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Banks, stock markets, and China's 'great leap forward' ☆

Peter L. Rousseau [a,b,*], Sheng Xiao [c]

[a] Department of Economics, Vanderbilt University, Box 1819 Station B, Nashville, TN 37235, USA
[b] National Bureau of Economic Research, 1050 Massachusetts Ave., Cambridge, MA 02138, USA
[c] Department of Economics, Furman University, 3300 Poinsett Hwy., Greenville, SC 29613, USA

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Abstract

Using quarterly data for 1995–2005, we examine the role of financial factors in China's recent increases in real sector activity. After describing the institutional challenges that China faces in building a well-functioning equity market to complement its banking system, a series of cointegrated vector autoregressive models and the associated variance decompositions and impulse response functions show that banking sector development was central to these successes. At the same time, we find that stock market development, as measured by market size and trading volume, did not contribute significantly to them. We suspect that lingering questions regarding the quality of China's stock markets are largely responsible for the latter result, though it also may reflect the smaller size of the "stock market economy" relative to the broader economy in which we measure outcomes.

JEL classification: E44; O53

Keywords: Finance–growth nexus; Investment; Stock markets; Growth; VAR

1. Introduction

China became the world's fastest-growing economy from 1995 to 2005, an achievement that The Economist (2005a,b) refers to as a "great leap forward" and "a model of reform". According to the National Bureau of Statistics of China database, real GDP per capita grew at a startling average rate

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* Corresponding author. Department of Economics, Vanderbilt University, Box 1819 Station B, Nashville TN 37235, USA. Tel.: +1 615 343 2466; fax: +1 615 343 8495.
E-mail address: Peter.L.Rousseau@vanderbilt.edu (P.L. Rousseau).

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of 9.1% per year over this period, while real fixed investment per capita grew at 15.1% per year. Going from a GDP in 1994 of little more than 0.7 trillion constant 2000 US dollars to over 2 trillion in 2005, China has rapidly ascended from the world's tenth to its fourth largest economy, following only the United States, Japan, and Germany. This growth was accompanied by fundamental structural reforms, many of which have occurred in the financial sector.

China's financial system has also developed rapidly, with improvements in both the quality and quantity of bank credit.[1] In terms of quality, Chen et al. (2005) assert that "the major reform in the banking system came when a Western-style Central Bank Law and Commercial Bank Law were enacted in 1995 to establish the foundation of a competitive, modern banking system." The most recent *Economic Survey of China* of the Organization for Economic Cooperation and Development (OECD, 2005) notes that, "until 1995, banks paid considerable attention to national policies in determining the allocation of bank credit…[but] wide ranging reforms have been introduced since then. Banks have now started to modernize their lending and risk management practices." With respect to quantity, the IMF reports that growth in real domestic credit per capita grew at an average rate of 14.2% per year from 1995 to 2005, while the ratio of domestic credit to GDP rose from 0.84 to 1.33.

The financial sector also saw significant restructurings, the most important coinciding with the emergence of the Shanghai Stock Exchange in 1990 and the Shenzhen Stock Exchange in 1991. The enactments of the Companies Law in 1993 and the Securities Law in 1998 formally established "the legal framework for issuance of equity" (OECD, 2002). The establishment of legal and market infrastructures created conditions conducive to stock market development, and the number of firms listed on the exchanges rose from 345 in 1995 to 1379 by the end of the first quarter of 2005. At the same time, real stock market capitalization per capita grew at an average rate of 24% per year, the ratio of market capitalization to GDP rose from 5.7% in 1995 to a peak of 48.5% in 2000, before falling to 17.7% by 2005, while trading volume increased more than 10-fold from 1995 to the peak in 2000.[2]

Despite rapid growth in quantitative measures of China's stock markets, however, there is widespread suspicion about the quality of these markets. For example, Forbes Magazine (2001) has called them "China's $600 billion casino", Time Magazine (2005, Asian Edition) reports of "China's market maladies", and The Economist (2005c) characterizes the stock markets as "marginalized". Nonetheless, it is still widely conjectured that financial sector reform is crucial to China's sustainable long-term growth.

This study uses a time series methodology to sort out statistically where the most plausible links between banks, the financial markets, and the real sector can be found over this recent period of rapid change. To do this, we provide some background in Section 2 on how traditional views of the finance–growth relationship might apply to the Chinese economy. Section 3 describes our data sources and methodology, while Section 4 presents the empirical findings. We draw together our conclusions in Section 5.

2. Banks, stock markets and China's economic performance

The strength and direction of linkages between the financial and real sectors have become topics of renewed interest among macro and development economists since King and Levine

[1] See, for example, Prasad (2005).

