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Financial development and economic growth in China

Abstract

The purpose of this paper is to examine the relationship between financial development and economic growth. In particular, the authors examine the impact of financial development on the growth of primary, secondary, and tertiary industries in China. Ordinary Least Square (OLS) multiple regressions are applied on a set of data from China for the period 1978 to 2013 to determine the effects of financial development on economic growth, while controlling for other macroeconomic variables, namely labor force, capital growth, inflation rate and export growth. The empirical results show that financial development has a negative effect on economic growth in general, but on the growth of the tertiary industry in particular. By contrast, it is found that financial development has no significant effect on the primary and secondary industries. The findings offer policymakers some useful insights that more attention may need to be paid on developing capital markets and providing more investment choices/opportunities for Chinese households. This paper is different from most of the previous studies as it uses up-to-date data (1978-2013) from China capturing the effects of financial development on economic growth in addition to other macroeconomic factors.

Keywords: economic growth, financial development, China, three major industries (primary, secondary and tertiary industry).
JEL Classification: N1, O11, O43.

Introduction

The central objective of this paper is to investigate the impact of financial development on economic growth in China. Specifically, it seeks to measure the effect that financial development has on the growth of the primary, secondary and tertiary industries. Since 1973, the theory of financial liberalization has been carried out by Mckinnon (1973) and Shaw (1973). They argue that the liberalized financial sector or developed financial sector can stimulate economic growth by efficiently allocating resources. Since the idea of financial liberalization has been recognized by more and more policymakers, many countries have begun to reform their economies in order to develop the financial sector. In 1978, Chinese government launched an economic reform in order to transform the planned economy (pre-1978) to market economy (post-1978). Since then, the economic development in China has experienced tremendous changes, many enterprises have been established during that period, and the local governments have gained more powers and rights to allocate resources (Naughton, 2007). Yueh (2013) suggests that the post-1978 economic reform has led to high economic growth in China. China has begun to experience high GDP growth rate, and the average annual growth rate of GDP is around 10% even in the period of the 2007/2008 financial crisis. In 2011, the total GDP in China reached 5.93 trillion US dollars, with China overtaking Japan and becoming the second largest economy in the world (*National Bureau of Statistics of China, 2013*).

Some researchers have investigated the relationship between financial development and economic growth in China. Zheng and Yu (2009) find that there is a positive relationship between financial development and economic growth by using the annual data of 29 provinces over the period 1994 and 2005. This result is supported by Wen (2009) who uses data from the central region (cover six provinces) of China over the period 1978 to 2007. By using the annual data from 286 cities over the period 2001-2006, Zhang et al. (2012) also find out that there is a positive relationship between financial development and economic growth. In contrast, Hasan et al. (2009) find that there is a negative relationship between financial development and economic growth by using annual data of 31 provinces over the period 1986-2002. More recently, by using the annual data of 34 provinces for China over 1998-2010, Fang and Jiang (2014) examine the effect of financial development on primary, secondary, and tertiary industries in China. They find that financial development has no effect on the growth of primary industry, but has a positive effect on the growth of secondary and tertiary industries. Different from most previous studies, which used provincial data or city-level data to examine the relationship between financial development and economic growth in China, this paper first examines the relationship between financial development and economic growth in general, and then, respectively, examines the relationship between financial development and the growth of the primary, secondary, and tertiary industries using country level data, which covers the period between 1979 and 2013.

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The aim of this paper, therefore, is to examine the relationship between financial development and economic growth in China by using country level data over the period 1979-2013. More specifically, we attempt to answer the following questions. Firstly, what kind of effects (i.e., positive/ negative/no) does financial development has on economic growth in China? Secondly, among the three major industries (primary, secondary, and tertiary industry), which industry has mostly been influenced by financial development in China? By using multivariate regression models, we find that financial development has a negative effect on economic growth and the growth of the tertiary industry. In contrast our findings suggest that financial development has no significant effect on the growth of the primary and secondary industries over the period 1979-2013.

The rest of this paper is organized as follows. Section one reviews the relevant literature. Section two describes the sample and research design. Section three presents the empirical results. The final section concludes the study and suggests areas of future research.

