Could financial distortions be no impediment to economic growth after all? Evidence from China

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ABSTRACT

Using data for 30 Chinese provinces over the period 1989-2003, this study examines the relationship between finance, and real *GDP*, capital, and total factor productivity growth. We find that traditionally used indicators of financial development and China-specific indicators measuring the level of state interventionism in finance are generally negatively associated with growth and its sources, while indicators measuring the degree of market driven financing in the economy are positively associated with them. These effects have been gradually declining over time, and are weaker for high *FDI* recipients, suggesting that *FDI* may be used to alleviate the costs associated with the inefficient banking sector.

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1. Introduction

Studying the linkages between financial development and growth is a popular topic both in theoretical and empirical macroeconomics. According to Levine (2005), financial systems foster growth as they produce ex ante information about possible investment; monitor investment and exert corporate governance after providing finance; facilitate the trading, diversification, and management of risk; mobilize and pool savings; and ease the exchange of goods and services. As early as 1969, Goldsmith (1969) provided the first cross-country empirical study documenting the existence of a strong positive link between the functioning of the financial system and growth. A number of studies followed, generally confirming the existence of this link (see Levine, 2005, for a survey). The majority of these studies are based on cross-country macro data, but cross-country industry-level and firm-level data have also been used. For instance, Rajan and Zingales (1998) find that in countries with better functioning financial systems, industries that are naturally heavy users of external finance grow faster than industries that are not, and Demirgüç-Kunt and Maksimovic (1998) show that in these same countries, a larger proportion of firms grows at rates that cannot be self-financed, but require access to external financing.

Yet, cross-country economic growth regressions are likely to suffer from data compatibility problems, as country officials may define, collect, and measure variables inconsistently across countries (Levine and Zarvos, 1996). Using cross-regional data within a single country instead of cross-country data makes these problems less severe, and represents a promising alternative route for examining the impact of finance on growth[1]. Our paper follows this route: we analyze the links between finance and growth in 30 Chinese provinces, over the period 1989-2003.

China represents an interesting case study for two reasons. First, considering that Bekaert et al. (2006) find that China's extraordinary growth cannot be fully explained using standard growth regressions, understanding its determinants remains an open question. Second, Allen et al. (2005) characterize China as a counterexample to the findings of the finance-growth literature, as in spite of a malfunctioning financial system, it has one of the

[1] Very few studies have followed this route. For instance, Jayaratne and Strahan (1996) and Dehejia and Lleras-Muney (2003) study the impact of finance on economic growth by examining individual states in the USA. Similarly, Guiso et al. (2002) analyze the effects of financial development on growth across individual regions in Italy.

fastest growing economies[2]. The Chinese case suggests therefore that there might be circumstances under which financial distortions do not represent an impediment to growth.

Existing research on the links between finance and growth in China has led to contrasting results: some authors documented a positive relationship; others, a negative one; and others, no relationship at all. Our analysis extends the literature in several dimensions. First, we use a wide range of financial indicators, including traditionally used indicators of financial intermediary development (ratio of bank loans, total loans, or total household saving deposits in the banking system over *GDP*); China-specific indicators measuring the level of state interventionism in finance (credit provided by the four main state-owned commercial banks over total credit or *GDP*; ratio of loans to deposits of the state-owned banks); and indicators measuring the degree of market driven financing in the economy (share of fixed assets investment financed by domestic loans relative to that financed by state budget appropriation; share of investment financed by self-raised funds). Our wide selection of indicators allows us to account both for the size and quality effect of financial intermediation. Second, for the first time in the Chinese context, we analyze the links between finance and two sources of *GDP* growth, namely physical capital accumulation and total factor productivity (*TFP*) growth. Third, we investigate whether, as a result of the progressive restructuring of the banking sector in China, the link between finance and growth has changed after 2000. Finally, considering that China is among the top Foreign Direct Investment (*FDI*) recipients in the world (Prasad and Wei, 2005), we investigate whether the finance-growth nexus changes for regions with different *FDI* to *GDP* ratios. This exercise is motivated by Harrison et al. (2004), who show that firms in countries with greater *FDI* inflows are less likely to face financial constraints, as incoming foreign investment provides an additional source of capital. It is therefore possible that, in the Chinese case, *FDI* provides capital to firms which would otherwise be constrained in their growth by the inability to obtain funds, due to distortions in the banking sector[3].

We find that traditionally used indicators of financial development and China-specific indicators measuring the level of state interventionism in finance are generally negatively associated with growth and its sources, while indicators measuring the degree of market

[2] According to our data, China's annual growth rate of real *GDP* has been on average 9.1 percent over the period 1989-2003.

[3] In line with this idea, Huang (2003) formulates a "demand perspective" on *FDI*, which stresses that private Chinese enterprises may be forced to look for foreign investors as they are constrained in their activity due to discrimination relative to state-owned enterprises both from the banking system and the equity market. Private firms might therefore use foreign joint-ventures as a way to acquire needed capital in order to undertake investment. Moreover, as highlighted in Luo (2007), forming joint-ventures with foreign firms may also reduce the level of asymmetric information faced by private firms, leading to easier access to bank finance.

driven financing in the economy tend to promote *GDP* and *TFP* growth, as well as capital accumulation. These effects have gradually declined over time and tend to be weaker for high *FDI* recipients, suggesting that *FDI* may be used to alleviate the costs associated with the inefficient banking sector.

The remainder of this paper is organized as follows. In Section 2, we briefly describe the Chinese financial system and review the literature on the finance-growth nexus in China. Section 3 describes our data set and provides some descriptive statistics. Section 4 illustrates our baseline specification and estimation methodology. Section 5 presents our main empirical results. Section 6 investigates how the relationship between growth and our financial indicators has evolved over time, and how it depends on the level of *FDI* received by each province. Section 7 concludes.

2. Financial system and finance-growth nexus in China

2.1 China's financial system

Before 1978, the Chinese economy was centrally planned and production was exclusively conducted by state-owned enterprises. The financial system consisted of a single bank, the People's Bank of China (*PBC*), which served both as a Central Bank and as a commercial bank. Yet, the role of the *PBC* was very limited as most long-term investment financing was not channelled to enterprises through the banking system, but financed with budgetary grants. The *PBC* only provided working capital to enterprises.

In 1978, the single bank was split. The *PBC* was left to operate as a Central Bank; and three state-owned banks were created: the Bank of China, the People's Construction Bank of China, and the Agriculture Bank of China, respectively dealing with foreign currency transactions, investment in manufacturing, and banking in rural areas. A fourth state-owned bank was created in 1984, the Industrial and Commercial Bank of China. It took over all commercial transactions from the *PBC*. After 1984, a number of non-state owned banks also entered the financial system, including commercial banks, urban and rural credit cooperatives, trust and investment companies, financial companies, and other institutions. Yet, in 1994, the state-owned banks still dominated the financial sector: their total assets covered around 78 percent of the total assets of the entire financial sector. Moreover, the banking system was plagued by huge amounts of non performing loans (Podpiera, 2006).

Major banking reforms were initiated in 1994 when the central government decided to separate policy banks from commercial banks, and established three policy-lending banks and

four specialized commercial banks. The banking reforms thereafter include, among others: transforming the urban credit cooperatives into commercial banks (1996-1998); granting limited licenses to some foreign banks; reducing government intervention in credit allocation; loosening interest rate controls; recommending standard accounting and prudential norms (Shirai, 2002). A further impulse for changes in the banking sector came about with China's entry into the World Trade Organization (*WTO*) in 2001. Progresses include fewer restrictions on ownership and increased operational freedom. As a consequence of the reforms, by the end of 2002, the state-owned banks' market share had declined to 68 percent, and non performing loans had also significantly declined (Podpiera, 2006; Allen et al., 2006).

Despite the large size of the banking sector in China, until recently, most bank credit was directed to inefficient state enterprises, leaving good private enterprises without access to external funding. Until 1998, the four state-owned commercial banks (*SOCBs*, i.e. the Bank of China, China Construction Bank, the Industrial and Commercial Bank of China, and the Agricultural Bank of China) were instructed to lend to state-owned enterprises (*SOEs*). The Chinese state enterprises submitted investment plans and funding requests that had to be approved at the provincial and central authority level. Based on this, lending quotas were issued to enterprises. Since private enterprises were excluded from submitting investment plans, they were, naturally, also excluded from lending quotas. In addition, there was also a legal bias against private domestic firms, which made it harder for them to collateralize their assets in order to obtain loans, and made it riskier for banks to lend them money (Huang, 2003).

The system was liberalized at the end of 1990s, when the China Constitution acknowledged the private sector to be an integral part of the economy, and theoretically it is not in place any more. However, in practice, banks still consider private enterprises to be riskier than their public peers either due to their short credit history or lower chance of being bailed out by the government. Moreover, as discussed in Park and Sehrt (2001), lending by state banks is still determined by policy reasons, rather than by commercial motives.

In summary, a major problem in China's corporate sector is a political pecking order of firms which leads to the allocation of China's financial resources to the least efficient firms (state-owned enterprises), while denying the same resources to China's most efficient firms (private enterprises). Although they are the engine of growth in the Chinese economy[4],

[4] Allen et al. (2005) document that the private sector in China dominates the state and listed sectors, both in terms of output size and growth trend. Specifically, they show that between 1996 and 2002, the private sector grew at an annual rate of 14.3 percent, while the combined state and listed sector only grew at 5.4 percent.

private firms are discriminated against in terms of access to external funding, property rights protection, taxation, and market opportunities. Such distortions may force private Chinese firms to look for foreign investors (Huang, 2003; Luo, 2007). By establishing cross-border relationships with foreign firms, private domestic firms can bypass both the financial and legal obstacles that they face at home. *FDI* can in fact be seen as a form of equity financing (Harrison et al., 2004). Moreover, from the very beginning of economic reforms in China, foreign-invested firms were accorded a superior legal status compared with private firms.

2.2 The finance-growth nexus in China

A first strand of literature has used provincial level data to look at the links between indicators of financial development and growth in China obtaining contrasting results. Like ours, most of these studies are panel studies. For instance, Liu and Li (2001) analyze the links between growth and the four sources of total investment in fixed assets (state budget appropriation, national bank loans, self-raised funds, and foreign investment). They find that between 1985 and 1998, the growth of national bank loans and self-raised funds are both positively related to the growth of provincial output, while state budget appropriation only affects growth in the interior regions, where non state sources of finance might be unavailable. Aziz and Duenwald (2002) use data for 27 provinces over the period 1988-97 and find no evidence that financial development (proxied by bank lending) boosts growth among Chinese provinces. Specifically, domestic private credit plays a small role in the financing of the fast growing provinces. Using similar data over the period 1990-1999, Boyreau-Debray (2003) finds that credit extended by the banking sector has a negative impact on growth, which she attributes to the burden of supporting the state-owned corporate sector. Chen (2006) shows that Chinese growth has been fostered by the substitution of loans for state budget appropriation, but not by loan expansion. His findings are challenged by Cheng and Degryse (2006) who argue that banking development spurs growth in China[5]. These studies make use of different financial indicators, and different econometric techniques, which might explain their contrasting results.