[2] These figures were calculated using data from the *China Statistical Yearbook 2005* and the official website of China Securities Regulatory Commission: http://www.csrc.gov.cn.

(1993) published their path-breaking study of a cross-section of 120 developed and emerging economies covering the period from 1960 to 1989. Levine (2005) surveys the vast literature that has followed. Among these are several contributions that explore the roles that banks and stock markets, both independently and jointly, play in the growth process. Boyd and Smith (1998), for example, develop an endogenous growth model in which the unique functions of equity markets, such as the provision of immediacy and liquidity, allow them to complement debt markets in mobilizing and allocating resources. Levine and Zervos (1998) explore this complementarity in a series of cross-country regressions of growth on measures of banking and stock market development, concluding that "financial markets provide important services for growth and stock markets provide different services from banks." Rousseau and Wachtel (2000) note that, among other functions, equity markets provide investors and entrepreneurs with a potential exit mechanism, which in turn promotes venture capital investments and technological innovations, and produce information that improves the efficiency of financial intermediation generally.

There are other economists, however, who emphasize what seem to be inherent weaknesses of stock markets. For example, Singh (1997) notes that share prices in emerging markets fluctuate more than those in well-developed ones, and contends that higher volatility discourages participation by risk-averse savers and investors while encouraging speculation. He points out that in many developing countries the emergence of a stock market is not "an evolutionary response to market forces" but is rather an expansion in which "governments play a major proactive role." This implies that firms in developing countries may not strictly follow the standard "pecking order" of corporate finance, and that a generalized multi-country approach to studying the relationship between banks, stock markets and growth may not tell the full story of how finance may matter for growth in individual countries. Since China is a transition economy in which the government has been proactive in developing the stock market, focusing on this nation's unique experiences may yield insights into the nature of the finance–growth link that differ in some important respects from the traditional ones.

China's financial sector consists of banks, non-bank financial institutions (such as the People's Insurance Company of China) and stock markets. By the end of the 1990s, the banking system included a central bank (the People's Bank of China), four major state-owned commercial banks, three policy banks (the State Development Bank, the Export and Import Bank, and the Agricultural Development Bank), two commercial banks (the Bank of Communications and the CITIC Industrial Bank), twelve joint stock banks, and the city commercial banks. The banking system had always been at the center of enterprise finance, especially for state-owned enterprises, but the government began to alter this position through the development of stock markets. These markets went through a formative period in the late 1970s, and more formal structures (e.g., stock exchanges, corporate laws, and regulatory mechanisms) emerged in the early 1990s. These were followed by additional reforms in the aftermath of the 1997 East Asian crisis (OECD, 2002).

The Chinese government encouraged the development of stock markets in order to mobilize savings and to provide an alternative to the costs of lodging large stocks of household savings in banks. Tong (1999) notes a sharp rise in household savings in the 1990s, and attributes it to the limited choices of personal investments available to individuals as well as the lack of an effective social security system. High savings rates are seen as potentially problematical because they increase the chances that a sharp inflation will trigger deposit withdrawals and lead to a liquidity crisis, as it did in 1988, and thereby cause a decline in long-term investment and slower economic growth. Lan (1997) suggests that these excess bank savings may even put pressure on inflation itself, while Rousseau and Wachtel (2002) find that high inflation rates may counteract the positive effects of financial development on economic growth. China has seen several inflationary

episodes since the start of reforms in the late 1970s, including increases in the consumer price index of 18.7% in 1988 and 24.2% in 1994. In such a climate, stock markets can be viewed as vehicles for hedging against inflation.

One can also trace the establishment of China's stock markets to the government's view that well-functioning exchanges are needed to facilitate the successful restructuring of unprofitable state-owned enterprises (SOEs) (Mookerjee and Yu, 1999). By attracting funds and technologies from both domestic and foreign sources, it was hoped that stock markets would render SOEs less dependent on subsidized state loans and expose them to the discipline of the market, which in turn would improve corporate governance, firm performance, and the economic growth more generally. One improvement brought about by the emergence of the exchanges was the requirement that a firm release a prospectus according to broadly accepted international accounting practices before listing. The Chinese authorities have also adopted a rigorous disclosure policy for corporate information. In 1998, China promulgated the *China Securities Law*[3], which is an important component of the regulatory structure of the stock market, and is a way to discipline the operations of SOEs.

