219	219	219

Note: ***, **, and* indicate significance at the 10, 5, and 1 percent levels, respectively. ^(a) Standard errors clustered by province in parenthesis(.). ^(b) Outliers with high leverage are downweighted, robust standard errors. ^(c) 21 outliers deleted, bootstrapped standard errors.

The heterogeneity in how the different sub-indices of capital freedom and the development of financial institutions affect Chinese growth are highlighted in estimations 4-7 in Table 3. The estimated impact covers both positive and negative values. Specifically, estimation 4, capturing government and legal institutional factors, is positively related to per capita income, whereas estimation 5 suggests a non-significant impact of economic factors (focusing on the size of the non-state sector and foreign direct investment). Estimation 6 focuses on indicators of the money supply

⁵ A sensitivity analysis revealed the existence of outliers. To control for outliers, in estimations 2-3 in Table 3, we weight the analysis using the inverse leverage. Estimations 4-7 are performed using bootstrapped standard errors. To control for outliers in estimations 4-7, we dropped 21 outliers with weights of less than 0.5 (non-outliers have a weight of unity). Our results are not dependent on the choice of a specific cut-off value.

and financial stability such as the inflation rate, savings and the amount of cash held by households. Contrary to the results for the institutional factors in estimation 4, the results in estimation 6 indicate a negative relationship between indicators of the money supply and per capita income. That is, estimations 4-6 in Table 3 contain positive and significant, insignificant and negative and significant estimates of capital freedom and financial institutions development.

However, the main index of interest in this study is the last sub-index capturing the level of marketization in financial markets, measured as the extent of privatization in financial markets. Thus, a high index value suggests a market-oriented allocation of financing and, potentially, less dependence on state-owned sources of financing. As observed in estimation 7 in Table 3, a higher degree of privatization in financial markets is associated with higher per capita income. Therefore, in line with the literature suggesting mixed evidence for the finance-growth nexus in China, different indices of capital freedom and financial development yield different results. However, the index that is closely related to financial market development, capturing the degree of privatization in financial markets, is positively related to per capita income levels, whereas the results for more macro-oriented indices vary.

To scrutinize the stability of our results, in Table 4 we estimate regional growth models. That is, instead of focusing on the relationship between financial institutions and per capita income, we analyze the relationship between financial institutions and per capita income growth. This leads us to include a lagged left-hand-side variable. We therefore proceed and estimate system GMM models based on equation 2 above.

The estimates in Table 4 are in line with the level estimates in Table 3, although the share of insignificant results increases when analyzing growth rates. Specifically, the index capturing government size changes from positive and significant to insignificant when moving from income levels to income growth. The macro-oriented index, capturing economic factors and the size of the non-state sector, remains insignificant, and the index of money supply indicators remains negative and marginally significant at the ten percent level. Finally, our key index of interest, the marketization of financial institutions, remains positive and significant in both the level and growth

models, suggesting a positive and robust relationship between the development of private, market-driven financial institutions and income and income growth.

Table 4. Capital freedom, financial development and per capita income growth. Dependent variable, per capita income, 2001-2009, SYS-GMM Models.

Applied index of financial development	1. Total index	2. Government size and institutions	3. Economic Factors	4. Money Supply	5. Marketization of financial institutions
(Per capita income)_{t-1}	0.8525 (0.060)***	0.8502 (0.034)***	0.8976 (0.024)***	0.8978 (0.042)***	0.8471 (0.020)***
Financial institutions development	0.0052 (0.026)	0.0123 (0.021)	-0.0067 (0.006)	-0.0134 (0.009)*	0.0061 (0.003)**
ln(population)_t	0.0311 (0.018)*	-0.0148 (0.038)	0.0075 (0.020)	-0.0256 (0.023)	0.0129 (0.018)
ln(K/L)_t	0.1369 (0.028)***	0.1433 (0.030)***	0.0960 (0.031)***	0.1360 (0.030)***	0.1804 (0.042)***
(Human capital)_t	-0.0002 (4e-05)	0.0003 (1e-05)	0.0009 (8e-05)	0.000 (6e-05)	-0.0002 (8e-05)
Period dummies	yes	yes	yes	yes	yes
Obs.	200	200	200	200	200
AR(2) p-val	0.96	0.27	0.49	0.08	0.18
Sargan test p-val	0.94	0.96	0.83	0.97	0.89
Hansen test p-val	0.70	0.63	0.44	0.95	0.26