1. Literature review

A number of empirical studies has been undertaken to examine the relationship between finance and growth, as discussed below. Most of them are based on endogenous growth theory, which demonstrates that economic growth can continuously increase because of endogenous forces, such as technological progress, human capital accumulation, research and development (i.e., R&D). In this paper, reviewing the relevant literature based on cross-country studies and country-specific studies is undertaken.

***Cross-country studies*:** these studies mainly use panel dataset for many countries to examine the finance-growth nexus. The findings of one of the early cross-country studies undertaken by King and Levine (1993) supported the views of Schumpeter (1911), who believed that a developed financial system can effectively allocate saving to investment, and thus stimulate economic growth. King and Levine (1993) analyze panel data for 80 countries over the period 1960-1989, and find that financial development is positive and strongly related to economic growth. They state that a developed financial system can improve the efficiency of investment and increase capital accumulation, and thus stimulate economic growth. Gregorio and Guidotti (1995) find similar results to those by King and Levine (1993). They use panel data for 98 countries during 1960-1985, and conclude that financial development is positively correlated to economic growth, as financial system can make a more efficient investment. Moreover, they created another panel dataset for 12 countries of Latin America over the period 1950-1985, and find that there is no relationship between financial development and economic growth. Gregorio and Guidotti (1995) argue that those Latin American countries pursued financial liberalization reforms within relatively poor regulatory environment, and thus it seems harder for financial development to play significant positive role in economic growth.

Since then, many scholars realized that the finance-growth relationship may vary depending on the specific characteristic of an economy, such as the level of economic development and income. Thus, a considerable number of studies have been done whose sample selection has been influenced by the characteristic of the country or countries under study. By analyzing data for 30 developing countries during the period 1970-1999, Al-Yousif (2002) states that there is a bi-directional causal relationship between financial development and economic growth.

Apergis et al. (2007) analyze data for 15 OECD[1] countries and 50 Non-OECD countries over the period 1975-2000. They argue that the policies for stimulating financial development also have a positive effect on economic growth and *vice versa*. Moreover, using a panel data for 27 transition economies, which have transformed from planned-economy to market-economy, over the period 1989-2004, Akinov et al. (2009) found that there is a significant positive correlation between financial development and economic growth. They argue that those countries have already experienced long-term transition of their economies from planned-economies to a market-economies, and thus their financial system can be more efficient in allocating resources based on the supply and demand of goods (Akinov et al., 2009).

Handa and Khan (2008) choose 13 countries to evaluate whether the causality relationship relates to the different stages of economic development using data from 1960 to 2002. These 13 countries include four low-income countries, namely Bangladesh, India, Pakistan, and Sri Lanka; five middle-income countries, namely Argentina, Brazil, Malaysia, Thailand and Turkey; and four high-income countries, namely Germany, Japan, UK and USA. They find that India and four high-income countries have a bi-directional causal relationship between financial development and economic growth, and other low-income and middle-income countries have unidirectional causality running from economic growth to financial development (i.e.,

[1] OECD refers to Organization for Economic Co-operation and Development, which is composed of 34 countries with a market economy.

demand-following hypothesis). Handa and Khan (2008) argue that because the financial systems in low-and middle-income countries tend not to be, as developed as those of high-income countries, and therefore the positive role of the financial system on economic growth is not easily observed. Moreover, and although India belongs to low-income countries; its financial sector is relatively developed, with the country boosting of a variety of financial institutions and instruments. Thus, India's financial system can help in improving the efficiency of investment, and stimulate economic growth better than the other low-income countries.

Most of the previous studies show that financial development could either have positive influence or no influence on economic growth. However, the 2007/2008 financial crisis demonstrated that sophisticated financial systems can also sometimes have negative effects on economic growth. Law and Singh (2014) explain that the failure of the financial system can lead to a waste of resources, a decrease in savings and an increase in speculation, which can cause problems of misallocation of resources and underinvestment. As a result, the economy can thus contribute towards increasing unemployment and poverty rates. Therefore, some scholars argue that there should be a threshold relationship between financial development and economic growth, which means that financial development can have positive impact on economic growth at certain thresholds, but no or even negative effects at other thresholds.

