Regional Financial Development Scale, Structure, Efficiency and Economic Growth: A Dynamic Analysis

DENG Qizhong[1,*]; SHEN Jianfu[2]; CHEN Rui[2]

[1]Lecture, School of Management, Hunan University of Science and Technology, Xiangtan 411201, China
[2]PH.D Candidate, Department of Real Estate & Construction, University of Hong Kong, HKSAR
*Corresponding author.
Email:dqzdesertsea@163.com

Abstract

With the panel data in 29 provinces and cities in China from 1991 to 2007, this paper applies the dynamic panel data model to empirically explore the relationships between financial development scale, structure, efficiency and economic growth. The results show that after controlling other factors, financial scale has significantly positive impact on economic growth in middle and western regions but negative in eastern region; while financial structure and efficiency exhibit significantly positive effects only in eastern region. This paper then adopts the model of panel data VAR to investigate the causality relationships between them. It finds that the "demand-following" phenomenon between financial development and economic growth occurs in eastern region, the "supply-leading" phenomenon happens in western region, and yet the middle region shows no obvious pattern of financial development.

Key words: Financial scale; Financial structure; Financial efficiency; Economic growth

INTRODUCTION

After the reform and opening up, the economy in China grows rapidly in thirty years. It is a puzzle, however, that the financial development in China lags far behind world. Yet the relationships between financial development and economic growth have already been studied in a large amount of research. Applying various econometric methods to empirically study some countries and regions, some economists argue that financial development is positively related to economic growth; the higher the level of regional economic growth, the higher the level of financial development. Nevertheless, the imbalances of economic growth and financial development coexist in China and the financial imbalance in the regions is more severe than the imbalance of economic growth, even though most economists emphasize the important role of financial development in promoting the economic growth. Then we wonder that, under the different economic and financial condition, how do the financial scale, efficiency and structure contribute for the financial development? Do they have consistent correlations and causality with economic growth? This paper tries to address these problems. We expect to discover the relationships between financial development and economic growth through investigating the regional differences between them; and we also expect to find out the explicit evidences to support the argument that the financial development influences economic growth, which help us understand the nature and importance of financial reforms.

This paper uses the method of dynamic panel data to remove the endogeneity in empirical regression and test correlation and causality relationships between financial development scale, structure, efficiency and economic growth. This paper is organized as following: the section two reviews the literature of financial development and economic growth; section three runs empirical analysis between the financial development and economic

growth in China based on three key ratios in financial development; the results and implications are presented in section four.

1. LITERATURE REVIEW

Since 1960, economists have already explored the relationships between financial development and economic growth. Theoretically, Patrick (1966) proposes the famous Patrick hypothesis: the growth of financial system is supply-leading in developing countries, which stimulates the entrepreneurial response to modern financial sectors; the evolutionary development of financial system in developed countries, however, is demand-following, which responds to the demand of its services in real economy. In following studies, Goldsmith (1969) extends the arguments of Patrick and stresses on that the financial development has essentially positive and active effects on economic growth, although it is difficult to identify whether it is the finance promotes economic growth, or the financial development is the response of the growth in economy stimulated by other factors. Consequently, the studies like McKinnon (1973) and Shaw (1973) also point out that in theory the development of financial system play important role in economic growth. There could be some causality between these two.

Beside theoretical exploration, economists also empirically investigate the relationships between the growths of finance and real economy. Norman (2002) uses panel data in 74 countries from 1960 to 1995 and builds dynamic regression models to study these relationships. His results confirm that in the countries once experiencing financial crisis, the promotion of financial development to economic growth is less pronounced than its impact in countries without financial crisis. The development of financial intermediary is negatively associated with economic growth in short term, and while positively in long term. With the quarterly data from 1981 to 2002, Wang and Sun (2003) adopt the vector error correction model and Granger causality test to analyze the relationship between finance and real sectors. They reveal bidirectional causality relations between them and argue that financial development simulates economic growth and meanwhile the latter promotes the former as well. Yet Sun (2007) empirically investigates the causality in different time horizons. His findings indicates that in the short run, economic growth stimulate financial development and yet financial development has no significant impact on economic growth; in the long run, financial development causes the growth of economy through the channels of efficient resource allocation, capital accumulation and technology improvement.