Note: ***, **, and * indicate significance at the 10, 5, and 1 percent levels, respectively. Two-step estimates. Outliers dropped. Endogenous variables; per capita income, the development of financial institutions and capital intensity. Due to a large set of instruments relative to the number of observations, to avoid overfitting, the instrument matrix is reduced using the collapse option.

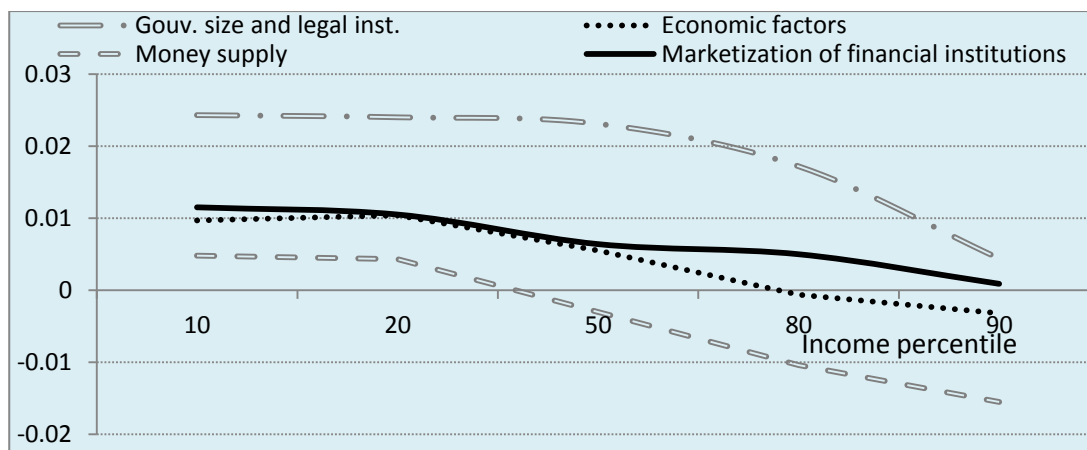
To conclude, the results from applying a regional growth model framework in line with Boyreau-Debray (2003) and Guariglia and Poncet (2008) confirm the previous mixed evidence for the finance-growth nexus in China. Disaggregating the results from the total index reveals that the development of private financial institutions has a positive and significant impact on economic growth in China. To the extent that a non-significant or negative relationship between capital freedom and economic growth in China is observed, we do so when using macro-oriented indicators of capital freedom such as the money supply and economic factors.

A common feature of the results in Tables 3-4 is that they are evaluated at the mean of the distribution. In Table 5, we examine another source of heterogeneity, regional differences in per capita income. If the impacts of capital freedom and financial institutions vary across provinces with respect to per capita income, an analysis based on the mean will provide an incomplete picture of the relationship between financial institutions and income. To analyze the asymmetric effects of capital freedom and financial development across wealthy and poor provinces, in Table 5 we

estimate fixed effects quantile regressions. Following Canay (2011), we apply a two-step estimator that enables us to cope with fixed effects and a varying slope along the dependent variables' conditional probability distribution.

To ease the interpretation of the results in Table 5, we depict the estimated impact of the four sub-indices of capital freedom and financial institutions in Figure 1, from the 10th to the 90th percentile of the income distribution. Figure 1 indicates that the marginal impact of capital freedom and financial development decreases with per capita income and that this holds for all four sub-indices. Specifically, all four sub-indices shift from positive and significant for the poorest decile to insignificant at the wealthiest decile, with the exception of the money supply index, which becomes negative and significant at the highest income decile. That is, the positive impact of improved capital freedom and financial development is greatest in the relatively poor provinces.