Arcand et al. (2012) analyze panel data for 100 countries during 1960-2010. They find that when the ratio of private sector credit to GDP is below 100%, financial development tends to stimulate economic growth; conversely, when that ratio exceeds 100%, further development of the financial sector tends to have negative effect on economic growth. Law and Singh (2014) also provide evidence on the threshold relationship between finance and economic growth using panel data for 87 countries over the period 1980 to 2010. They show that the threshold value is 88% when the proxy of financial development is the ratio of private sector credit to GDP, and the threshold value is 91% when the proxy of financial development is the ratio of illiquidity liability to GDP. This means that finance can have a negative effect on economic growth when the ratio of credit to the private sector exceeds 88%, or when the ratio of illiquidity liability of GDP exceeds 91% (Law and Singh, 2014).

Country-specific studies: although the Cross-country studies give an overall view of the finance-growth relationship, it ignores the specific characteristic of each country. Therefore, some scholars who are interested in the finance-growth relationship of specific country would like to analyze time-series data for one country. Ghali (1999) investigates the finance-growth relationship in Tunisia using annual data over the period 1963-1993. He finds that financial development can lead to economic growth in Tunisia. Moreover, the financial sector is still underdeveloped in Tunisia, and thus further studies should be conducted by the government of Tunisia to further develop the financial sector, such as liberalizing interest rate and increasing the availability of different types of financial instruments (Ghali, 1999).

Different from Tunisia, finance development does not have much influence on economic growth in Tanzania. By analyzing annual data for Tanzania during 1966-1996, Akinboade (2000) find that financial development has no influence on economic growth during 1966-1981, and thus has little positive influence on economic growth during 1981-1996. That is because the financial system does not operate efficiently over the period 1966-1981, as it is mainly controlled by the government; and from 1980s, the financial system became more liberalized because of the pursuance of financial reform. Akinboade (2000) argues that financial development has a positive influence on economic growth since the financial reform in Tanzania has taken root.

Lee and Wong (2005) investigate the inflationary effect of financial development on economic growth using time-series data for Japan over the period 1970-2001. They argue that the relationship between financial development and economic growth is influenced by the inflation level in Japan. Specifically, financial development has a positive effect on economic growth when inflation is lower than 2.5%, and has a negative effect on economic growth when inflation is greater than 2.5%. They explain that high inflation means the price level increase and the value of money decrease; consequently, people would prefer to hold real assets rather than monetary assets as monetary assets value may be affected negatively by inflation. However, without enough monetary assets, the financial system may be suppressed, and thus may be unable to have a positive influence on economic growth.

Apart from inflation, Greenwood et al. (2013) examine the role of technological progress in the finance-growth relationship. Using the time-series data for the U.S. over the period 1974-2004, they find that technological improvement in financial intermediation can contribute to economic growth. They argue that technological progress in the U.S. encourages more financial innovations (e.g., Collateralized Debt Obligation and Credit Default Swap) and thus the financial capital system can be more efficient and effective in allocating credit and

capital. Based on their data, 29% of GDP is contributed by the technological improvements in the financial sector over the period 1997-2004.

Adusei (2013) reports that financial liberalization has a negative relationship between financial development and economic growth in Ghana by analyzing annual data during 1971-2010 is found. Adusei (2013) explains that due to lax supervision of the Ghanaian financial system, it grants more autonomy to bankers and banking institutions. By contrast, banks are unable to distinguish between good and bad investment projects due to lack of skilled professionals. Therefore, financial liberalization in Ghana has led to over-lending or careless-lending, which has impacted negatively on economic growth. Adusei (2013) suggests that the Ghanaian government should take tighter regulation on the banking sector, especially in their lending services.

Different from other countries, China has experienced high economic growth (GDP) over the past decades with an average annual growth rate of about 10%. However, China's financial system remains under developed and mainly dominated by state-owned banks (Zhang et al., 2012). Therefore, the finance-growth relationship in China attracts great interest as a country-specific study. Using 29 provinces data during 1994-2005, Zheng and Yu (2009) find that there is a positive relationship between financial development and economic growth in China. They state that the better-developed financial system can mobilize more savings to investment, and thus stimulates economic growth. Wen (2009) finds that financial development has a positive influence on economic growth using data from the central region of China over the period 1978 to 2007. Wen (2009) argued that financial development of the central region is significant for economic growth and suggested that the Chinese government should strengthen the reform of financial intermediation to stimulate economic growth.