Despite the original good intentions of the Chinese government in developing stock markets, many of the benefits described above have not materialized. Zhang and Zhang (2001) show, for example, that in 1996, total losses by industrial SOEs were a hefty 79 billion yuan, compared to only 4.2 billion yuan in 1978. The losses were absorbed mainly by government subsidies and loans from the state banks. A battery of empirical tests of the efficient market hypothesis conducted by Mookerjee and Yu (1999) show that "there are significant inefficiencies present in both exchanges (Shanghai and Shenzhen)." Among these are price distortions resulting from the state's holding of nearly two-thirds of all listed shares. Indeed, when the government attempts to sell off blocks of shares for some of their often low-profit or losing state-owned enterprises, as it did in May of 2005, the market seems unable to attract the foreign and domestic investors needed to absorb them without dramatic downward price movements. There are also still widespread instances of insider trading and fraud. Du and Wei (2004) show, for example, that if insider trading in the United States were to increase to levels currently found in China, market volatility would rise by 250 basis points.

In light of the theoretical benefits of having stock markets and the actual difficulties experienced by China in developing them, we proceed to a more formal econometric investigation of their net effects, or more specifically, we ask whether banks, markets, or both have contributed to economic growth in China over the past decade.

3. Data and methodology

The passage of time and a steady inflow of more reliable data from China's financial sector now make it possible to examine possible links between financial factors and real activity for this transition economy using recent time series techniques. The methodology is useful for evaluating questions of statistical causation within a single country, and offers an alternative to cross-country studies where the econometric identification comes primarily from between-country variation in the data (e.g., Levine and Zervos, 1998; Rousseau and Wachtel, 2000). Given that several recent studies (e.g., Rioja and Valev, 2004; Kassimatis and Spyrous, 2001; Demetriades and Hussein, 1996) have argued against a "one-size-fits-all" approach to understanding the finance-growth

[3] The law is available at: http://www.csrc.gov.cn.

nexus, turning to single country analyses may add usefully to the information set available to those charged with formulating policy.

The variables that we consider are: 1) banking sector development as measured by the value of domestic credit; (2) stock market development as measured by size (total market value of outstanding shares or the number of listed firms) and activity (total market value of shares traded); and (3) real economic performance as measured by the value of GDP or fixed investment. We describe each in turn.

Domestic credit includes all claims on the government and the private sector held by China's banks, and as such reflects the size of the most important institutions in the intermediating sector. Since claims on the government include loans to SOEs and other government-directed investments, it does not isolate the extent of intermediation occurring for the private sector, even though the effects of finance on growth might be strongest there. Nonetheless, a large banking sector can operate at lower cost through the development of expertise and information networks that allow both private and quasi-public borrowers to be more carefully screened. When high return investments involve both large scale economies and large startup costs, as often occurs when adopting new technologies, a deep banking sector can also more easily deliver the funding necessary to overcome project indivisibilities. The diversified portfolio holdings afforded by larger banks also encourage them to avoid safe but low return projects that would contribute less to growth.

In terms of the baseline two-factor Solow growth model, we can think of intermediaries as promoting the accumulation of capital while also increasing the productivity of labor, leading to an outward shift and movement along the aggregate production isoquant. This implies higher levels of output and usually higher steady state growth rates. For these reasons, we believe that any study attempting to uncover the effects of growing stock market sophistication on real outcomes must take the traditional intermediating (i.e., banking) sector into account as a control.

Market capitalization is the product of share price and the number of shares outstanding for all stocks traded on China's two major exchanges, and should reflect the importance of financing through equity issues in the capital mobilization and resource allocation processes. To the extent that a deep stock market can absorb new issues at prices that reflect the intrinsic values of the underlying pre-IPO investments, the presence of a stock market can encourage entrepreneurship generally and thus have real effects that reach beyond those firms that are formally listed.

Total value traded is the product of market price and the number of shares traded, and as such contains components of both liquidity and size. Increases in liquidity are particularly important in emerging markets since they raise the confidence of both individual and portfolio investors in the values of information and risk diversification associated with trading on an organized exchange. This facilitates the transfer of surpluses from the short to long-term capital market and encourages the inflow of venture capital, which ultimately promote growth in the number of firms and shares available to investors. If investments with longer gestation periods are ones that tend to achieve the best outcomes, these transfers are growth-enhancing. With its emphasis on liquidity and its interaction with market size, total value traded is probably a better measure of stock market development than capitalization alone, even though it also tends to react to market shocks and to the extent of merger activity.

The number of listed securities, being unaffected directly by share prices, captures the size of the stock market in "real" terms, but also presents a few conceptual problems. In particular, when two listed firms merge in China, both retain their listing on the stock market, causing the aggregate count to overstate the actual number of business concerns. This measure is also

Table 1
Augmented Dickey–Fuller statistics

	Level	1st difference
Gross domestic product	−2.74	−3.88*
Fixed investment	−2.45	−5.10*
Total domestic credit	−3.02	−2.82
Stock market capitalization	−2.03	−4.13*
Number of listed firms	−3.02	−3.78*
Value of listed stock trades	−2.58	−3.62*

Note: The number of listed firms is expressed as the number per billion persons. All other variables are in per capita terms, with deflation by the consumer price index. The log transformation is applied to all of the series before estimating the ADF regression, which includes a constant, linear time trend and three lag differences of the variable of interest. An asterisk represents statistical significance at the 5% level.

influenced by regulation and competitive factors that would be less clearly linked to investment and output.