Figure 1. The estimated impact of various indices of capital freedom and financial institutions on per capita income, evaluated at different income percentiles.



Note: Estimates from fixed effects quantile regressions, Table 5.

These results contrast with the findings of Chen et al. (2013), who found the impact of financial institutions and economic growth to be strongest in wealthy provinces. One explanation for the divergent results may stem from the period of analysis. Chen et al. (2013) analyze the period 1978-2010, which includes the initial period during which economic reforms were concentrated in the relatively wealthy coastal area. In the initial reform period, we may therefore observe a positive correlation between financial development and growth that is particularly strong for the wealthy provinces. Therefore, the estimated relationship between financial development and economic

growth may change as the reform program shifts from being selective to covering the entire country.

Table 5 allows for a more detailed inspection of the results depicted in Figure 1. The only index that produces negative results at some point in the distribution is the money supply index. The money supply index is positive and significant at the lowest income decile only. For income levels above that level, the money supply index first presents insignificant results and then becomes significantly negative at the highest income decile. The remaining three sub-indices (government and legal institutions, economic factors, and the marketization of financial institutions) all present positive and significant effects from the lowest income decile to the median. The two indices for which a positive and significant growth-enhancing effect can be detected high in the income distribution is for government and legal institutions and the index capturing the marketization of financial institutions; these indices remain significant up to the 80th percentile.

Table 5. Fixed effects quantile regressions, dependent variable is per capita income.

Applied index of financial development	1. Total index	2. Government size and institutions	3. Economic Factors	4. Money Supply	5. Marketization of financial institutions
<i>Income percentile</i>					
p10	0.0233 (0.003) ^{***}	0.0243 (0.003) ^{***}	0.0097 (0.002) ^{***}	0.0048 (0.003) [*]	0.0115 (0.003) ^{***}
p20	0.0219 (0.004) ^{***}	0.0240 (0.004) ^{***}	0.0104 (0.003) ^{***}	0.0043 (0.0039)	0.0105 (0.002) ^{***}
p50	0.0155 (0.004) ^{***}	0.0231 (0.003) ^{***}	0.0055 (0.002) ^{***}	-0.0030 (0.002)	0.0064 (0.002) ^{***}
p80	0.0031 (0.005)	0.0172 (0.005) ^{***}	-0.0006 (0.002)	-0.0104 (0.003) ^{***}	0.0050 (0.003) [*]
p90	-0.0018 (0.003)	0.0044 (0.007)	-0.0032 (0.002)	-0.0155 (0.003) ^{***}	0.0009 (0.003)
Control variables	yes	yes	yes	yes	yes

Note: ***, **, and * indicate significance at the 10, 5, and 1 percent levels, respectively. Robust standard errors.

Control variables include: $\ln(\text{population})$, $\ln(K/L)$, higher education intensity, period dummies and indices of financial institutions' development.⁶

These results suggest that improving the conditions for capital freedom and the marketization of financial institutions enhance growth and the impact is strongest in the relatively poor provinces. Thus, improving the financial system not only enhances growth in China but also helps to decrease

⁶ Standard errors for the marketization of financial institutions index in model 5 are estimated assuming i.i.d. residuals.

regional inequality. It should also be noted that among the four sub-indices analyzed here, the money supply index is likely the least beneficial for growth because it records a large share of insignificant or even negative results. The two indices with a large share of positive results, in all three types of models analyzed here, are those related to government and legal institutions and the marketization of financial institutions. Considering the intensive debate over increasing regional inequality and Go-West policies, these results are easily transferred to viable policy recommendations

6. Conclusions

The combination of sustained high growth rates and a heavily regulated financial system has inspired a strand of literature that examines the finance-growth nexus in China. This literature has obtained mixed results, with studies suggesting both positive and negative relationships between finance and growth. One reason for this mixed evidence may be the approaches used to measure financial development. Certain scholars have proxied for financial development using the total volume of loans and bank deposits, whereas others have emphasized specific types of finance. However, there is no consensus on why the results differ across studies. In addition to the mixed results in the literature, the impact of financial institutions appears to vary across wealthy and poor provinces.