Our paper is different from previous researches. First, this paper adopts data at the province level to empirically study the factors of financial development and the regional differences of economy growth in China, other than most existing studies that only depend on data at aggregate level. The second difference is that we use dynamic panel data model to solve the endogeneity problem in explanation variables, leading to more reliable regression results. Third, the financial development is decomposed into three components as scale, structure and efficiency, which makes the investigation on the relationships between financial development and economic growth more reasonable and efficient.

2. EMPIRICAL ANALYSIS

2.1 The Specification of Empirical Model
One period lagged GDP per capita is taken as independent variable in the equations in this paper. We build dynamic panel data models for financial scale, structure, efficiency and economic growth in eastern, middle and western regions respectively, as following,

$$LNGDPP_{j,it} = \alpha_j + LNGDPP_{j,it-1} + LNFSC_{j,it} + LNFST_{j,it} + LNFEF_{j,it} + \varepsilon_{j,it}$$
(1)

Where $j = 1, 2, 3$ represent eastern, middle and western regions, i denotes the provinces and cities in the model, t is the indicator of year, and α_j is intercept. $GDPP_{it}$ represents GDP per capita in the province i at year t. FSC_{it}, FST_{it} and FEF_{it} respectively denote financial scale, financial structure and financial efficiency in the province at year .

2.2 Unit Root and Co-Integration Tests
The unit root tests are run to detect whether the regressions contain the variables of constant and trend. The results show that LNFSC, LNFST, LNFEF and LNGDPP all contain constant variables, but do not have trend variables. Based on this finding, only some variables in the eastern, middle and western regions are stationary under the LLC test. Under the first order differential sequence, all variables are stationary at 1% significance level. Hence, the variables in three regions follow the I(1) process and co-integration requirement is satisfied in the econometric model.

Co-integration test in panel data mainly has two cases: the first is that under the null hypothesis of zero co-integration, the stationary regression function in Engle and Granger is run, in which the residuals from panel data are taken as statistics to test the hypothesis, for instance, as the studies of Kao (1999) and Pedroni (1999); the other method is proposed by Johansen Fisher (1990) based on the maximum likelihood ratio. All these three methods are employed to test the co-integration between regional financial development (measured by scale, structure and efficiency respectively) and economic growth. The test results are listed in Table 1.

Table 1
Panel Co-Integration Tests Between Financial Scale, Structure, Efficiency and Economic Growth

Eastern Region				Middle Region				Western Region			
Between-dimension statistics		Within-dimension statistics		Between-dimension statistics		Within-dimension statistics		Between-dimension statistics		Within-dimension statistics	
Panel-v	-1.19	Group-rho	1.48	Panel-v	0.92	Group-rho	1.65	Panel-v	1.97**	Group-rho	2.49
Panel-rho	-0.01	Group-PP	-1.17*	Panel-rho	0.68	Group-PP	4.11***	Panel-rho	0.25	Group-PP	3.83***
Panel-PP	-1.23*	Group-ADF	-3.22***	Panel-PP	-2.49**	Group-ADF	-4.15***	Panel-PP	-13.5***	Group-ADF	-4.82***
Panel-ADF	-1.98*			Panel-ADF	-3.02***			Panel-AD	-10.2***		
Johansen Fisher Trace Test				Johansen Fisher Trace Test				Johansen Fisher Trace Test			
None			325***	None			176***	None			280.1***
At most 1			162.6***	At most 1			76.96***	At most 1			86.94***
At most 2			54.96***	At most 2			32.97***	At most 2			38.02***
Kao Test				Kao Test				Kao Test			
ADF			-1.8**	ADF			-2.99***	ADF			-3.42***

Note: 1. ***, ** and * stand for the rejection of null hypothesis at 1%, 5% and 10% significant level.

From the results in Table 1, we find that, except Panel-rho, Group-rho and Panel-v, other variables in three regions are all co-integrated in Pedroni tests. The Kao and Johansen tests also confirm these findings. It is concluded that financial scale, structure, efficiency and economic growth have consistent long-term trends and long-run equilibrium significantly exhibits in three regions.