A second strand of literature has focused on firm-level data to try and explain the high growth rates experienced in China, in spite of a poorly developed financial system. Ayyagari et al. (2007) rely on the World Bank Investment Climate Survey data that covers 2400 Chinese firms across 18 different cities. The survey was collected in 2003 and includes

[5] Using a multivariate Vector Autoregression (*VAR*) approach, based on annual Chinese data over the period 1952-2001, Liang and Teng (2006) find that high levels of bank credit in China do not cause higher growth.

information on sources of financing in 2003 and firm level information that are recalled for 3 years, namely 2000, 2001 and 2002. They analyze firm financing patterns, and show that a relatively small percentage of firms in their sample use formal bank finance, while reliance on informal finance is much stronger. They then show that it is finance from the formal financial system that is associated with faster firm-level growth, while informal finance is not. They conclude that it is not the non-standard financing mechanisms that promote growth in China. Cull et al. (2007) use data drawn from the annual accounting reports filed by industrial firms with the National Bureau of Statistics over the period 1998-2003 to investigate whether trade credit could have been what financed China's spectacular growth in spite of its malfunctioning financial system. They conclude that trade credit did not play a significant role[6].

While we acknowledge that useful information can be extracted at the micro-level, we believe that the finance-growth link can and should be apprehended at the macro-level as well. We consider our approach as a useful complement to the recent firm-level analyses that looked at the role of finance on firm performance in China. While the advantage of using firm-level data to describe the financing patterns of firms in recent years is clear-cut, it is of less use for the investigation of the evolution of the finance-growth nexus over time (spanning the pre and post liberalization period). Our dataset has the advantage of not only covering a 15 year-period from 1989 to 2003, but of also covering the entire Chinese territory (without a limitation to the urban sector only). Our paper contributes therefore to the first strand of the literature which analyzed the finance-growth nexus in China. Its specific contributions are that it looks, for the first time in the Chinese context, at the links between finance, *GDP* growth, and two of its sources: physical capital accumulation and *TFP* growth. Moreover, it makes use of a very wide range of financial indicators measuring both financial development and distortions, and focusing for the first time, on whether the effects of these indicators on growth have declined over time, and on whether they differ across provinces characterized by different levels of *FDI*. Our objective is to understand whether there might be circumstances under which financial distortions do not hinder growth.

[6] Héricourt and Poncet (2007) and Dollar and Wei (2007) also use firm-level data in the Chinese context, to link, to some extent, the financial dimension of the economy and the real dimension. Using World Bank Investment Climate Survey data, and focusing on firms' investment behavior, Héricourt and Poncet (2007) show that public firms do not appear to be credit constrained, and are not affected by foreign presence. On the other hand, private firms appear to suffer more from financial constraints, which are however alleviated in the presence of abundant foreign investment. Dollar and Wei (2007) use data from a survey conducted in 2005 and covering the period 2002-2004, to study firms' returns to capital. Their survey covers 12400 firms in 120 cities, located in all Chinese provinces (except Tibet). Their results suggest that state-owned firms have significantly lower returns than private and foreign-owned firms.

3. Data description and summary statistics

The key data used in this paper are our indicators of financial intermediary development and distortions, as well as measures of real per capita *GDP* growth and its components, i.e. per capita capital stock accumulation and per capita productivity growth. Our sample consists of a panel of 30 provinces in Mainland China with annual data for the period 1989-2003[7]. All our variables are measured at the province level. Appendix 1 provides details on all variables used in our analysis and information on data sources.

3.1 Indicators of financial development and distortions

Our intention is to evaluate the impact of measures of both financial intermediaries' development and financial distortions on growth and its sources in the context of China. Despite its large size, the Chinese banking sector is still dominated by four large state banks that allocate most of their financial resources to the inefficient and loss-making state-owned enterprise sector (Boyreau-Debray, 2003). As such, the transition to a modern and profit-oriented banking sector is far from being achieved.

A major challenge in this paper is therefore to disentangle between the effect of financial deepening and that of the distorting nature of the state-ruled banking sector. We go further than the indicators of financial development traditionally used in the literature, and rely on three families of indicators, intended to proxy for the development of the financial sector (Family 1), the misallocation of financial resources (Family 2), and the more modern and profit-oriented financial transactions (Family 3). The use of different measures focusing on different aspects of financial intermediation will allow us to account for both a size and a quality effect of the latter. To assess the robustness of our results, we will use several indicators within each family.

To evaluate the impact of the development of the financial sector, we will use three measures of financial depth (Family 1), one based on banks alone, and the other two on both bank and non-bank sources of financing. More specifically, we will use the following three indicators:

[7] China is administratively decomposed into 31 provincial units, which fall into three categories: 22 provinces or *sheng*; 4 autonomous regions or *zizhiqu* (Nei Monggol, Xinjiang, Tibet, Ningxia and Guangxi); and 4 municipal cities or *zhixiashi*, under direct supervision of the central power (Shanghai, Tianjin, Beijing, and, since 1997, Chongqing). Tibet is excluded from our sample due to data constraints.

(1) The ratio of total bank loans to *GDP*, which measures banking sector size (*BANK CREDIT*)[8].

(2) The ratio of total (bank and non-bank) loans to *GDP*, which measures the overall depth of the financial sector (*TOTAL CREDIT*).

(3) The ratio of household savings deposited in financial intermediaries relative to *GDP* (*SAVINGS*), which serves as a proxy of China's financial intermediary development[9].

To evaluate the specific impact of misallocation of funds in the finance-growth nexus in China, we rely on the following three measures of the role of distortions induced by state interventionism in the financial sector (Family 2):

(4) The share of state-owned commercial banks in total bank credit (*SOCB CREDIT* share). Chinese statistics do not provide any information on credit allocation between state and non-state enterprises. However, given that the state banks' primary function is to channel savings to *SOE*s, the ratio of the *SOCB*s credit to total bank credit can be interpreted as a proxy for the credit channelled to the state-owned sector. For instance, conservative estimates suggest that in the late 1990s, 80 percent of the total amount of credit by the *SOCB*s was extended to the *SOE*s (Boyreau-Debray, 2003). Even with the recent emphasis on profit maximization and management responsibility, state banks may still favor the *SOE*s, with which they have a long customer history and which are more likely to be bailed out by the government than non-state enterprises in case of financial distress. In contrast, projects in the non-state sector are perceived as more risky because of higher information costs and moral hazard.

(5) The ratio of state-owned commercial banks' credit to *GDP* (*SOCB CREDIT* to *GDP*).

(6) The ratio of loans to deposits of the *SOCB*s (*CENTRAL*). This ratio captures another distortion of the Chinese banking sector, namely the interventionism of the Central Bank. It was previously used by Lardy (1998), Dayal-Gulati and Hussain (2002), and Boyreau-Debray (2003). In China, while the volume of deposits is determined by economic activity, the volume of lending is largely determined by policy objectives

[8] Unlike past studies and following Beck et al. (2000), we carefully deflate those financial intermediary statistics, which are expressed as a ratio to *GDP*. Specifically, financial stock items are measured at the end of the period, while *GDP* is measured over the period. Simply dividing financial stock items by *GDP* can therefore produce misleading measures of financial development. This paper deflates end-of-year financial balance sheet items by end-of-year consumer price indices (*CPI*), and deflates the *GDP* series by the annual *CPI*. We then compute the average of the real financial balance sheet item in year *t* and *t*-1, and divide this average by real *GDP* measured in year *t*.

[9] This indicator excludes corporate deposits, which might be affected by the central government's credit policies. As argued by Chen (2006), households' deposits are based on households' own decisions, and are much less influenced by the central government's policies than loans.

and is set through a credit plan, independently of the ability of branch banks in each region to finance the lending target from local deposits (Lardy, 1998). As pointed out by Boyreau-Debray (2003), some rapidly growing provinces could therefore have a low credit quota and be constrained in their lending relative to the rapid growth of their deposits. Alternatively, branch banks in slower growing regions could be assigned high quotas with insufficient local deposits to finance their lending: these provinces would therefore depend on the Central Bank to lend them additional funds. We follow the literature and consider the ratio of *SOCB* loans to deposits as a measure of the Central Bank's credit to local branch banks aimed at helping them to meet their lending quotas.

Our third family of indicators intends to proxy for the efficient use of capital in a context of widespread misallocation. We rely on information of the decomposition of fixed asset investment financing by source. This is typically broken into domestic loans, state budgetary appropriation, foreign investment, and self-raised funds[10]. In general, loans are considered a more efficient means of resource distribution than state budget allocation. Unlike state budget appropriation, loans call in fact for payments of interest and principals, helping to harden enterprises' budget constraints, and promoting more efficient use of capital. Self-raised funds may represent even harder budget constraints in a context of ineffectual decision-making and excessive investment. Both Liu and Li (2001) and Chen (2006) make use of these measures of fixed assets investment financing. The former find a positive and significant relationship between growth and fixed asset investments financed by domestic loans and self-raised funds, and the latter conclude that, while loan expansion did not directly contribute to growth, the substitution of loans for state budget appropriation significantly fostered it.

We construct the following two measures of market and profit-oriented financial transactions (Family 3):

(7) The share of fixed asset investment financed by domestic loans relative to that financed by state budgetary appropriation (*LOANS* over *APPRO*).

(8) The share of fixed asset investment financed by self-raised funds (*SELF RAISED FUNDS*).

[10] Domestic loans include funds borrowed from domestic banks and non-bank financial institutions by local enterprises and institutions. State budgetary appropriation consists essentially of appropriation in the government budget earmarked for capital construction and infrastructure projects. Foreign investment refers to foreign funds in fixed assets, foreign funds borrowed and managed by the government or by individual units, as well as foreign funds in joint-ventures. Self-raised funds include funds raised by various types of enterprises through non-state channels such as bonds, stocks, venture capital, and retained earnings.

All our financial indicators are measured at the provincial level. This can be justified considering that although banks can technically finance across provincial lines, the majority of their activities takes place within provinces. The World Bank's (2005) report on markets integration in China indicates a positive and significant correlation between provincial bank deposits and loans (p. 136). In the light of the Feldstein and Horioka (1980) test, this finding suggests a very limited intra-national mobility of bank financing. This result holds even after controlling for national factors and province-specific shocks. Moreover, an increased correlation is observed in the 1990s, suggesting a decrease in capital mobility within the banking sector in most recent years[11].

3.2 Indicators of economic growth and its sources

Our investigation of the finance-growth nexus in China will assess the impact of our various indicators of financial development on real per capita *GDP* growth, capital accumulation, and productivity growth.