In this study, we seek to reveal the underlying aspects of financial mechanisms that are important for economic growth and thereby increase our understanding of why the results differ across studies. In particular, we focus on the link between the marketization of the financial system and economic development. To achieve this task, we utilize a uniquely rich set of capital freedom and financial development data at the provincial level in China. These data allow us to discern various aspects of financial development, thereby enabling us to identify specific factors of financial development that are important for economic growth.

The results of the study suggest that capital freedom and financial development enhance growth and the effect is most pronounced in relatively poor provinces. The positive impact is especially robust for policies that increase the marketization of financial intuitions and improve government and legal institutions, whereas the impact of macro-oriented indices such as economic factors (capturing the size of the non-state sector and foreign direct investment) and the money supply is less clear. Thus, improving the financial system in general, and marketization of the financial system in particular,

not only enhances growth but could also potentially reduce regional inequality in China. Considering the debate over increased regional inequality and Go-West policies, these results can be transferred to viable policy recommendations.

Appendix

Table A1. Correlation, indices of capital freedom and financial institutions

	1.Tot	2. Gov.	3. EF	4. MS	5. MFI
1. Total index of financial freedom	1.00				
2. Government size and legal institutions	0.74	1.00			
3. Economic Factors	0.89	0.57	1.00		
4. Money Supply	0.48	0.00	0.39	1.00	
5. Marketization of financial institutions	0.75	0.62	0.50	0.06	1.00

References

- Allen, F., Qian, J., & Qian, M. (2005). Law, finance, and economic growth in China. *Journal of financial economics*, 77(1), 57-116.
- Ayyagari, M., Demirgüç-Kunt, A., & Maksimovic, V. (2010). Formal versus informal finance: Evidence from China. *Review of Financial Studies*, 23(8), 3048-3097.
- Aziz, J., & Duenwald, C. (2002). *Growth-financial intermediation nexus in China* (No. 2002-2194). International Monetary Fund.
- Beck, T., Levine, R., & Loayza, N. (2000). Finance and the Sources of Growth. *Journal of financial economics*, 58(1), 261-300.
- Benhabib, J., & Spiegel, M. M. (2000). The role of financial development in growth and investment. *Journal of economic growth*, 5(4), 341-360.
- Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of econometrics*, 87(1), 115-143.
- Borst, N. (2011). China shadow banking primer. *China Economic Watch*. Washington, DC: Peterson Institute for International Economics, 1.
- Boyreau-Debray, G. (2003). *Financial intermediation and growth-Chinese style* (No. 3027). The World Bank.
- Canay, I. A. (2011). A simple approach to quantile regression for panel data. *The Econometrics Journal*, 14(3), 368-386.
- Caselli, F., Esquivel, G., and Lefort, F. (1996). Reopening the Convergence Debate: A New Look at Cross-Country Growth Empirics, *Journal of Economic Growth*, 1, 363-389.