2.3 Dynamic Panel Estimation

Because the lagged period dependent variables enter the regression equations as explanation variables, the explanation variables may correlate with random disturbance terms in dynamic panel data model. If the usual LSDV or FGLS methods are used to deal with panel data model, the regression coefficients would be biased and inconsistent even though the assumptions of independent error terms are satisfied, which may distort the economic implications from regressions. To solve the estimation problems in dynamic panel data model, this paper uses the one-step system GMM model, proposed by Arellano and Bover (1995) and Blundell and Bond (1998), to overcome the endogeneity problem of the lagged explanation variables in the regressions. The results are reported in Table 2.

Table 2
Dynamic Panel Estimations Between Financial Scale, Structure, Efficiency and Economic Growth

	Eastern Region	Middle Region	Western Region
Intercept	1.29***	2.4***	NA
Last Period Economic Growth	0.97***	0.76***	0.63***
Financial Scale	-0.35***	0.33***	0.83*
Financial Structure	0.13***	-0.009	-0.59*
Financial Efficiency	0.36***	-0.56***	-1.68*
Wald Test Value	3762.1***	7035.29***	15635.42***
Sargan-test	131.1(0.08)	123.52(0.11)	157.27(0.02)
AR(1)-test	-1.81(0.07)	-1.37(0.16)	-1.34(0.18)
AR(2)-test	-1.62(0.11)	1.06(0.29)	1.31(0.19)
Sample	187	136	170

Note: 1. In the table NA denotes that the regression function does not contain constant variables.
2. ***, ** and * stand for the rejection of null hypothesis at 1%, 5% and 10% significant level. The probabilities for tests are shown in the parentheses.
3. The null hypothesis for AR-test is that the residuals after differential order do not exist (if the residuals after difference exhibit first order serial correlation, system GMM is still effective. See the discussion in Roodman (2006)); the null hypothesis for Sargan-test is that over-identifying restrictions are efficient.

Firstly, the increase of 1 percent of economic growth in last period would lead to 0.95 (eastern), 0.76 (middle) and 0.64 (western) percent of the growth increase this year. The values for these coefficients are all significant at 1% level. This indicates that the economic growth last period has positive impact on the growth in this year. The coefficients in three regions show that: the better the regional economic base last period, the larger the economic growth this period. These results are consistent with the actual situations. If one region has better economic performance than others, it will be more likely to obtain good opportunities and policies to attract financial investments. Meanwhile the implications are also associated with the nature of capital flow: the large profits drive the middle and western capitals to the eastern which eventually results in higher economic growth in the eastern region.

Secondly, the coefficients of financial scale measure

its impacts on economic growth. They are negative in the eastern and yet significantly positive in the middle and western. The coefficients are largest in the western, smallest in the eastern and median in the middle at the absolute level. The enhancement of financial scale significantly promotes economic growth in middle and western regions: 1 percent increase of financial scale causes 0.33 and 0.83 percent increase of economic growth. For the eastern region, the coefficient is -0.35. In the absolute value, this number is almost the same as the one of the middle region, but it is far less than the one in the western. The implicit implication behind these results is that the enhancement of financial scale would play positive role in economic growth when the economy is initially at low state and its effect is more pronounced in stimulating economy than the ones of financial liberty and financial efficiency.

Thirdly, the coefficients of financial structure measure the contributions of financial liberty and competition to economic growth. As for the signs, only the number in the eastern region is positive. The coefficient in the middle is not only negative but also insignificant. The main reasons for negative coefficients are that in the middle and eastern regions marketization reform of financial system is still in its infancy now, the financial structure evolves inefficiently, and the powers of non-state financial institutions and non-financial institutions are relatively week. The situation that financial competition promotes the financial system does not appear in the middle and eastern regions. In the contrary, the competition generates negative impact on the middle and western regions where the enhancement of financial scale has been taken as main development strategy.