The rate of real per capita *GDP* growth (*GDP GROWTH*) is computed as yearly growth of per capita *GDP* deflated by consumer prices. The growth rate of the per capita physical capital stock (*CAPITAL GROWTH*) is computed using the perpetual inventory method. We follow Harberger's (1978) suggestion for deriving an initial estimate of the capital stock, which assumes that each province was at its steady-state capital-output ratio in 1974[12]. We then apply the perpetual inventory method with a depreciation rate (δ) of five percent to compute capital stocks in later years. The capital stock (K_t) is therefore computed using the following formula: $K_{t+1} = K_t + I_t - \delta K_t$, where I_t represents real investment in fixed assets.

As in Beck et al. (2000), our measure of productivity growth (*TFP GROWTH*) builds on the neoclassical production function. We assume that this aggregate production function is common across provinces and time, so that aggregate output in province *i*, Y_i, is given by the

[11] As highlighted by World Bank (2005), in 2000, only 5 percent of financial flows were conducted through the bond and stock markets. While recent shifts in financial portfolios suggest a tendency of the Chinese capital market to evolve towards a more market-based system in which direct financing through stocks and bonds plays an incrementally more important role, this development is still at its infancy. For this reason, we have not included stock-market related indicators among our financial indicators.

[12] As argued by Beck et al. (2000), while this assumption is surely incorrect, it is better than assuming an initial capital stock of zero, which many researchers use. The initial stock is computed for the year 1974, the first year for which data on investment flows are available. Alternative measures of capital growth based on assuming an initial stock of zero produced similar results. Also note that capital stock figures are computed based on the accumulation (perpetual inventory method) of total investment in fixed assets deflated by the GDP deflator. Unfortunately, to the best of our knowledge, no statistics exist at the provincial level over our period of investigation on capital-type specific deflators.

following expression: $Y_i = A_i K_i^{\alpha} L_i^{1-\alpha}$, where *K* denotes the capital stock; *L*, labor; and *A*, the level of total factor productivity. We solve for the growth rate of per capita productivity by first dividing all terms in the production function by *L* to get per capita production. We then take logarithms and the time derivative. Finally, we use the decomposition of province level gross domestic product into compensation of workers, depreciation of fixed assets, net taxes on production, and operating surplus, in order to compute labor shares for each Chinese province. We rely on data for 1997 (which is the first year this information is provided by the National Bureau of Statistics in the China Statistical Yearbook) to compute these province-specific labor shares. We then derive province-level capital shares, α_i, as 1-(labor compensation/*GDP*)$_i$, and use them to calculate per capita *TFP* growth as follows[13]:

$$TFP\ GROWTH_{i,t} = GDP\ GROWTH_{i,t} - \alpha_i * CAPITAL\ GROWTH_{i,t} \quad (1)$$

3.3 Descriptive statistics and correlations

The summary statistics of our variables are presented in Table 1a. Column (1) refers to the entire sample; columns (2) and (3) to the early (1989-1999) and late (2000-2003) periods, respectively; and columns (4) and (5), respectively to those province-year observations belonging to the three lower quartiles, and the highest quartile of the distribution of the *FDI* stock to *GDP* ratio.

Comparing the early with the late period, we can observe no major differences in the growth rates of *GDP*, *TFP*, and capital stock. Yet, the later period is characterized by a much higher *GDP* per capita, with no major differences in the *FDI* inflows to *GDP* ratio. It is also interesting to note that the share of population with more than primary education increased from about 73 percent in the early years to 86 percent in the later years, that the inflation rate declined from 9.28 percent to 0.52 percent, and that the share of state entities in total fixed assets declined from 65 percent to 52 percent.

Coming to our financial indicators, the statistics suggest that financial depth, which was already high at the start of the period, further increased from 1989 to 2003: the ratio of total bank loans to *GDP* rose from 78 percent to 91 percent, while the ratio of total loans to *GDP* rose from 95 percent to 109 percent. State interventionism, on the other hand, declined, probably as a result of the financial reforms discussed in the previous Section. In particular,

[13] The capital share varies from 0.65 in the case of Shanghai to 0.30 in the case of Guangxi, and is on average equal to 0.35. We thank an anonymous Referee for suggesting the calculation of province-specific capital shares.

the share of *SOCB* credit in total bank credit declined from 68 percent to 59 percent, while the ratio of loans to deposits of the *SOCB*s declined from 112 percent to 77 percent. Surprisingly, the share of fixed assets investment financed by loans relative to that financed by state budget appropriation also declined over time, as did the share financed by self-raised funds.

Comparing the low and high-*FDI* province-year observations, we can see that the latter are characterized by higher *GDP*, *TFP*, and capital stock growth, by a higher level of *GDP*, degree of openness, percentage of educated people, and a lower share of state entities in total investment. The high-*FDI* regions also display a higher degree of financial depth, and a lower degree of state interventionism than their low-*FDI* counterparts. Finally, the share of fixed assets investment financed by loans relative to that financed by state budget appropriation is higher for high *FDI* recipients, while the share financed by self-raised funds is slightly lower.

Table 1b presents the correlation matrix between our growth variables and our financial indicators. We can see that our Family 1 and Family 2 indicators are negatively related with *GDP* and *TFP* growth, as well as with physical capital accumulation, while the correlation between our Family 3 indicators, growth, and its sources is generally positive. In the Section that follows, we will provide formal evidence for the effects of our financial indicators on *GDP* and *TFP* growth, and capital accumulation. We will also investigate whether the relationship between our financial indicators, growth, and its sources has changed over time, and whether it differs across provinces with different *FDI* stock to *GDP* ratios.

4. Econometric methodology and baseline specification

In this Section, we first present our baseline growth equation, and discuss the conditioning information set that we use. We then describe our econometric methodology.

4.1 Baseline specification

We use a cross-province time-series panel of data to estimate the relationship between finance and *GDP* growth, capital accumulation, and productivity growth[14]. Our baseline regression takes the following form:

$$\Delta Y_{i,t} = \alpha + \beta\, FINANCE_{i,t} + \gamma\, CONTROL_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \qquad (2)$$

[14] We rely on annual growth rate to maximize the number of observations. Our results were robust to using two year averages. The results based on the two year averages are not reported for brevity, but are available on request.

where *i* indexes our 30 provinces, and *t*, time. *ΔY* is either *GDP GROWTH*, *CAPITAL GROWTH*, or *TFP GROWTH*. *FINANCE* represents in turn each of the eight indicators presented in Section 3.1 to proxy respectively for the size of the financial sector, its state-induced distorting nature, and its market driven functioning. *CONTROL* is defined according to the augmented Solow model as proposed by Mankiw et al. (1992). The logarithm of lagged real per capita *GDP* is included to control for convergence. We also introduce the share of population with more than primary schooling as a proxy for human capital (*EDUCATION*). The following five additional policy variables that have been identified in the empirical growth literature as being correlated with growth performance across countries (Barro, 1991; Easterly et al., 1997) are also included: government expenditure over *GDP* as an indicator of government size (*GOV*); the rate of inflation based on the Consumer Price Index *(CPI)*; trade as a share of *GDP* (*OPENNESS*), and *FDI* inflows as share of *GDP* (*FDI*), to capture the degree of openness of the economy; and the share of state entities in total investment (*STATE ENTITIES*) as an indicator of low progress in reform. Finally, provincial fixed effects and time fixed effects are denoted by η_i and λ_t respectively, and $\varepsilon_{i,t}$ is an idiosyncratic error term.

4.2. Econometric methodology

Let us focus on *GDP* growth as our dependent variable, and denote with *y*, the logarithm of real per capita *GDP*; and with *X*, our set of explanatory variables (including our financial indicators and other control variables expressed in logarithms, but excluding lagged per capita *GDP*). Our real per capita *GDP* growth Equation can be expressed as follows:

$$y_{i,t}-y_{i,t-1} = (\alpha-1)y_{i,t-1} + \beta' X_{i,t} + v_i + v_t + e_{i,t}\,, \qquad (3)$$

The error term in Equation (3) is made up of the following components: v_i, which denotes a province-specific component (encompassing any permanent additive measurement error); v_t, which represents a time-specific component (that we account for by including time dummies in all our specifications); and $e_{i,t}$, which is an idiosyncratic component. Equation (3) can be rewritten as follows:

$$y_{i,t} = \alpha y_{i,t-1} + \beta' X_{i,t} + v_i + v_t + e_{i,t}, \qquad (4)$$

Equation (4) can be estimated using a within-groups estimator, which controls for province-specific heterogeneity. Yet, since the lagged dependent variable is introduced among the regressors, together with the provincial fixed effects, this estimator is biased and inconsistent even if $e_{i,t}$ is not serially correlated, as the lagged dependent variable is correlated with the error term[15]. Moreover, in all specifications, most of the explanatory variables can be expected to be endogenously determined (and many of them are likely to be measured with error). We thus need to control for the endogeneity arising both from the dynamic specification of the equation and from reverse causation.

External instruments such as legal origin, which have been commonly used in the literature (La Porta et al., 1997, 1998) cannot be used in our context since Chinese provinces share a common legal system and similar institutions. Alternatively, we rely on internal instruments, using the Generalized-Method-of-Moments (GMM) panel estimator, proposed by Arellano and Bond (1991) and Blundell and Bond (1998), which relies on first-differencing the estimating equation to get rid of the province-specific fixed effect, and uses appropriate lags of the right-hand side variables as instruments.

As can be seen from the following Equation, first-differencing (4) allows us to eliminate the province-specific effect, v_i:

$$y_{i,t} - y_{i,t-1} = \alpha(y_{i,t-1} - y_{i,t-2}) + \beta'(X_{i,t} - X_{i,t-1}) + (v_t - v_{t-1}) + (e_{i,t} - e_{i,t-1}) \quad (5)$$

Yet, in order to estimate Equation (5), instrumentation is still necessary to deal with the possible endogeneity of the regressors, and with the correlation between $(y_{i,t-1} - y_{i,t-2})$ and $(e_{i,t} - e_{i,t-1})$. Assuming that $e_{i,t}$ is not serially correlated and that the regressors contained in X are weakly exogenous (meaning that they are uncorrelated with future realizations of the error term), the GMM first-difference estimator uses the following moment conditions:

$$E[y_{i,t-s}(e_{i,t} - e_{i,t-1})] = 0 \text{ for } s \geq 2;\ t = 3,\ldots,15 \quad (6)$$

$$E[X_{i,t-s}(e_{i,t} - e_{i,t-1})] = 0 \text{ for } s \geq 2;\ t = 3,\ldots,15 \quad (7)$$

[15] This bias is generally referred to as the Nickell (1981) bias. Nickell (1981) derives a formula for this bias (when there are no exogenous regressors), showing that it approaches 0 as the sample size tends to infinity. The within-groups estimator is thus likely to perform well only when the time dimension of the panel is large.