In addition, Zhang et al. (2012) find that there is a positive finance-growth relationship using city-level dataset of 286 cities from 2001 to 2006. As China has entered the World Trade Organization (WTO) in 2001, many foreign banks were able to provide services in China. Therefore, the domestic banks have to improve their efficiency in order to become more competitive than foreign banks. Consequently, the efficient banking system stimulates economic growth by providing more efficient investment. By contrast, Hasan et al. (2009) find that there is a negative relationship between financial development and economic growth using provincial level data over the period 1986-2002. That is because the banking sector was mainly dominated by state-owned banks during that period, and most of them had high non-performing loans as they mainly provided loans for state-owned enterprise regardless of whether the enterprise can repay loans. Furthermore, using the provincial level data for China over 1998-2010, Fang and Jiang (2014) examine the effect of financial development on primary, secondary, and tertiary industries in China. They find that financial development has no effect on the growth of primary industry, but has a positive effect on the growth of secondary and tertiary industries. Fang and Jiang (2014) argue that the banking sector is mainly making loans to secondary and tertiary industries as the primary industry has enjoyed slow growth since 1998.

In this paper, a country-specific investigation is undertaken. Our main aim is to analyze the finance-growth relationship in China using up-to-date datasets. Moreover, the effect of financial development on the growth of the primary, secondary, and tertiary industries are examined after China adopted economic reform in 1978. Different from Fang and Jiang's (2014) study, this paper uses country-level data to examine the finance-growth relationship and covers a much longer time period, that is from 1979 to 2013.

2. Research methodology

2.1. Sample and variables. We use annual data from the National Bureau of Statistics of China (NBSC) and the World Bank. Specifically, the economic growth and growth of primary, secondary, and tertiary industries, capital stock growth, labor force growth, financial development, export growth rate, and inflation rate are collected from above sources from 1979 to 2013.

Dependent variables: as shown in Table 1, and following the previous literature (e.g., King and Levine, 1993; Al-Yousif, 2002; Handa and Khan, 2008), this paper uses an annual growth rate of GDP as the proxy of economic growth. The growth rate of GDP is defined as follows:

$$\dot{GDP}_t = \frac{GDP_t - GDP_{t-1}}{GDP_{t-1}} \times 100\%,$$

where $\dot{GDP}_t$ refers to the GDP growth rate in year t; GDP_t refers to GDP in year t; and GDP_{t-1} refers to the GDP in the year t-1. Notably, $\dot{GDP}_t$ is measured in percentage.

Moreover, and following Fang and Jiang (2014), the growth of primary, secondary, and tertiary industry is respectively measured by the annual growth rate of output of primary, secondary, and tertiary industry. The primary industry is a sector of the economy that makes a direct use of natural resources; the secondary industry is a sector to produce finished goods by manufacturing the outputs of primary industry; and the tertiary industry

is a sector that provides services to consumers (Clark, 1940). In this paper, the growth rate of primary, secondary, and tertiary industry are calculated as follows:

$$\dot{PI}_t = \frac{output\ of\ PI_t - output\ of\ PI_{t-1}}{output\ of\ PI_{t-1}} \times 100\%,$$

$$\dot{SI}_t = \frac{output\ of\ SI_t - output\ of\ SI_{t-1}}{output\ of\ SI_{t-1}} \times 100\%,$$

$$\dot{TI}_t = \frac{output\ of\ TI_t - output\ of\ TI_{t-1}}{output\ of\ TI_{t-1}} \times 100\%,$$

where $\dot{PI}_t$, $\dot{SI}_t$, and $\dot{TI}_t$ refer to the output growth rate of primary, secondary, and tertiary industry in year *t*, respectively; *output of* PI_t, *output of* SI_t and *output of* TI_t refers to outputs of primary, secondary, and tertiary industry in the year *t*, respectively; *output of* PI_{t-1}, *output of* SI_{t-1} and *output of* TI_{t-1} refers to outputs of primary, secondary, and tertiary industry in year *t*-1, respectively. Notably, $\dot{PI}_t$, $\dot{SI}_t$, and $\dot{TI}_t$ are measured in percentage.