Finally, the financial efficiency reflects the impact of the improvement of financial capital allocation on economic growth. The coefficients for this variable are all significant in three regions. Financial efficiency plays positive role in economic growth in eastern region and the impact is largest as its coefficient is 0.36. However, for the middle and western regions, financial efficiency depresses the growth of economy, especially in the western region where its coefficient reaches negative 1.68. The negative coefficients reveal that the improvement of

financial efficiency, measured by the increasing ratio of loans over savings deposits, in turn prohibits economic growth in the middle and western regions. There exist negative correlations between these two variables. The explicit reasons are that the growths of financial efficiency in the middle and western regions have time lags and thus the marketization is not sufficient to exert the advantage of financial efficiency, which depress the economic growth. The implicit reason is that the quality of financial development does not improve much although financial scales in the middle and western regions substantially increase. The loans in bank sector are largely issued to state-owned entrepreneurs. Low efficiency in state-owned entrepreneurs leads to a large amount of non-performed loans in state-owned commercial banks. Hence although the loan scale is increasing in quantity all the time, the quality of financial efficiency does not improve and even turn worse. This situation causes real financial efficiency lower and depresses the growth of regional economy.

2.4 Panel Causality Test

Following the research of Hurlin and Venet (2001) , this paper applies the panel data Granger model to investigate the causality relations between financial scale, structure, efficiency and economic growth. Considering the stationary condition in Granger test, the application of OLS method would generate biased estimation. To fulfill the stationary requirement and remove the individual effect, it is better to make first order difference to each variable as like:

$$\Delta Y_{i,t} = \sum_{j=1}^{k} b_{1j} \Delta Y_{i,t-j} + \sum_{j=1}^{k} g_{1j} \Delta X_{i,t-j} + \Delta e_{i,t}$$

$$\Delta X_{i,t} = \sum_{j=1}^{k} b_{2j} \Delta Y_{i,t-j} + \sum_{j=1}^{k} g_{2j} \Delta X_{i,t-j} + \Delta u_{i,t}$$

(2)

Take GDP per capita and financial scale as examples: if γ_{1j} is not all zero, it indicates that financial scale Granger causes economic growth; if β_{2j} is not all zero, it shows that economic growth Granger causes financial scale; if neither γ_{1j} and β_{2j} are all zero, they reveal that there exists feedback effect between financial scale and economic growth. This paper adopts one-step GMM in Arellano and Bond (1991) to estimate the relationships. The results are shown in Table 3.

Table 3
Panel Causality Test of Financial scale, Structure, Efficiency and Economic Growth

Source of Causation	Joint Test	Eastern Region	Middle Region	Western Region
$LFSC \Rightarrow LGDPP$	$\gamma_{11} = \gamma_{12} = 0$	26.94***	4.07**	12.96***
$LGDPP \Rightarrow LFSC$	$\beta_{21} = \beta_{22} = 0$	5.70**	2.58	0.26
$LFST \Rightarrow LGDPP$	$\gamma_{11} = \gamma_{12} = 0$	0.02	0.22	6.61**
$LGDPP \Rightarrow LFST$	$\beta_{21} = \beta_{22} = 0$	21.2***	0.51	0.17
$LFEF \Rightarrow LGDPF$	$\gamma_{11} = \gamma_{12} = 0$	0.42	2.74	19.39***
$LGDPP \Rightarrow LFEF$	$\beta_{21} = \beta_{22} = 0$	3.89*	4.3*	15.84***

From the results in Table 3, it concludes at 10% significant level that we derive panel Granger causality relationships between financial scale, structure, efficiency and economic growth. In the eastern region, there exist bidirectional Granger causality relationships between economic growth and financial scale, which is the feedback effect. Economic growth Granger causes financial structure and financial efficiency. In the middle region, economic growth leads to financial efficiency in one-way causality and financial scale Granger causes economic growth. In the western region, financial structure and scale respectively Granger causes economic growth in one way; while financial efficiency and economic growth generate feedback effects.