These moment conditions imply that values of real per capita *GDP* (*y*) and of all the *X*'s lagged twice or more can be used as instruments in our regressions[16].

The GMM first-difference estimator, suffers however from a significant shortcoming. Blundell and Bond (1998) have shown that when the explanatory variables are persistent over time, lagged levels of these variables are weak instruments for the regression equation expressed in first-differences[17]. This is likely to lead to biased coefficients, and the problem is generally exacerbated in small samples. To avoid this bias, Blundell and Bond (1998) proposed a system-GMM estimator. This estimator basically combines in a system the first-differenced Equation (5) with the same Equation expressed in levels. The instruments for the regression in differences are the same as those described above, while the instruments for the Equation in levels are lagged differences of the corresponding variables[18]. The additional moment conditions in the system-GMM estimator are:

$$E[(y_{i,t-s}-y_{i,t-s-1})(v_i + e_{i,t})] = 0 \text{ for } s=1;\ t=3,\ldots,15 \quad (8)$$

$$E[(X_{i,t-s}-X_{i,t-s-1})(v_i + e_{i,t})] = 0 \text{ for } s=1;\ t=3,\ldots,15 \quad (9)$$

As discussed in Bond et al. (2001), Berg and Krueger (2004), and Hauk and Wacziarg (2004), the system-GMM is indeed the most suitable way to address the problems of estimating growth regressions. For this reason, we use this particular estimator in the estimation of all Equations in our paper.[19]

Consistency of the GMM estimates depends on the validity of the instruments. We test for the validity of our instruments by using two tests suggested by Arellano and Bond (1991): the *J* test and the test for second-order serial correlation of the residuals (*m2*). The former is the Sargan test for overidentifying restrictions, asymptotically distributed as a chi-square with degrees of freedom equal to the number of instruments less the number of parameters, under

[16] The first-difference GMM estimator was originally developed by Arellano and Bond (1991) and was first introduced in the growth literature by Caselli et al. (1996).

[17] Blundell and Bond (1998) also show that the instruments used with the standard first-differenced GMM estimator (i.e. the endogenous variables lagged two or more periods) become less informative in models where the variance of the fixed effects is particularly high relative to the variance of the transitory shocks.

[18] The latter are valid instruments under the assumption that there is no correlation between the differences of these variables and the province-specific effect. Note that considering that lagged levels of the regressors are used as instruments for the differenced equation, it is sufficient to use only the most recent difference as an instrument in the equation in levels.

[19] All our results were robust to using the simple first-difference GMM estimator rather than the system-GMM. Also note that while estimates obtained using the first-difference GMM estimator only reflect the within-provinces dimension of the relationship between financial indicators and growth, as the between-provinces dimension is differenced away, the system-GMM estimator also allows us to consider the latter dimension.

the null of instrument validity.[20] The *m2* test is asymptotically distributed as a standard normal under the null of no second-order serial correlation, and provides a further check on the specification of the model and on the legitimacy of variables dated *t*-2 as instruments. As stated in Beck et al. (2000), the appropriateness of the instrumental variables "gives credence to the conclusion that the estimated […] link between finance and growth is not due to simultaneity bias or insufficient control for other determinants of growth." (p. 35).

5. Regression results

5.1 Main results

Table 2 reports the system-GMM estimates of Equation (2) where $\Delta Y_{i,t}$ is the real per capita *GDP* growth rate[21]. The results show a statistically and economically significant relationship between our financial indicators and economic growth. Specifically, our Family 1 indicators all attract a negative coefficient, suggesting that financial depth is negatively associated with growth. To assess the economic magnitude of this association, let us consider, for instance, a province exogenously moving from the 25th percentile of the distribution of the ratio of bank loans to *GDP* (58.1 percent) to the 75th percentile (96.8 percent). Using the coefficient in column 2 of Table 2, this province would experience a 0.92 percentage points slower *GDP* growth rate, which is an economically significant number. These findings contrast with the typical conclusion of most cross-country studies that analyzed the finance-growth nexus, finding a positive link between financial depth and growth. They can be a consequence of policies, which have promoted inefficient allocation of savings. These policies can be explained by the fact that the state's main objective is not to maximize efficiency. In particular, it might channel capital to poor, slow-growing regions, with the aim of reducing poverty (Boyreau-Debray, 2003; Boyreau-Debray and Wei, 2005).

Our Family 2 indicators are also negatively associated with growth, probably due to the inefficient allocation of savings by the state-banking sector, as well as to the fact that state-owned banks mainly support the relatively inefficient state-owned sector. As argued by Boyreau-Debray and Wei (2005), the state typically channels capital (through state-owned banks) to the inefficient *SOEs*, in order to avoid the unemployment consequences that would

[20] It should be noted that when panels with a short cross-sectional dimension are used, the Sargan test has low power (Baltagi et al., 2007).

[21] All our results were robust to using the within-groups estimator. We only report the system-GMM estimates for brevity. The estimates obtained using the within-groups estimator can be found in Guariglia and Poncet (2006).

follow from *SOE* bankruptcy. Focusing on the ratio of state-owned banks' credit to *GDP* and using the coefficient in column 6 of Table 2, a province exogenously moving from the 25th percentile of the distribution of state-owned banks' credit to *GDP* (45.8 percent) to the 75th percentile (78.3 percent) would experience a 1.66 percentage points slower *GDP* growth rate, which is once again economically significant[22].

Finally, our Family 3 indicators generally display positive coefficients, suggesting that a higher use of more market and profit-oriented financial transactions (such as loans relative to state budget appropriation, and self-raised funds) promotes growth. For instance, based on the coefficient reported in column 9 of Table 2, a province exogenously moving from the 25th percentile of the distribution of the share of fixed investment financed by self-raised funds (41.1 percent) to the 75th percentile (52.8 percent) would benefit from a 1.03 percentage point faster *GDP* growth rate.

The variables in the conditioning information set also have the expected signs. Lagged *GDP* per capita attracts a negative (although not always significant) coefficient, indicating a process of convergence. Our proxy for human capital accumulation generally attracts a positive and significant coefficient. Finally, among our policy indicators, the share of state entities in total investment enters as a negative determinant of economic growth, while our proxies for the degree of openness (trade and *FDI* share of *GDP*) have a positive impact on economic growth.

The Sargan test of overidentifying restrictions indicates that the orthogonality conditions cannot be rejected at the five percent level, and the *m2* test for the second order autocorrelation of the first-differenced residuals suggests that the error term is not serially correlated. Thus, we do not reject the null hypothesis that the instruments are appropriate. The strong link between finance and growth does not appear to be driven by simultaneity bias.

Table 3 presents the system-GMM estimates relative to physical capital accumulation, and Table 4, those relative to *TFP* growth[23]. Table 3 shows that like in the case of real *GDP* growth, all our Family 1 and Family 2 indicators are negatively associated with physical

[22] (1- *SOCB CREDIT* share*)* is the share of non state-owned commercial banks in total credit, and can be seen as a proxy for the money lent to the private sector. Using this variable as a financial indicator shows that the share of non-state-owned commercial banks in total credit exerts a positive effect on economic growth and its sources. This suggests that the higher the share of total credit that is provided by non-state banks, the more credit flows towards the more efficient private firms, allowing them to grow faster, and raising provincial *GDP* and productivity growth. Moreover, it is likely that compared to state-owned banks, non-state owned banks are more engaged in researching firms before making the actual loans, and in exerting corporate control once the loan has been made, leading to a higher efficiency in the process, and consequently, to higher *GDP* and productivity growth. These results are not reported for brevity, but are available from the authors upon request.

[23] Since the province of Chongqing was only created in 1997, it was not possible to compute its capital stock. As such, only 29 provinces are used in the capital stock and *TFP* growth equations.

capital accumulation. Thus, contrary to Beck et al. (2000), financial intermediary development indicators do have a significant impact on capital accumulation. This can be seen as evidence that the inefficient allocation of saving hampers capital accumulation, probably because the private firms, which have more potential to invest, are unable to obtain funds. Coming to our Family 3 indicators, we can see that only the share of total investment in fixed assets financed by self-raised funds has a positive and significant effect on capital accumulation.

We obtain similar results for productivity growth (Table 4): in this case, however, the coefficients associated with our Family 3 indicators are all positive and statistically significant. These results point to the fact that the positive impact of market and profit-oriented financial transactions on economic growth mainly operates through enhanced efficiency, while the negative impact of other financial indicators seems to work both through lower returns and capital constraints.

5.2 Can reverse causality be ruled out?

Although the use of a system-GMM estimator ensures that the relationship found between finance and growth is essentially explained by the effects of the exogenous component of our financial indicators on growth, it does not completely rule out that growth can also influence financial development. To further investigate the issue of reverse causality of the relationship between finance and economic growth, we have performed a panel Granger causality test (Holtz-Eakin et al., 1989), for whether growth causes subsequent financial development. Specifically, we have estimated an Equation of the following type:

$$FINANCE_{i,t} = a_o FINANCE_{i,t-1} + a_1 FINANCE_{i,t-2} + b_1\, GDP\ GROWTH_{i,t-1} + \\ + b_2\, GDP\ GROWTH_{i,\,t-2} + e_i + e_t + v_{i,t}, \qquad (10)$$

where $FINANCE_{i,t}$ represents in turn one of our eight financial indicators; e_i denotes province fixed-effects; e_t, time-fixed effects; and $v_{i,t}$, an idiosyncratic error term. In this framework, the variable *GDP GROWTH* is said not to Granger cause the variable *FINANCE* if all the coefficients on lagged *GDP GROWTH* in Equation (10) are not significantly different from 0, i.e. if $b_1 = b_2 = 0$. The results of the estimates of Equation (10), together with the *p*-values associated with the *F*-test aimed at testing our null hypothesis are presented in Table A1 in Appendix 2. We can see that for each of our eight financial indicators, the null hypothesis

cannot be rejected. There is therefore no evidence that *GDP GROWTH* Granger causes financial development[24].

An alternative way to test for whether *GDP GROWTH* Granger causes *FINANCE* is to estimate both the restricted (assuming that $b_1 = b_2 = 0$) and unrestricted models using the same moment conditions, and compare their Sargan statistics using an incremental Sargan/*J* test of the form: $D_{RU} = n(J_1 - J_2)$, where J_1 denotes the *J* statistic for the restricted model; J_2, the *J* statistic for the unrestricted model; and *n*, the number of observations (Bond et al., 2001; Bond and Windmeijer, 2005). Under the null hypothesis that *GDP GROWTH* does not Granger cause *FINANCE*, D_{RU} is asymptotically distributed as a χ^2 with *r* degrees of freedom, where *r* is the number of restrictions (2 in our case). Table A1, in Appendix 2 reports the D_{RU} statistics for our eight financial indicators: in all cases, we cannot reject the null hypothesis that *GDP GROWTH* does not Granger cause *FINANCE* [25].