- Cetorelli, N., & Gambera, M. (2001). Banking market structure, financial dependence and growth: International evidence from industry data. *The Journal of Finance*, 56(2), 617-648.
- Chen, H. (2006). Development of financial intermediation and economic growth: The Chinese experience. *China Economic Review*, 17(4), 347-362.
- Chen, K. C., Wu, L., & Wen, J. (2013). The relationship between finance and growth in China. *Global Finance Journal*, 24(1), 1-12.
- Cheng, X., & Degryse, H. (2010). The impact of bank and non-bank financial institutions on local economic growth in China. *Journal of Financial Services Research*, 37(2-3), 179-199.
- Dehejia, R., & Lleras-Muney, A. (2003). *Why does financial development matter? The United States from 1900 to 1940* (No. w9551). National Bureau of Economic Research.
- Feng X., & Shoulong M. (2011). *Capital freedom in China: 2011 Annual Report*, Beijing, Huaxia Publishing House.
- Frankel, J. A., & Romer, D. (1999). Does Trade Cause Growth?. *The American Economic Review*, 89(3), 379-399.
- Goodman, D. S. (2004). The campaign to Open up the West: national, provincial-level and local perspectives, *The China Quarterly*, 178, 317-334.
- Goldsmith, R. W. (1969). *Financial structure and development* (Vol. 1, p. 969). New Haven: Yale university press.
- Griliches, Z. and Mairesse, J. (1997), Production Functions: The Search for Identification, Working Papers 97-30, Centre de Recherche en Economie et Statistique.
- Guariglia, A., & Poncet, S. (2008). Could financial distortions be no impediment to economic growth after all? Evidence from China. *Journal of Comparative Economics*, 36(4), 633-657.
- Hepeng, Z., Ljungwall, C. and Xingyuan, F. (2012). Capital Freedom: Evidence from China's Provinces 2006-2009. Mimeo. Copenhagen Business School.
- Jayaratne, J., & Strahan, P. E. (1996). The finance-growth nexus: Evidence from bank branch deregulation. *The Quarterly Journal of Economics*, 639-670.
- King, R. G., & Levine, R. (1993). Finance and Growth: Schumpeter Might be Right. *The Quarterly Journal of Economics*, 108(3), 717-737.
- Koenker, R., & Bassett Jr, G., (1978). Regression quantiles, *Econometrica*, 46(1), 33-50.
- Levine, R. (1998). The legal environment, banks, and long-run economic growth. *Journal of Money, Credit and Banking*, 596-613.
- Levine, R. (1999). Law, finance, and economic growth. *Journal of financial Intermediation*, 8(1), 8-35.
- Levine, R., Loayza, N., & Beck, T. (2000). Financial intermediation and growth: Causality and causes. *Journal of monetary Economics*, 46(1), 31-77.
- Levine, R. (2005). Finance and growth: theory and evidence. *Handbook of economic growth*, 1, 865-934.

- Liu, T., & Li, K. W. (2001). Impact of liberalization of financial resources in China's economic growth: evidence from provinces. *Journal of Asian Economics*, 12(2), 245-262.
- Liu, B-Y & Yoon, B. J., (2000). China's Economic Reform and Regional Productivity Differentials, *Journal of Economic Development*, 25(2) 23-41.
- Martin, M., (2012). China's Banking System: Issues for Congress, CRS Report for Congress. Congressional Research Service, USA.
- Naughton, B., (2007). *The Chinese Economy: Transitions and Growth*. Cambridge, US-MA: The MIT Press.
- Rajan, R. G., & Zingales, L. (1998). Financial Dependence and Growth. *The American Economic Review*, 88(3), 559-586.
- Rioja, F., & Valev, N. (2004a). Finance and the sources of growth at various stages of economic development. *Economic Inquiry*, 42(1), 127-140.
- Rioja, F., & Valev, N. (2004b). Does one size fit all?: a reexamination of the finance and growth relationship. *Journal of Development economics*, 74(2), 429-447.
- Roodman, D. (2009). How to Do xtabond2: An Introduction to Difference and System GMM in Stata, *Stata Journal* 9(1), 86-136.
- Rousseau, P. L., & Sylla, R. (2005). Emerging financial markets and early US growth. *Explorations in Economic History*, 42(1), 1-26.
- Rousseau, P. L., & Wachtel, P. (2000). Equity markets and growth: cross-country evidence on timing and outcomes, 1980–1995. *Journal of Banking & Finance*, 24(12), 1933-1957.
- Zhang, J., Wang, L., & Wang, S. (2012). Financial development and economic growth: Recent evidence from China. *Journal of Comparative Economics*, 40(3), 393-412.