These results confirm that on the one hand, the supply-leading approach in Patrick (1966) is supported in the western region, which means that when the economy is undeveloped, the financial development can stimulate the economic growth through its positive roles of saving increase (scale), risk management (structure perfection) and transaction facility (efficiency improvement); on the other hand, the demand-leading phenomenon is justified in the western region, indicating that the demand of new services caused by economic growth would in turn influence the development of finance as the economy grows to some level. When it occurs, financial development is then affiliated to economic growth. The growth of real sectors facilitates the evolution of financial systems. As the economy grows continually, it requires more and more diversified financial services and also higher efficient financial institutes to provide these services.

3. DISCUSSIONS AND CONCLUSIONS

This paper employs the panel data of China at province level from 1991 to 2007 to empirically explore its relationships between three factors in financial development (financial scale, structure and efficiency) and economic growth. Based on the estimation, test and analysis, it achieves the conclusions as follows:

Firstly, as for the regions, the coefficients for economic growth of one lagged period are 0.97 in the eastern, 0.76 in the middle and 0.63 in the western. These results reveal that the economic growth last period positively influence the growth this period all in the eastern, middle and western regions. The positive impacts are largest in the eastern, median in the middle and smallest in the western.

Secondly, financial scale, structure and efficiency in financial development have substantial effects on economic growth in China, but their effects are different in three regions. In the eastern region, considering the absolute values of the coefficients of three factors, the coefficient for financial efficiency is largest and follows by the scale and the structure. The positive coefficient

signs for financial structure and efficient indicate their positive impacts; while the sign for financial scale is negative as well as its effect. In the middle region, the financial scale shows significantly positive impact and the coefficient value is moderate. Although the coefficient of financial structure is negative, it is not significant in the dynamic function. The coefficient of financial efficiency is significantly negative and has largest absolute value in three factors. In western region, the scale has positive effect and this effect is most pronounced in three factors. And the structure and efficiency play significant but negative role in the economy.

Thirdly, under the multiple regional constraints, there are not stable and consistent Granger causality relations between three factors in financial development and economic growth in three regions. In the eastern region, economic growth and financial development (scale, structure and efficiency) are co-integrated with unidirectional Granger causality from economic growth to financial development, which reveals the demand-following pattern. The western region shows supply-leading pattern in which the unidirectional Granger causality is from financial development to economic growth. There is no obvious pattern of financial development in middle region.

REFERENCES

[1] Patrick H T. (1966). Financial Development and Economic Growth in Undeveloped Countries. *Economic Development and Cultural Change, 34*(4), 174-189.

[2] Jung W S. (1986). Financial Development and Economic Growth: International Evidence. *Economic Development and Cultural Change, 34*(3), 333-346.

[3] R.W. Goldsmith.(1969). *Financial Structure and Development*. New Haven, Conn.: Yale University Press.

[4] Ronald I. McKinnon (1973). *Money and Capital in Economic Development*. Washington D.C.: Brookings Institution Press.

[5] Shaw, Edward S. (1973). *Financial Deepening in Economic Development*. Oxford: Oxford University Press.

[6] Ross Levine (1996). Stock Markets, Corporate Finance and Economic Growth: An Overview. *Oxford Journals Social Sciences World Bank Economic Review*, (10), 223-239.

[7] Kao,C.J. (1999). Spurious Regression and Residual Based Tests for Cointegration in Panel Data. *Journal of Econometrics,* (90), 109-142.

[8] Pedroni, P. (2000). Critical Values for in Heterogeneous Cointegrated Panels. *Advances in Econometrics,* (4), 653-670.

[9] Johansen,Sorer and K.Juselius (1990). Maximum Likelihood Estimation and Inference on Cointegration with Application to the Demand for Money. *Oxford Bulletin of Economics and Statistics,* (52), 169-210.

[10] Arellano,M.and O.Bover (1995). Another Look at the

Instrumental Variable Estimation of Error Components Models. *Journal of Econometrics,* (68), 29-51.

[11] Blundell, R.W. & S.R.Bond (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of Econometrics,* (87),115-143.

[12] Hurlin, C, Venet, B. (2001). Granger Causality Tests in Panel Data Models with Fixed Coefficients. *Working Paper.* EURIsCO, Universit'e Paris IX Dauphin.

[13] Arellano, M. & S. R. Bond (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equation. *Review of Economic Studies*, (58), 277-297.