Our results so far indicate that financial distortions do represent an impediment to economic growth[26]. But what can then explain the phenomenal growth characterizing the Chinese economy? We attempt to answer this question by looking first at whether the negative relationship between finance and growth has become weaker over time, as a consequence of the banking sector reforms, and then by trying to determine whether there are circumstances under which financial distortions might not be an impediment to economic growth after all.

6. Evolution over time and *FDI* dependence of the finance-growth relationship

6.1 Evolution over time

As we discussed in Section 2.1, since the beginning of the economic reform, China has experienced a fundamental change with regard to the means of allocating financial resources. Major banking reforms were initiated in 1994, and a further impulse for changes in the banking sector came about with China's entry in the *WTO* in 2001. Consequently, as shown in Table 1a, state interventionism has significantly declined in the latest years of our sample. However, although these changes in banking policy are important, serious banking sector

[24] These results were robust to adding other control variables to the regressions.
[25] Similar results, not reported for brevity, but available from the authors upon request, hold for per capita capital accumulation, and per capita *TFP* growth.
[26] Our results were generally robust to adding further regressors measuring the quality of institutions, such as the share of private firms in output or employment, and an indicator measuring the number of opened economic zones, i.e. the zones allowed to operate in an economic environment without regulations against the marketization and internationalization of economic activities (Démurger et al., 2002).

problems remain. It is therefore of primary interest to investigate whether the relationship between finance and economic growth has evolved over the period of reform. We would expect that the rationalization and introduction of market driven practices in the final years of our sample would mitigate the problem of misallocation of funds, and therefore reduce the estimated negative impact of our indicators of financial development and state interference on growth. We also anticipate that reforms will reduce the differences between the various sources of financing in terms of returns to investment. In a context of widespread efficiency, there is in fact no reason to expect higher effects on growth of investment financed by loans, state appropriation, or self-raised funds. Returns to investment financed with different sources should converge and equalize in parallel with financial system reforms, so that our indicators of market driven finance would lose their relevance over time. In order to test this hypothesis, we estimate the following variant of Equation (2):

$$\Delta Y_{i,t} = \alpha + \beta_1 FINANCE_{i,t} + \beta_2 FINANCE_{i,t} * LATE_t + \gamma CONTROL_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (11)$$

where $LATE_t$ represents a dummy equal to 1 in 2000, 2001, 2002, and 2003, and 0 otherwise[27]. If the estimated negative impact of our indicators of financial development and state interference on growth is indeed reduced in the later years of our sample, and the positive impact of our indicators of market driven finance is mitigated, then we should observe a positive and significant β_2 coefficient for our Family 1 and 2 indicators, and a negative and significant β_2 coefficient for Family 3 indicators (together with a negative β_1 coefficient for Family 1 and 2 indicators, and a positive β_1 coefficient for Family 3 indicators).

The estimates of Equation (11) for *GDP* growth, capital accumulation, and *TFP* growth are respectively presented in columns 1, 2, and 3 of Table 5[28]. Columns 1 and 3 show that the coefficients associated with Family 1 financial indicators are negative and precisely determined, while the interactions between the indicators and the *LATE* dummy are generally positive and statistically significant. This suggests that the negative effect of most Family 1 financial indicators on *GDP* and *TFP* growth became weaker over the final years of our sample (2000-2003), possibly due to the financial system reforms, which reduced the

[27] Our results were generally robust to setting the dummy $LATE_t$ equal to one in 2001 to 2003; or in 1999 to 2003.

[28] To save space, Table 5 only shows the coefficients on our financial indicators and the interaction terms. Full estimates can be found in Guariglia and Poncet (2006).

system's inefficiencies. In a number of cases, summing the coefficients on the financial depth indicators and that on the same indicators interacted with the dummy gives a positive number: this shows that financial depth became positively associated with *GDP* and *TFP* growth after 2000. For instance, focusing on column 1 of Table 5, and summing the coefficients on *BANK CREDIT*, and its interaction with the *LATE* dummy, yields 0.008, which can be interpreted as the coefficient on *BANK CREDIT* in the latest years of the sample (2000-2003). This number suggests that if a province were to exogenously move from the 25th percentile of the 2000-2003 distribution of *BANK CREDIT* (66 percent) to the 75th percentile (103 percent), it would experience a 0.36 percentage point faster *GDP* growth rate.

Column 2 of Table 5 reports the regressions for capital accumulation: the relationship between our Family 1 financial indicators and capital accumulation did not significantly change over time. This can be explained by the fact that a more efficient financial system led to a rationalization of investment behavior, and not to an increase in capital accumulation. Rawski (2006) documents China's traditional reliance on "extensive" growth achieved by adding more resources to the production process, rather than "intensive" growth based on higher productivity. Officially managed investments typically generate low returns, and the overall investment picture in China reveals a surprising persistence of Soviet-style outcomes. Vigorous reform efforts are expected to increase investment returns and address the problems of ineffectual decision-making (Von Pfeil, 2004). As such, financial system reforms should help mitigating the Soviet-style seasonality pattern in investment spending and reduce excessive investment.

The negative effects of most of our Family 2 indicators on *GDP*, *TFP*, and capital stock growth appears to generally have declined or been reversed over time, although not all indicators are associated with a positive and significant β_2 coefficient.

Coming to our Family 3 indicators, all columns of Table 5 show that their positive effect on *GDP* and *TFP* growth, and physical capital accumulation, declined over time (the interaction terms attract negative and precisely determined coefficients), and in some cases became insignificantly different from zero. This can be explained by the fact that as the banking system became more efficient, it started to positively affect growth and its sources, reducing the difference in terms of effects on growth of the alternative forms of financing such as self-raised funds.

Financial distortions have therefore declined over time, hindering growth to a lower extent. Yet, China's growth has been phenomenal not only after 2000, but also before that,

when financial distortions were still severe. So what can explain the co-existence between this sustained growth and strong financial distortions?

6.2 Does the finance-growth relation depend on FDI presence in each province?

We now investigate whether the sensitivity of economic performance to financial intermediation depends on the *FDI* to *GDP* ratio in each province. This analysis is motivated by Harrison et al. (2004), according to whom firms in countries with greater *FDI* inflows suffer less from financial constraints and have therefore more growth opportunities, as incoming foreign investment provides additional sources of capital. Specifically, in the Chinese case, private enterprises may look for foreign investors, being constrained in their activity due to distortions in the state-dominated financial system (Huang, 2003; Luo, 2007)[29]. As we discussed in Section 2.1, most of the *SOCB*s' credit goes in fact to *SOE*s, and banks typically impose stricter scrutiny criteria and collateral requirements on private firms compared to other firms (financial bias). The problem was exacerbated prior to 2004 when China's Constitution did not commit to the protection of property rights of private firms (legal bias). Establishing joint-ventures with foreign firms may allow private firms to bypass both the financial bias (by using foreign firms as sources of finance) and the legal bias (by accessing the superior legal protection and regulatory treatment granted to foreign firms)[30]. On average, over the period under investigation, *FDI* accounted for 8.7 percent of the total investment in fixed assets at the provincial level (China Statistical Yearbook, various issues). The share peaked at 13.9 percent in 1994. It is thus very likely that *FDI* is a significant source of financing for Chinese firms.

Our aim is to determine whether in the presence of *FDI*, financial distortions may become less of an impediment to economic growth. We conduct a straightforward test of this hypothesis, introducing interaction terms of our indicators of financial intermediation, with

[29] Havrylchyk and Poncet (2007) provide primary empirical confirmation of this thesis. They find that indicators of the distorting nature of the inefficient banking sector are important determinants of the *FDI* received by Chinese provinces. It should be noted, however, that while this thesis might explain part of the inward *FDI* in China, it cannot explain the very rapid increase that took place more recently, when discrimination against private firms was becoming less relevant. See Prasad and Wei (2005) for a discussion of other possible factors explaining the behavior of *FDI* in China in recent years.

[30] Prior to 1999, private firms were also banned from exporting directly, while foreign-invested firms were granted automatic trading licenses within their lines of business. Establishing joint-ventures with foreign firms made it therefore easier for private firms to enter export markets.

the logarithm of the stock of *FDI* to *GDP* in each province and year ($FDI\ stock_{i,t}/GDP_{i,t}$)[31]. We therefore estimate the following Equation:

$$\Delta Y_{i,t} = \alpha + \beta_1 FINANCE_{i,t} + \beta_2 FINANCE_{i,t} * \left(FDI\ stock_{i,t} \Big/ GDP_{i,t} \right) + \\ + \gamma CONTROL_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (12)$$

A positive β_2 coefficient for Family 1 and 2 financial indicators, and a negative β_2 coefficient for Family 3 indicators (together with a negative β_1 coefficient for Family 1 and 2 indicators, and a positive β_1 coefficient for Family 3 indicators) would suggest that the higher the *FDI* in each region, the lower the constraints related to the misallocation of finance, and the less the heterogeneity in terms of returns to investment depending on financing sources[32].

The estimates of Equation (12) for *GDP* growth, capital accumulation, and *TFP* growth are respectively presented in columns 1, 2, and 3 of Table 6[33]. The results suggest that provinces characterized by higher *FDI* stocks relative to *GDP* tend to suffer less from the negative effects of Family 2 indicators on *GDP*, capital, and *TFP* growth. For instance, the results in column 1 show that if a province with an *FDI* stock to *GDP* ratio of 10.05 percent (the sample mean less one third the sample standard deviation) were to exogenously move from the 25th percentile of the distribution of the *SOCB CREDIT* share (55 percent) to the 75th percentile (74 percent), it would experience a 0.99 percentage point slower per capita *GDP* growth rate. For a province with an *FDI* stock to *GDP* ratio twice as large, the same increase in *SOCB CREDIT* would result in a 0.45 percentage point slower *GDP* growth rate. These findings support the view that *FDI* may be used as a way to bypass the inefficiencies of the local banking sector. In particular, private firms, for whom it is difficult to obtain loans from state banks, may use foreign joint-ventures to acquire needed capital, and can in this way achieve higher productivity and growth rates (Harrison et al., 2004; Huang, 2003; Luo, 2007)[34].

[31] We use the stock of *FDI* to *GDP* ratio as an interaction term, instead of the ratio of *FDI* inflows to *GDP*, since the former indicator is likely to better capture the overall presence of foreign firms in each province. Our results were generally robust to using the ratio of *FDI* inflows to *GDP* as an interaction term.

[32] Using a similar methodology, Rioja and Valev (2004) study whether the relationship between finance and growth varies across countries characterized by different levels of financial development.

[33] Once again, to save space, Table 6 only shows the coefficients on our financial indicators and the interaction terms. Full estimates can be found in Guariglia and Poncet (2006).