Despite the limitations associated with each of our three measures of stock market development, we believe that an informative view of how stock markets have so far affected China's aggregate (i.e., stock market and non-stock market) economy can be obtained from working with all three. Indeed, if stock markets are able to mobilize funds that would be otherwise less productive and channel them to innovative, high-quality projects in the long-term capital market, new placements should pay off in the form of higher levels of investment and output per capita.

Our study uses quarterly data from 1995:Q1 through 2005:Q1. Gross domestic fixed investment is from the National Bureau of Statistics of China's (1995–2005a) *China Monthly Statistics*, GDP is from the Economist Intelligence Unit Database (2005), domestic credit is from the IMF's *International Financial Statistics*, and population and the consumer price index are from the National Bureau of Statistics of China's (1995–2005b) *China Statistical Yearbook*. The quarterly stock market data for 1998–2005 are from the China Securities Regulatory Commission (www.csrc.gov.cn), and we join these with data for 1995–1997 from the China Stock Market and Accounting Research (CSMAR) database developed by Shenzhen GTA Information Technology Co. Ltd. (2005). We transform all variables into real per capita terms using the consumer price index (CPI), take logs, and then adjust investment, GDP, and domestic credit for seasonality by regressing each on quarterly dummy variables.

To evaluate possible causal links between banks, stock markets, and real activity, we follow Rousseau and Wachtel (1998) and estimate a series of tri-variate vector autoregressive (VAR) systems of the form:

$$x_{1,t} = a_{1,0} + \sum_{i=1}^{k} a_{1,i}x_{1,t-i} + \sum_{i=1}^{k} b_{1,i}x_{2,t-i} + \sum_{i=1}^{k} c_{1,i}x_{3,t-i} + \mu_{1,t} \quad (1a)$$

$$x_{2,t} = a_{2,0} + \sum_{i=1}^{k} a_{2,i}x_{1,t-i} + \sum_{i=1}^{k} b_{2,i}x_{2,t-i} + \sum_{i=1}^{k} c_{2,i}x_{3,t-i} + \mu_{2,t} \quad (1b)$$

$$x_{3,t} = a_{3,0} + \sum_{i=1}^{k} a_{3,i}x_{1,t-i} + \sum_{i=1}^{k} b_{3,i}x_{2,t-i} + \sum_{i=1}^{k} c_{3,i}x_{3,t-i} + \mu_{3,t} \quad (1c)$$

Table 2
Johansen tests for cointegration

System	Maximum eigenvalue		Trace		
	$r=0$	$r<=1$	$r=0$	$r<=1$	$r<=2$
GDP, domestic credit, and					
Market capitalization	23.14*	10.74	35.77*	12.63	1.89
No. listed firms	25.00*	13.38	40.95*	15.96*	2.58
Value of trades	21.15*	7.94	31.65*	10.49	2.55
Investment, domestic credit and					
Market capitalization	19.97*	15.53*	35.54*	15.57*	0.04
No. of listed firms	22.86*	16.22*	39.73*	16.87*	0.65
Value of trades	21.05*	15.68*	37.87*	16.81*	1.13

Note: The columns labeled $r=0$ test a null hypothesis of no cointegration, while the $r\leq 1$ ($r\leq 2$) columns test a null of a least one (two) cointegrating vectors. * represents statistical significance at the 5% level.

where x_1 is fixed investment or GDP, x_2 is domestic credit, and x_3 is one of our measures of stock market development.

Before proceeding with the estimation, it is important to ensure that test statistics for block exclusion (i.e., Granger-causality) in these systems conform to standard distributions. This amounts to determining whether the variables in the systems that we consider have unit roots, and if so, whether they are cointegrated. If there is a single cointegrating vector, Sims et al. (1990) show in the tri-variate case that the asymptotic distribution of the Wald test for Granger-causality is chi-square, making levels VARs appropriate for inference. If there are possibly two cointegrating vectors, Toda and Yamamoto (1995) show that tests for block exclusion remain chi-square distributed when an additional lag is added to the VAR structure but not used when constructing the Granger causality test.

4. Econometric findings

When we compute augmented Dickey–Fuller (ADF) tests for all of our series using specifications with a constant, trend, and three lag differences, the first column of Table 1 shows that the null hypothesis of a unit root cannot be rejected for any of the series in levels, while the second column shows that we can reject it for five of the six series after differencing (the 5% asymptotic critical value for this form of the ADF test is − 3.45).[4] Based on these tests, it is reasonable to proceed under the assumption that all data series are integrated of order one.