[34] Inspection of data from the World Bank Investment Climate Survey (2003), which includes 2400 firms surveyed in 13 cities in 2003, suggests that 12 percent of private firms (i.e. of those firms with a private share greater than 49 percent) have shares owned by a foreign partner. Moreover, the sales per employee of these firms

Similar results are observed for the effects of our Family 1 indicators on *TFP* growth, but not for *GDP* and capital growth[35]. Coming to our Family 3 indicators, we find that the positive effects of loans over state budget appropriation on *GDP* and *TFP* growth are lower in high *FDI* recipient provinces.

In sum, our results indicate that provinces with higher *FDI* stocks relative to *GDP* benefit from faster economic growth primarily thanks to enhanced efficiency, and seem to be less sensitive to the negative impact of state intervention induced inefficiency and constraints in capital access[36]. *FDI* can therefore help to alleviate the costs associated with financial distortions, and could provide an explanation for why, as discussed by Allen at al. (2005), China is a counterexample to the findings of the finance-growth literature, being characterized by malfunctioning financial institutions and phenomenal growth rates[37].

7. Conclusions

We have used data for 30 Chinese provinces over the period 1989-2003 to study the relationship between finance and economic growth. Moving beyond existing literature, we have considered a wide range of financial indicators, accounting both for the size and the quality of financial intermediation; focused on two important sources of *GDP* growth: physical capital accumulation, and total factor productivity growth; and investigated whether the relationship between our financial indicators and growth has changed over time, and whether it differs across provinces characterized by different *FDI* stock to *GDP* ratios.

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are 15 times higher, and their growth over the period 2001-2002 was almost 5 times faster than those of the 100 percent domestically owned private firms. This evidence is consistent with our hypothesis that those private firms that enter joint-ventures with foreign firms are able to bypass the costs associated with an inefficient banking sector in China, and can consequently achieve higher productivity and growth rates.

[35] In column 2 of Table 6, which reports the estimates for capital accumulation, we can see that while the Family 1 indicators do not attract statistically significant coefficients, their interactions with the *FDI* stock to *GDP* ratio attract negative and precisely determined coefficients. This finding can be explained by the fact that *FDI*-financed projects may be driven more by a logic of efficiency than by a logic of spending. Consequently, *FDI* abundant environments may promote less disbursement-driven investment, reducing the rhythm of capital accumulation.

[36] One could claim that instead of being driven by *FDI* being a major source of financing, our results may be driven by it being an indicator of more market based or reformed provinces. In order to assess whether this is the case, we replaced the *FDI* stock variable with the share of state units in investment (*STATE ENTITIES*) as an interaction term for our financial development indicators. The results, which are not reported for brevity, show that these new interaction terms are generally insignificant, suggesting that our results based on the *FDI* interactions do not stem from the fact that *FDI* is an indicator of more reformed provinces.

[37] Alfaro et al. (2004), Durham (2004), and Hermes and Lensink (2003) use cross-country data to look at the other side of the coin: they examine the extent to which the effects of *FDI* on growth depend on the countries' level of financial development. They find that it is only countries with well-developed financial markets that gain significantly from *FDI*. They argue that the lack of development of local financial markets can limit the economy's ability to take advantage of potential *FDI* spillovers. In contrast, we show that, in the Chinese context, it is financial distortions at home that may lead domestic firms to establish joint-ventures with foreign firms.

We found that traditionally used indicators of financial development and China-specific indicators measuring the level of state interventionism in finance are generally negatively associated with growth and its sources, while indicators measuring the degree of market driven financing in the economy tend to promote *GDP* and *TFP* growth, as well as capital accumulation. This suggests that financial distortions do represent an impediment to growth.

In order to explain how, in spite of the distortions, China managed to sustain phenomenal growth rates, we showed that the adverse effects of financial distortions on growth have gradually declined over time, probably due to the progressive restructuring of the banking sector in China. We also showed that these effects tend to be weaker for high *FDI* recipients, suggesting that *FDI* may be used to alleviate the costs associated with the inefficient banking sector: private firms, which are generally discriminated against by the local financial system, might be able to use foreign joint-ventures as sources of finance, and might consequently achieve higher productivity and growth rates. *FDI* could therefore provide an explanation for why, as discussed by Allen at al. (2005), China is a counter-example to the findings of the finance-growth literature, being characterized by malfunctioning financial institutions and phenomenal growth rates. It is obviously also possible that growth has been so high in China despite the poorly performing banking sector, because private firms were able to make use of alternative mechanisms such as internal finance, non-bank financial intermediaries, and coalitions of various forms among firms; investors, and local governments. Yet, whichever the explanation for the Chinese growth miracle, we can conclude that there are indeed circumstances under which financial distortions do not represent an impediment to growth in China after all.

More insights on the link between financial development and growth in China can be derived from a comprehensive firm-level study of the determinants of firms' growth, with particular emphasis on whether this growth is constrained by the quantity of internal finance and the types of external finance available to firms. This is on the agenda for future research.

Appendix 1: Definition of the variables and statistical sources

Most data on the banking and financial sector for Chinese provinces are taken from the annual issues of the "Almanac of China's Finance and Banking" (*ACFB*). Data on growth and its components as well as data on our control variables are taken from annual issues of the China Statistical Yearbook (*CSY*) and from two statistical books that provide data at the provincial level from 1978 onwards ("China Regional Economy, a Profile of 17 Years of Reform and

Opening Up" issued by the China Statistical Bureau, *CRE,* and "1949-1999 China Statistical Data Compilation" issued by the China Marketing Research, *CMR*). This Appendix provides the exact definition (and the source, in parentheses) for each indicator used as explained or explanatory variables in our regressions. All our variables are measured at the province level.

Explained variables

GDP per capita and *GDP GROWTH*: logarithm of real *GDP* per capita and annual growth (deflation based on annual *CPI*) (source: *CSY*).

CAPITAL GROWTH: annual growth of real per capita capital stock (deflation based on annual *CPI*). The capital stock is computed based on the perpetual inventory method with a depreciation rate of five percent. The initial capital stock is computed following Harberger's (1978) assumption of a steady-state capital-output ratio in 1974. Investment flows are real investments in fixed assets (source: *CSY*).

TFP GROWTH: annual growth of per capita *TFP*, computed following Equation (1) in the text.

Explanatory variables

Financial indicators:

Family 1: Size of financial sector

BANK CREDIT: ratio of total bank loans to *GDP* (source: *ACFB*)

TOTAL CREDIT: ratio of total loans (in bank and non-bank financial institutions) to *GDP* (source: *ACFB*)

SAVINGS: ratio of households' savings deposits in financial intermediaries relative to *GDP* (source: *CMR* and *CSY*).

Family 2: State-related misallocation of funds

SOCB CREDIT share*:* share of state-owned commercial banks in total credit (source: *ACFB*).

SOCB CREDIT to *GDP*: ratio of state-owned commercial banks' credit to *GDP* (source: *ACFB*).

CENTRAL: ratio of loans to deposits of the state-owned banks (source: *ACFB*).

Family 3: Profit-driven allocation of funds

*LOANS*over*APPRO*: share of fixed asset investment financed by domestic loans relative to that financed by state budgetary appropriation (source: *CSY* and *CMR*).

SELF-RAISED FUNDS: share of fixed asset investment financed by self-raised funds (source: *CSY* and *CMR*).

Control variables:

EDUCATION: Share of population with more than primary schooling (source: *CSY*)
CPI: Inflation rate based on the *CPI* (source: *CSY*)
STATE ENTITIES: Share of state entities in total investment in fixed assets (source: CSY)
GOV: Government expenditure over GDP (source: *CRE*)
OPENNESS ratio: ratio of exports plus imports to *GDP* (source: *CSY*)
FDI/GDP: ratio of foreign direct investment inflows to *GDP* (source: *CSY* and authors' computation). *FDI* inflows are defined as the investments inside China by foreign enterprises and economic organizations or individuals (including overseas Chinese, compatriots from Hong Kong, Macao and Taiwan, and Chinese enterprises registered abroad), following the relevant policies and laws of China for the establishment of ventures exclusively with foreign own investment, Sino-foreign joint-ventures, and cooperative enterprises, or for co-operative exploration of resources with enterprises or economic organizations in China. It includes the re-investment by foreign entrepreneurs of profits gained from investment, as well as the funds that enterprises borrow from abroad in the total investment of projects, which are approved by the relevant department of the government.

Other

FDI stock/GDP: ratio of foreign direct investment stock to *GDP* (source: *CSY* and authors' computation). The *FDI* stock is computed as the sum of the deflated *FDI* inflows, where the U.S. Department of Labor Producer Price Index for Capital Equipment is used as a deflator.

List of provinces and municipalities

Beijing, Tianjin, Hebei, Shanxi, Nei Monggol, Liaoning, Jilin, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Hainan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang, Sichuan, Chongqing.

Appendix 2: Investigating the reverse causality issue: a Granger causality test

Table A1 presents the estimates of Equation (10), which is aimed at assessing whether *GDP GROWTH* Granger causes *FINANCE*.

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Table 1a: Descriptive statistics

	Entire sample	Early Period: 1989-1999	Late Period: 2000-2003	Low *FDI stock/GDP*	High *FDI stock/GDP*
	(1)	(2)	(3)	(4)	(5)
Dependent variables					
GDP GROWTH	0.09	0.09	0.09	0.09	0.10
	(0.05)	(0.05)	(0.03)	(0.05)	(0.05)
CAPITAL GROWTH	0.13	0.13	0.13	0.12	0.14
	(0.05)	(0.05)	(0.04)	(0.04)	(0.06)
TFP GROWTH	0.02	0.02	0.02	0.02	0.03
	(0.04)	(0.04)	(0.03)	(0.04)	(0.03)
Controls					
Lagged real *GDP* per capita (yuan)	3 442	2 754	5 289	2 430	6 354
	(2 804)	(1 991)	(3 702)	(1 184)	(3 883)
CPI: inflation rate	6.94	9.28	0.52	7.73	4.78
	(8.17)	(8.36)	(1.47)	(8.20)	(7.75)
EDUCATION	0.76	0.73	0.86	0.73	0.85
	(0.11)	(0.10)	(0.09)	(0.10)	(0.10)
STATE ENTITIES: share in investment	0.62	0.65	0.52	0.64	0.55
	(0.16)	(0.15)	(0.14)	(0.14)	(0.18)
FDI / GDP	0.03	0.03	0.03	0.01	0.08
	(0.04)	(0.05)	(0.03)	(0.01)	(0.05)
OPENNESS ratio	0.23	0.20	0.29	0.12	0.52
	(0.29)	(0.23)	(0.40)	(0.10)	(0.43)
*GOV*ernment expenditures over *GDP*	0.13	0.12	0.16	0.13	0.12
	(0.05)	(0.04)	(0.06)	(0.05)	(0.04)
Financial indicators					
Family 1: *BANK CREDIT*	0.81	0.78	0.91	0.77	0.93
	(0.32)	(0.26)	(0.44)	(0.25)	(0.46)
TOTAL CREDIT	0.99	0.95	1.09	0.90	1.21
	(0.43)	(0.37)	(0.54)	(0.28)	(0.63)
SAVINGS	0.55	0.48	0.73	0.48	0.75
	(0.28)	(0.24)	(0.31)	(0.18)	(0.41)
Family 2: *SOCB CREDIT* share	0.65	0.68	0.59	0.68	0.58
	(0.13)	(0.13)	(0.08)	(0.13)	(0.10)
SOCB CREDIT to *GDP*	0.65	0.64	0.65	0.63	0.68
	(0.23)	(0.23)	(0.25)	(0.20)	(0.30)
CENTRAL	1.02	1.12	0.77	1.10	0.82
	(0.32)	(0.32)	(0.10)	(0.32)	(0.20)
Family 3: *LOANS*over*APPRO*	5.02	5.34	4.27	4.50	6.56
	(3.66)	(3.50)	(3.92)	(3.18)	(4.46)
SELF-RAISED FUNDS	0.48	0.48	0.45	0.48	0.45
	(0.09)	(0.09)	(0.08)	(0.09)	(0.06)
Observations	450	330	120	328	114

Notes: The Table reports the variables' means. Standard deviations are reported in parentheses. Column (4) refers to those province-year observations characterized by a ratio of *FDI* stock to *GDP* that falls in the bottom three quartiles of the distribution. Column (5) refers to those observations that fall in the top quartile. See Appendix 1 for precise definitions of all variables.

Table 1b: Correlation matrix

	GDP GROWTH	*CAPITAL GROWTH*	*TFP GROWTH*	*BANK CREDIT*	*TOTAL CREDIT*	*SAVINGS*	*SOCB CREDIT* share	*SOCB CREDIT* to *GDP*	*CENTRAL*	*LOANS*over *APPRO*	*SELF-RAISED FUNDS*
GDP GROWTH	1.00										
CAPITAL GROWTH	0.60	1.00									
TFP GROWTH	0.93	0.28	1.00								
BANK CREDIT	-0.12	-0.14	-0.08	1.00							
TOTAL CREDIT	-0.09	-0.12	-0.04	0.93	1.00						
SAVINGS	-0.04	-0.09	-0.11	0.70	0.83	1.00					
SOCB CREDIT share	-0.20	-0.13	-0.23	-0.08	-0.22	-0.39	1.00				
SOCB CREDIT to *GDP*	-0.19	-0.16	-0.10	0.87	0.84	-0.57	0.30	1.00			
CENTRAL	-0.15	-0.20	-0.13	-0.10	-0.20	-0.46	0.61	0.14	1.00		
*LOANS*over*APPRO*	0.32	0.18	0.40	-0.03	0.09	0.12	-0.34	-0.12	-0.07	1.00	
SELF-RAISED FUNDS	0.14	0.06	0.11	-0.41	-0.35	-0.23	0.03	-0.37	0.14	0.14	1.00

Notes: See Appendix 1 for precise definitions of all variables.

Table 2: Finance and *GDP* growth

Dependent variable: *GDP GROWTH*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged real *GDP* per capita	-0.019	-0.021	-0.022	-0.029**	-0.019	-0.031**	-0.041**	-0.023	-0.004
	(0.011)	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)	(0.018)	(0.015)	(0.014)
EDUCATION	0.038	0.057	0.066*	0.084**	0.042	0.085*	0.026	0.077**	0.024
	(0.028)	(0.035)	(0.037)	(0.034)	(0.033)	(0.046)	(0.038)	(0.037)	(0.034)
*STATE ENTITIE*S: share in investment	-0.035**	-0.034**	-0.029*	-0.037**	-0.034***	-0.016	-0.023	-0.030**	-0.028*
	(0.013)	(0.016)	(0.014)	(0.017)	(0.012)	(0.015)	(0.022)	(0.012)	(0.014)
FDI/GDP	0.011***	0.012***	0.011***	0.012***	0.009***	0.012***	0.006	0.009**	0.011***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
OPENNESS ratio	0.002	0.004	0.005	0.007	-0.001	0.010	0.010	-0.000	0.000
	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)	(0.010)	(0.008)	(0.007)
*GOV*ernment expenditure over *GDP*	-0.004	0.015	0.009	0.011	-0.003	0.020*	-0.019	0.001	0.005
	(0.009)	(0.011)	(0.010)	(0.009)	(0.009)	(0.011)	(0.017)	(0.009)	(0.013)
CPI: inflation rate	0.246*	0.001	0.038	0.055	0.201	0.108	0.248*	0.167	0.089
	(0.124)	(0.139)	(0.141)	(0.135)	(0.123)	(0.138)	(0.124)	(0.164)	(0.206)
BANK CREDIT		-0.018*							
		(0.010)							
TOTAL CREDIT			-0.019*						
			(0.011)						
SAVINGS				-0.026**					
				(0.011)					
SOCB CREDIT share					-0.036*				
					(0.021)				
SOCB CREDIT to *GDP*						-0.031***			
						(0.011)			
CENTRAL							-0.048**		
							(0.020)		
*LOANS*over*APPRO*								0.002**	
								(0.001)	
SELF-RAISED FUNDS									0.041**
									(0.018)
Constant	-0.849	0.348	0.180	0.086	-0.661	-0.141	-0.715	-0.463	-0.216
Fixed effects by year	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	434	407	377	431	376	398	398	399	399
Sargan	13.33	9.62	12.01	12.06	14.18	9.44	13.40	5.88	14.68
(degrees of freedom)	(177)	(182)	(182)	(182)	(177)	(160)	(81)	(182)	(136)
m2	1.20	1.12	0.96	1.18	0.58	0.78	0.91	0.87	1.14

Note: All regressions were estimated using a system-GMM estimator. All variables are expressed in logarithms. The sample used in estimation consists of 30 provinces between 1989 and 2003. All right hand-side variables were instrumented using two or more lags of themselves in the first-differenced equation, and their first-difference lagged once in the levels equation. Test statistics and standard errors (in parentheses) are asymptotically robust to heteroskedasticity. *m2* is a test for second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. The *Sargan* statistic is a test of the overidentifying restrictions, distributed as chi-square under the null of instrument validity. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent level, respectively. See Appendix 1 for precise definitions of all variables.

Table 3: Finance and capital stock growth

Dependent variable: *CAPITAL GROWTH*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged real *GDP* per capita	-0.011	-0.008	-0.006	-0.016	-0.021	-0.014	-0.028	-0.011	-0.000
	(0.016)	(0.018)	(0.017)	(0.018)	(0.016)	(0.018)	(0.025)	(0.021)	(0.019)
EDUCATION	0.005	0.033	0.042	0.045	0.015	0.037	0.017	-0.023	0.030
	(0.043)	(0.042)	(0.038)	(0.043)	(0.044)	(0.046)	(0.054)	(0.043)	(0.045)
*STATE ENTITIE*S: share in investment	-0.067***	-0.052***	-0.046**	-0.062**	-0.064***	-0.049**	-0.067***	-0.048***	-0.045**
	(0.017)	(0.017)	(0.022)	(0.024)	(0.022)	(0.018)	(0.024)	(0.014)	(0.020)
FDI/GDP	0.016**	0.016***	0.017***	0.018***	0.017***	0.016***	0.014**	0.014**	0.016***
	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)
OPENNESS ratio	-0.006	-0.004	-0.005	-0.005	-0.007	0.000	-0.008	-0.003	-0.009
	(0.008)	(0.009)	(0.010)	(0.009)	(0.009)	(0.010)	(0.013)	(0.010)	(0.011)
*GOV*ernment expenditure over *GDP*	0.025*	0.049***	0.039**	0.034**	0.028**	0.060***	0.008	0.016	0.029**
	(0.014)	(0.016)	(0.015)	(0.015)	(0.012)	(0.021)	(0.020)	(0.012)	(0.013)
CPI: inflation rate	0.567***	0.396**	0.416**	0.495**	0.668***	0.483***	0.640***	0.468*	0.483
	(0.175)	(0.167)	(0.154)	(0.218)	(0.168)	(0.169)	(0.149)	(0.260)	(0.322)
BANK CREDIT		-0.030**							
		(0.013)							
TOTAL CREDIT			-0.024**						
			(0.010)						
SAVINGS				-0.026**					
				(0.011)					
SOCB CREDIT share					-0.062*				
					(0.033)				
SOCB CREDIT to *GDP*						-0.043**			
						(0.017)			
CENTRAL							-0.074**		
							(0.033)		
*LOANS*over*APPRO*								0.000	
								(0.001)	
SELF-RAISED FUNDS									0.031**
									(0.015)
Constant	-2.340***	-1.570**	-1.720**	-2.022**	-2.846***	-1.958**	-2.593***	-1.903*	-2.057
	(0.739)	(0.732)	(0.685)	(0.947)	(0.744)	(0.754)	(0.653)	(1.061)	(1.420)
Fixed effects by year	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	427	400	370	424	369	391	391	392	392
Sargan	8.42	10.26	5.88	8.23	10.78	9.64	6.43	4.66	6.42
(degrees of freedom)	(177)	(182)	(165)	(160)	(134)	(160)	(81)	(186)	(138)
m2	0.63	0.50	0.46	0.59	0.52	0.37	0.63	0.54	0.25

Note: All regressions were estimated using a system-GMM estimator. All variables are expressed in logarithms. The sample used in estimation consists of 29 provinces between 1989 and 2003. Also see *Note* to Table 2. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent level, respectively. See Appendix 1 for precise definitions of all variables.