Table 2 shows the trace and maximum eigenvalue statistics from Johansen (1991) cointegration tests for each of the six VAR systems that we consider. A series of nested likelihood ratio tests select a lag order of three for each system, and trends in the data suggest the inclusion of an unrestricted intercept in the short-run component of the model. Since the columns labeled $r=0$ reject the null hypothesis of no cointegration (i.e., that the rank of the coefficient matrix on the long-run component of the model is zero) at the 5% level or less for all six systems and both test statistics, we consider next the columns labeled $r\leq 1$. For the systems with GDP as the measure of real activity, we find that at least one of the tests fails to reject the null hypothesis that $r\leq 1$. This

[4] The Akaike information criterion (AIC) selects two lags in all cases. We choose three lags in the test regressions because Schwert (1989) has shown that ADF tests tend to over-reject the null of a unit root in small samples when the AIC is used and that the loss of power from the extra lag is generally small. The Phillips and Perron (1988) test for unit roots yielded similar inferences regarding the non-stationarity of our data.

Table 3
Estimates for VARs with GDP, credit and stock market indicators

Stock market indicator	Levels tests for Granger non-causality				
Lags $K=3$	Eq.	GDP	Credit	Stock	R^2
Market capitalization	(1a)	0.466(0.012)	0.295(0.006)	−0.036(0.264)	0.977
	(1b)	−0.113(0.867)	1.024(0.000)	−0.011(0.465)	0.996
	(1c)	0.719(0.167)	−0.341(0.409)	0.866(0.000)	0.968
No. of listed firms	(1a)	0.426(0.019)	0.361(0.002)	−0.124(0.129)	0.979
	(1b)	−0.108(0.935)	1.030(0.000)	−0.015(0.853)	0.995
	(1c)	0.030(0.104)	−0.067(0.057)	0.881(0.000)	0.997
Value of trades	(1a)	0.485(0.011)	0.244(0.022)	−0.008(0.931)	0.974
	(1b)	−0.073(0.910)	1.010(0.000)	−0.013(0.737)	0.995
	(1c)	2.598(0.076)	−1.054(0.721)	0.398(0.223)	0.552

Note: The VAR systems include three lags of GDP, domestic credit, and the stock market indicator listed in the left column. The equation numbers correspond to those in the text, with (1a), (1b) and (1c) using GDP, domestic credit and the stock market indicator named in the left column as the respective dependent variables. The table reports the sum of the regression coefficients for each variable block with the significance level of the *F*-test for Granger non-causality in parentheses.

implies the presence of a single cointegrating relationship. For the systems that replace GDP with domestic fixed investment, we reject the null that $r \leq 1$ but do not reject that $r \leq 2$. This suggests that there are two cointegrating relationships.

Based on the Johansen tests and the findings of Sims, Stock, and Watson (1990), which show that block exogeneity tests on the coefficients from cointegrated tri-variate VAR systems conform to the standard chi-square distribution, we proceed to estimate VARs in levels with three lags for the systems with GDP. The results appear in Table 3, which reports the sum of the regression coefficients for each variable block in Eqs. (1a), (1b), and (1c), with the *p*-value of the *F*-test for Granger non-causality in parentheses. In all three systems (i.e., regardless of the stock market indicator chosen), our measure of banking development Granger-causes GDP at the 5% level or less with a positive sum of the regression coefficients (see for example, the *p*-value of 0.006 for the block that includes lags of domestic credit in the first row of the table), while GDP does not

Table 4
Estimates for VARs with investment, credit and stock market indicators

Stock market indicator	Levels tests for Granger non-causality				
Lags $K+1=4$	Eq.	Investment	Credit	Stock	R^2
Market capitalization	(1a)	0.586(0.521)	0.600(0.012)	−0.066(0.812)	0.957
	(1b)	0.084(0.805)	0.855(0.000)	−0.005(0.514)	0.995
	(1c)	0.132(0.613)	−0.210(0.870)	0.896(0.000)	0.971
No. of listed firms	(1a)	0.461(0.291)	0.768(0.007)	−0.132(0.245)	0.959
	(1b)	0.084(0.830)	0.862(0.000)	−0.003(0.847)	0.995
	(1c)	−0.006(0.635)	0.046(0.127)	0.908(0.000)	0.995
Value of trades	(1a)	0.591(0.375)	0.534(0.004)	−0.047(0.239)	0.960
	(1b)	0.075(0.824)	0.884(0.000)	−0.013(0.754)	0.995
	(1c)	−0.346(0.380)	0.541(0.748)	0.506(0.055)	0.408

Note: See note for Table 3. The VARs include four ($K+1$) lags of each variable. Granger-causality tests are computed using the first *K* lags as described by Toda and Yamamoto (1995).