Table 4: Finance and *TFP* growth

Dependent variable: *TFP GROWTH*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged real *GDP* per capita	0.004	0.009	0.008	0.001	0.000	-0.002	-0.016	0.005	0.006
	(0.009)	(0.010)	(0.009)	(0.009)	(0.010)	(0.011)	(0.012)	(0.011)	(0.013)
EDUCATION	0.029	0.009	0.024	0.048	0.007	0.035	0.016	0.047	0.010
	(0.030)	(0.037)	(0.039)	(0.036)	(0.041)	(0.042)	(0.047)	(0.036)	(0.042)
*STATE ENTITIE*S: share in investment	-0.001	0.010	0.009	0.004	0.012	0.020	0.019	0.000	-0.018
	(0.011)	(0.014)	(0.013)	(0.010)	(0.013)	(0.014)	(0.020)	(0.009)	(0.017)
FDI/GDP	-0.000	-0.001	-0.001	0.000	-0.002	-0.001	0.000	-0.002	-0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
OPENNESS ratio	0.007	0.011*	0.012*	0.012**	0.012*	0.016**	0.016**	0.005	0.007
	(0.005)	(0.006)	(0.007)	(0.005)	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)
*GOV*ernment expenditure over *GDP*	-0.017**	-0.009	-0.006	-0.010	-0.023*	-0.002	-0.021	-0.016*	-0.015
	(0.008)	(0.012)	(0.012)	(0.010)	(0.011)	(0.016)	(0.013)	(0.009)	(0.009)
CPI: inflation rate	-0.101	-0.107	-0.178	-0.194	-0.070	-0.133	0.036	-0.081	-0.137
	(0.098)	(0.108)	(0.109)	(0.128)	(0.098)	(0.119)	(0.129)	(0.126)	(0.141)
BANK CREDIT		-0.019*							
		(0.010)							
TOTAL CREDIT			-0.024*						
			(0.012)						
SAVINGS				-0.023**					
				(0.011)					
SOCB CREDIT share					-0.028*				
					(0.016)				
SOCB CREDIT to *GDP*						-0.026*			
						(0.014)			
CENTRAL							-0.026*		
							(0.015)		
*LOANS*over*APPRO*								0.002***	
								(0.000)	
SELF-RAISED FUNDS									0.042**
									(0.017)
Constant	0.442	0.450	0.798	0.926*	0.318	0.689	0.002	0.331	0.613
	(0.407)	(0.462)	(0.474)	(0.549)	(0.408)	(0.519)	(0.562)	(0.540)	(0.658)
Fixed effects by year	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	427	400	370	424	369	391	391	392	392
Sargan	6.65	9.42	2.80	9.75	6.09	10.96	15.08	12.07	3.66
(degrees of freedom)	(177)	(154)	(154)	(164)	(119)	(120)	(67)	(181)	(125)
m2	0.76	0.42	0.98	0.63	0.33	0.75	0.52	0.41	0.72

Note: All regressions were estimated using a system-GMM estimator. All variables are expressed in logarithms. The sample used in estimation consists of 29 provinces between 1989 and 2003. Also see *Note* to Table 2. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent level, respectively. See Appendix 1 for precise definitions of all variables.

Table 5: Finance and growth: evolution over time

	GDP GROWTH (1)	*CAPITAL GROWTH* (2)	*TFP GROWTH* (3)
BANK CREDIT	-0.031**	-0.032**	-0.020*
	(0.012)	(0.015)	(0.011)
*BANK CREDIT * LATE*	0.039**	0.012	0.036***
	(0.015)	(0.022)	(0.009)
TOTAL CREDIT	-0.028**	-0.037**	-0.031***
	(0.013)	(0.016)	(0.011)
*TOTAL CREDIT * LATE*	0.033*	-0.007	0.043***
	(0.019)	(0.029)	(0.011)
SAVINGS	-0.026***	-0.022	-0.025**
	(0.009)	(0.015)	(0.009)
*SAVINGS * LATE*	0.023	-0.021	0.033***
	(0.020)	(0.023)	(0.011)
SOCB CREDIT share	-0.048*	-0.082**	-0.036*
	(0.024)	(0.032)	(0.019)
SOCB CREDIT share * *LATE*	0.055**	0.159***	0.012
	(0.024)	(0.047)	(0.026)
SOCB CREDIT to *GDP*	-0.041***	-0.049***	-0.022*
	(0.011)	(0.015)	(0.012)
SOCB CREDIT to *GDP * LATE*	0.038**	0.026	0.036***
	(0.015)	(0.026)	(0.009)
CENTRAL	-0.044**	-0.073**	0.004
	(0.022)	(0.034)	(0.012)
CENTRAL LATE*	0.031	0.125*	-0.012
	(0.052)	(0.070)	(0.020)
*LOANS*over*APPRO*	0.003***	0.002**	0.002**
	(0.001)	(0.001)	(0.001)
*LOANS*over*APPRO * LATE*	-0.003***	-0.006***	-0.001
	(0.001)	(0.001)	(0.001)
SELF-RAISED FUNDS	0.065***	0.028*	0.072***
	(0.023)	(0.016)	(0.025)
*SELF-RAISED FUNDS*LATE*	-0.069***	-0.066*	-0.083*
	(0.024)	(0.035)	(0.042)
Control variables	yes	yes	yes
Fixed effects by year	yes	yes	yes

Note: All regressions were estimated using a system-GMM estimator. Control variables include lagged real *GDP* per capita, *EDUCATION*, *STATE ENTITIES*: share in investment, *FDI/GDP*, *OPENNESS* ratio, *GOV*ernment expenditure over *GDP*, and *CPI*: inflation rate. All variables are expressed in logarithms. The sample used in estimation consists of 30 provinces between 1989 and 2003 in column (1), and 29 provinces over the same period in columns (2) and (3). Also see *Note* to Table 2. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent level, respectively. See Appendix 1 for precise definitions of all variables.

Table 6: Finance and growth: the role of *FDI*

	GDP GROWTH (1)	*CAPITAL GROWTH* (2)	*TFP GROWTH* (3)
BANK CREDIT	-0.042**	0.018	-0.044***
	(0.019)	(0.024)	(0.014)
*BANK CREDIT * (FDI stock/GDP)*	0.008	-0.013*	0.016***
	(0.005)	(0.007)	(0.004)
TOTAL CREDIT	-0.013	0.044	-0.049**
	(0.022)	(0.026)	(0.018)
*TOTAL CREDIT *(FDI stock/GDP)*	0.001	-0.016**	0.013***
	(0.006)	(0.007)	(0.004)
SAVINGS	-0.014	0.041	-0.036***
	(0.015)	(0.026)	(0.011)
*SAVINGS *(FDI stock/GDP)*	-0.003	-0.019***	0.007***
	(0.004)	(0.006)	(0.002)
SOCB CREDIT share	-0.093***	-0.095**	-0.062***
	(0.031)	(0.041)	(0.021)
SOCB CREDIT share * *(FDI stock/GDP)*	0.026***	0.020**	0.018***
	(0.009)	(0.008)	(0.005)
SOCB CREDIT to *GDP*	-0.058***	-0.017	-0.062***
	(0.016)	(0.025)	(0.013)
SOCB CREDIT to *GDP* * (*FDI stock/GDP)*	0.012***	-0.008	0.017***
	(0.004)	(0.006)	(0.003)
CENTRAL	-0.070***	-0.098***	-0.028*
	(0.023)	(0.032)	(0.015)
CENTRAL (FDI stock/GDP)*	0.019**	0.019**	0.014**
	(0.007)	(0.007)	(0.007)
*LOANS*over*APPRO*	0.004***	-0.000	0.005***
	(0.001)	(0.002)	(0.001)
*LOANS*over*APPRO *(FDI stock/GDP)*	-0.001**	0.000	-0.001**
	(0.000)	(0.001)	(0.000)
SELF-RAISED FUNDS	0.014	0.022	0.025*
	(0.014)	(0.014)	(0.013)
SELF-RAISED FUNDS(FDI stock/GDP)*	0.007	0.001	0.007
	(0.006)	(0.006)	(0.005)
Control variables	yes	yes	yes
Fixed effects by year	yes	yes	yes

Note: All regressions were estimated using a system-GMM estimator. Control variables include lagged real *GDP* per capita, *EDUCATION*, *STATE ENTITIES*: share in investment, *FDI/GDP*, *OPENNESS* ratio, *GOV*ernment expenditure over *GDP*, and *CPI*: inflation rate. All variables are expressed in logarithms. The sample used in estimation consists of 30 provinces between 1989 and 2003 in column (1), and 29 provinces over the same period in columns (2) and (3). Also see *Note* to Table 2. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent level, respectively. See Appendix 1 for precise definitions of all variables.

Table A1: Investigation of reverse causation in the finance-growth relationship: a Granger causality test

Dependent variable: *FINANCE* indicator	*TOTAL CREDIT* (1)	*BANK CREDIT* (2)	*SAVINGS* (3)	*SOB CREDIT* share (4)	*SOB CREDIT* to *GDP* (5)	*CENTRAL* (6)	*LOANS* over *APPRO* (7)	*SELF-RAISED FUNDS* (8)
GDP GROWTH lagged once	0.166	-0.013	-0.056	0.438	-0.154	-0.127	0.855	-0.310
	(0.274)	(0.194)	(0.178)	(0.260)	(0.300)	(0.199)	(1.201)	(0.294)
GDP GROWTH lagged twice	0.287	0.184	-0.011	0.104	0.072	0.011	-1.099	-0.036
	(0.570)	(0.418)	(0.119)	(0.118)	(0.239)	(0.134)	(1.497)	(0.500)
FINANCE indicator lagged once	1.474***	1.541***	1.263***	0.892***	1.470***	0.978***	0.876***	0.896***
	(0.153)	(0.110)	(0.094)	(0.083)	(0.083)	(0.118)	(0.069)	(0.117)
FINANCE indicator lagged twice	-0.452***	-0.571***	-0.270*	0.201*	-0.406***	-0.133**	0.077	0.110
	(0.146)	(0.131)	(0.141)	(0.098)	(0.121)	(0.060)	(0.075)	(0.112)
Constant	-0.110	-0.052	0.019	-0.038	0.040	-0.031	0.403*	0.077
	(0.107)	(0.067)	(0.042)	(0.057)	(0.052)	(0.032)	(0.235)	(0.146)
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Observations	322	354	378	322	343	343	346	346
Sargan	17.88	15.49	17.16	13.52	21.36	16.28	14.58	11.53
(degree of freedom)	(33)	(33)	(33)	(33)	(31)	(30)	(33)	(33)
m2	-0.69	-0.86	-1.89	-1.18	-2.47	1.61	0.01	-0.18
Granger Causality F(2,29)	0.21	0.18	0.05	1.95	0.33	0.25	1.66	0.60
Granger Causality *p*-value	0.81	0.83	0.85	0.15	0.72	0.78	0.21	0.55
D_{RU}	962.94	539.95	185.22	1224.72	780.88	523.97	674.7	861.54

Note: All regressions were estimated using a system-GMM estimator, in which all right hand-side variables were instrumented using two or more lags of themselves in the first-differenced equation, and their first-difference lagged once in the levels equation. The Granger causality test examines the null hypothesis that each financial indicator is not Granger-caused by economic growth. The first test that we use is an *F*-test aimed at testing the hypothesis that the coefficients on the lags of *GDP GROWTH* are jointly equal to 0. Our second test is an incremental Sargan test of the form: $D_{RU} = n(J_1 - J_2)$, where J_1 denotes the *J* statistic for the restricted model; J_2, the *J* statistic for the unrestricted model; and *n*, the number of observations. Under the null hypothesis that *GDP GROWTH* does not Granger cause *FINANCE*, D_{RU} is asymptotically distributed as a χ^2 with *r* degrees of freedom, where *r* is the number of restrictions (2 in our case). Also see *Note* to Table 2. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent level, respectively. See Appendix 1 for precise definitions of all variables.