Table 5
Percent of variance explained by the credit variable

	Decomposition of GDP			Decomposition of investment		
	4 quarters	8 quarters	12 quarters	4 quarters	8 quarters	12 quarters
Variable ordering: credit, stock market indicator, GDP or investment						
Capitalization	17.52	36.32	46.80	9.52	17.38	21.66
No. of listed firms	21.13	50.32	59.89	10.73	17.22	22.00
Value of trades	16.51	33.23	43.43	11.07	19.18	23.80
Variable ordering: GDP or investment, stock market indicator, credit						
Capitalization	7.87	25.91	40.06	4.62	9.83	12.86
No. of listed firms	9.56	39.24	52.28	6.72	10.84	14.16
Value of trades	6.51	20.22	29.74	4.91	8.69	11.00

Note: The table shows the percent of GDP and investment attributable to bank credit in the tri-variate VAR systems at time horizons of 4, 8 and 12 quarters. In the upper panel, we place the Credit variable first, the stock market variable second, and the measure of real activity last. We reverse this ordering in the lower panel.

Granger-cause banking development. (see, for example, the *p*-value of 0.867 for the block that includes lags of GDP in the credit Eq. (1b) in the second row of the table). At the same time, the measures of stock market development do not Granger-cause output, though there is evidence of small positive effects from output to stock market development.

We report results for the three VARs with fixed investment as the measure of real activity in Table 4. Since these systems may be characterized as having two cointegrating vectors, we apply the technique proposed by Toda and Yamamoto (1995), which calls for using four (i.e., $K+1$) lags in the VARs while computing the block exclusion tests using only the first three (i.e., K) lags. Similar to the systems with GDP, we find that domestic credit Granger-causes investment, and that there is no feedback from investment to domestic credit. At the same time, there is no apparent relationship from any of the stock market indicators to investment.

In Table 5, we report the percentage of the variance in output and investment that can be attributed to bank credit in the VAR systems. When we order credit first, the stock market indicator second, and output or investment last in the upper panel, as the Granger causality tests suggest, we find that innovations in bank credit explain more than 40% of the variance in output after 12 quarters regardless of the stock market measure chosen, while credit explains more than 20% of domestic fixed investment. When we reverse the ordering in the lower panel as a

Table 6
Percent of variance explained by stock market indicators

	Decomposition of GDP			Decomposition of Investment		
	4 quarters	8 quarters	12 quarters	4 quarters	8 quarters	12 quarters
Variable ordering: stock market indicator, credit, GDP or investment						
Capitalization	13.91	24.12	23.35	6.01	10.91	13.83
No. of listed firms	9.88	11.30	10.81	7.43	7.72	8.53
Value of trades	3.81	12.16	16.38	9.84	14.36	17.68
Variable ordering: GDP or investment, credit, stock market indicator						
Capitalization	5.17	13.31	13.83	0.89	3.87	5.84
No. of Listed Firms	3.67	4.37	4.12	4.30	4.26	4.49
Value of Trades	0.79	3.04	3.95	6.21	7.74	9.16

See note to Table 5.

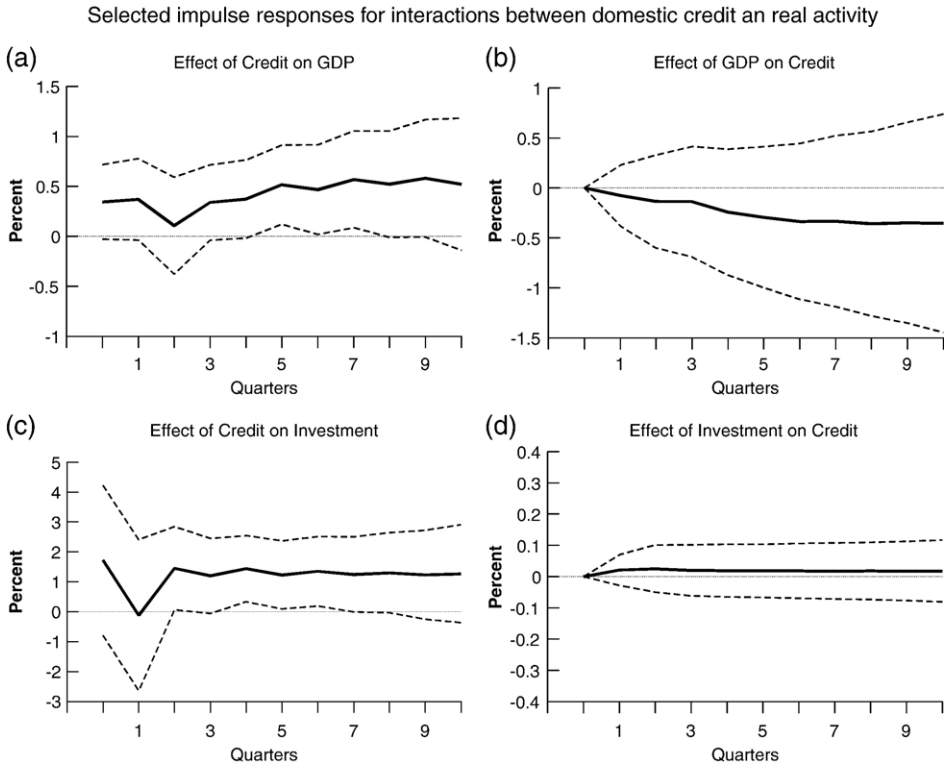

Fig. 1. Note: Panels (a) and (b) show impulse responses from the tri-variate system with GDP, domestic credit, and stock market capitalization, which corresponds to the upper panel of Table 3. Panels (c) and (d) correspond to the system with investment, domestic credit, and market capitalization shown in the upper panel of Table 4. In all cases the responses cover ten-quarter horizons, and order domestic credit first, market development second, and GDP or investment third, though the results are not particularly sensitive to this choice. Using Monte Carlo integration, the thick lines show the mean responses that result from 10,000 random draws from the posterior distribution of the VAR coefficients. The dotted lines are two standard error bands.

robustness check, the explanatory power of bank credit is lessened but still considerable for both real sector variables. In contrast, when we report the percent of variance in output and investment that can be attributed to each of the three measures of stock market development in Table 6, we find that even when we order the stock market variables first (upper panel), they never explain more than 25% of the variance in output after 12 months, and only about 15% of the variance in investment. The effects are considerably diminished when we reverse the orderings in the lower panel of Table 6. All of this suggests that the effects of stock market development on recent activity in the broadly-defined real sector are likely to have been small.

Some of the more interesting effects between domestic credit and real activity (generated using the systems with capitalization as the measure of stock market development) are traced out with the impulse responses in Fig. 1.[5] Panel (a) indicates that a 1% shock to the orthogonalized innovation to domestic credit raises per capita output by nearly 0.6% after six quarters, with the lower two-standard-error band crossing the horizontal axis after one year. Panel (c) shows that a 1% shock to

[5] Impulse response functions generated with our alternative measures of stock market development were quite similar to those obtained in Fig. 1, and are not reported here.

credit raises per capita investment by about 1.4% after two quarters, and that these effects are persistent. Panels (b) and (d) show that 1% shocks to output and investment do not generate responses in domestic credit for which the two standard error bands cross the horizontal axes of the diagrams.

5. Conclusion

To identify statistically causal relationships between China's banks, financial markets, and real sector, we examine quarterly data from 1995 to 2005 and estimate cointegrated VARs that include measures of the extent of bank credit, stock market activity, and GDP or fixed investment. Tests for Granger non-causation, variance decompositions, and impulse response functions indicate that increases in the size and sophistication of China's banking sector had positive and significant effects on both output and fixed investment, yet stock market development did not.

The results for stock markets are perhaps surprising given that the government intended to use them to mobilize household savings and channel it into capital accumulation, and to bring state-owned enterprises under presumably more efficient public monitoring and quasi-private control. On the other hand, using a similar empirical approach, Arestis et al. (2001) show that in *developed* economies (US, UK, Japan, Germany, and France), the positive effects of banking sector development on economic growth are much greater than those of stock market development. Our results show that this is also the case for China, a *developing* country. Further research of this type for other countries might shed important light on the types of economic environments in which this finding might hold more generally.

At the same time, there is reason to believe that the positive effects of stock markets pointed to by economic theory might take some time to appear in China's broad macroeconomic aggregates. For one, while the equity market is indeed growing rapidly in China, the majority of economic activity still occurs outside of the "stock market economy." This means that measures of stock market size and liquidity, which are directly influenced by the level of listings and de-listings and the expected earnings of the economy that the stock market represents, may not be a good representation of the overall economy. This argues for exercising some caution in interpreting our results.

Despite these caveats, the great recent successes of China's economy seem to have so far occurred in the face of an under-utilization of its stock markets. To reap more fully the potential economy-wide gains of intermediation through these markets, it may take more time for China to improve their liquidity. Strict enforcement of securities laws and exchange regulations could be the next important step towards this goal.

References

Arestis, P., Demetriades, P.O., Luintel, K.B., 2001. Financial development and economic growth: the role of stock markets. Journal of Money, Credit and Banking 33, 16–41.

Boyd, J., Smith, B.D., 1998. The evolution of debt and equity markets in economic development. Economic Theory 12, 519–560.

Chen, X., Skully, M., Brown, K., 2005. Banking efficiency in China: application of DEA to pre- and post-deregulation eras, 1993–2000. China Economic Review 16, 229–245.

Demetriades, P., Hussein, K., 1996. Does financial development cause economic growth? Time-series evidence from 16 countries. Journal of Development Economics 51, 387–411.

Du, J., Wei, S.J., 2004. Does insider trading raise market volatility? Economic Journal 114, 916–942.

Economist Intelligence Unit, London, 2005. The Economist Intelligence Unit Database.

Forbes Magazine, 2001. China's $600 Billion Casino. Forbes Inc., New York. Oct. 1.

International Monetary Fund, 2005. International Financial Statistics Database.
Johansen, S., 1991. Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. Econometrica 59, 1551–1580.
Kassimatis, K., Spyrous, S., 2001. Stock and credit market expansion and economic development in emerging markets: further evidence utilizing cointegration analysis. Applied Economics 33, 1057–1064.
King, R., Levine, R.G., 1993. Finance and growth: Schumpeter might be right. Quarterly Journal of Economics 108, 681–737.
Lan, Y., 1997. The stock market in China: problems and prospects for domestic and foreign investment. Working paper, Chinese Economies Research Center, University of Adelaide.
Levine, R., 2005. Finance and growth: theory and evidence. In: Aghion, P., Durlauf, S. (Eds.), Handbook of Economic Growth. Elsevier Science, New York.
Levine, R., Zervos, S., 1998. Stock markets, banks, and economic growth. American Economic Review 88, 537–558.
Mookerjee, R., Yu, Q., 1999. An empirical analysis of the equity markets in China. Review of Financial Economics 8, 41–60.
National Bureau of Statistics of China, 1995–2005, China Statistical Yearbook.
National Bureau of Statistics of China, 1995–2005, China Monthly Statistics.
Organization for Economic Cooperation and Development, 2002. China in the World Economy: an OECD Economic and Statistical Survey. Paris, France.
Organization for Economic Cooperation and Development, 2005. Economic Survey of China.
Prasad, E.S., 2005. Next steps for China — why financial sector reform is a crucial element of a long-term growth strategy. Finance and Development: A Quarterly Magazine of the IMF 42 (3), 44–47.
Phillips, P.C.B., Perron, P., 1988. Testing for a unit root in time series regression. Biometrika 57, 1361–1401.
Rioja, F., Valev, N., 2004. Does one size fit all? A reexamination of the finance and growth relationship. Journal of Development Economics 74, 429–447.
Rousseau, P.L., Wachtel, P., 1998. Financial intermediation and economic performance: historical evidence from five industrialized economies. Journal of Money, Credit and Banking 30, 657–678.
Rousseau, P.L., Wachtel, P., 2000. Equity markets and growth: cross-country evidence on timing and outcomes, 1980–1995. Journal of Banking and Finance 24, 1933–1957.
Rousseau, P.L., Wachtel, P., 2002. Inflation thresholds and the finance–growth nexus. Journal of International Money and Finance 21, 777–793.
Schwert, G.W., 1989. Tests for unit roots: Monte Carlo investigation. Journal of Business and Economic Statistics 7, 147–159.
Shenzhen GTA Information Technology Co. Ltd., 2005. China Stock Market and Accounting Research (CSMAR) Database.
Sims, C.A., Stock, J.H., Watson, M.W., 1990. Inference in time series models with some unit roots. Econometrica 58, 113–144.
Singh, A., 1997. Financial liberalization, stock markets and economic development. Economic Journal 107, 771–782.
The Economist, 2005a. The Real Great Leap Forward. Economist Inc, London. Sep. 1.
The Economist, 2005b. A Model of Reform. Economist Inc, London. Sep. 30.
The Economist, 2005c. China's Stock Market — A Marginalized Market. Economist Inc, London. Feb. 24.
Time Magazine, 2005. China's Market Maladies. Time Inc., New York. Feb. 7.
Toda, H.Y., Yamamoto, T., 1995. Statistical inference in vector autoregressions with possibly integrated processes. Journal of Econometrics 66, 225–250.
Tong, D., 1999. The heart of economic reform: China's banking reform and state enterprise restructuring. PhD Dissertation, Rand Graduate School.
Zhang, A., Zhang, Y., 2001. Impact of ownership and competition on the productivity of Chinese enterprises. Journal of Comparative Economics 29, 327–346.