Independent variables: as shown in Table 1 five predictor variables are used in this study. Labor force growth is measured by using an annual growth rate of total population. Following Lee and Wong (2005), the total population is used to measure the labor force. The growth rate of the labor force is defined as follows:

$$\dot{L}_t = \frac{P_t - P_{t-1}}{P_{t-1}} \times 100\%,$$

where $\dot{L}_t$ refers to the annual growth rate of the labor force in year *t*; P_t refers to total population in year *t*; and P_{t-1} refers to total population in year *t*-1.

Capital growth is measured by using an annual growth rate of gross fixed capital formation. The gross capital formation is used to measure how much capital has been formed by an economy during the specific period (NBSC, 2013). The capital growth is defined as follows:

$$\dot{K}_t = \frac{K_t - K_{t-1}}{K_{t-1}} \times 100\%,$$

where, $\dot{K}_t$ refers to the capital gross in year *t*; K_t refers to gross capital formation in year *t*; and K_{t-1} refers to gross capital formation in year *t*-1.

Financial development is measured by using an annual growth rate of *M2/GDP*. McKinnon (1973) argue that financial development, that is developed financial system, leads to an increase in using money to make the transaction in the economy (i.e. not barter). That process is called monetization of the economy, which is one of the most important indicators for financial development. McKinnon (1973) suggested that the monetization of the economy could be measured by the ratio of board money to *GDP*; the board money, that is *M2*, is used to measure the money supply in an economy, and *GDP* is used to measure the total outputs of the economy. Therefore, the ratio of *M2* to *GDP* could be used to measure the degree of transaction that is made by money as a medium of payment. The financial development is defined as follows:

$$\dot{FD}_t = \frac{(M2/GDP)_t - (M2/GDP)_{t-1}}{(M2/GDP)_{t-1}} \times 100\%,$$

where, $\dot{FD}_t$ refers to financial development index in year *t*; $(M2/GDP)_t$ refers to the level of financial development in year *t*; and $(M2/GDP)_{t-1}$ refers to the level of financial development in year *t*-1.

The inflation rate is measured by using annual growth rate of the *Consumer Price Index* (*CPI*). We use an annual growth rate of *CPI* as the proxy of inflation rate. The inflation rate is defined as follows:

$$\dot{P}_t = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}} \times 100\%,$$

where $\dot{P}_t$ refers to the inflation rate in the year *t*; CPI_t refers to the consumer price index in year *t*; CPI_{t-1} refers to the consumer price index in year *t*-1.

Export growth is measured by using an annual growth rate of export of goods. The export of goods refers to the value of commodities that are exported across the Chinese border such as exports through foreign trade and the gifts and supplies provided by China to other countries as the aid. According to NBSC (2013) China calculates the value of exports by using *Free on Board* (FOB) value of goods. FOB value demonstrates the seller is only responsible for the period before the loading of goods, and is not responsible for the further damage during transport. Therefore, the FOB value is the actual value of goods at the moment when it is loaded. The export growth rate is defined as follows:

$$\dot{EX}_t = \frac{EX_t - EX_{t-1}}{EX_{t-1}} \times 100\%,$$

where $\dot{EX}_t$ refers to export growth rate in the year *t*; EX_t refers to export value of goods in year *t*; EX_{t-1} refers to export value of goods in year *t*-1.

Table 1. List of variables used in the study

Variables	Measurement	Sources
Dependent variables		
Economic growth ($\dot{GDP}$)	annual growth rate of GDP	NBSC (2013)
Growth of primary industry ($\dot{PI}$)	annual growth rate of outputs in primary industry	NBSC (2013)
Growth of secondary industry ($\dot{SI}$)	annual growth rate of outputs in secondary industry	NBSC (2013)
Growth of tertiary industry ($\dot{TI}$)	annual growth rate of outputs in tertiary industry	NBSC (2013)
Independent variables		
Labour force ($\dot{L}$)	annual growth rate of total population	NBSC (2013)
Capital ($\dot{K}$)	annual growth rate of gross capital formation	NBSC (2013)
Inflation ($\dot{P}$)	annual growth rate of CPI	The World Bank (2013c)
Export ($\dot{EX}$)	annual growth rate of export of goods	NBSC (2013)
Financial development ($\dot{FD}$)	annual growth rate of M2/GDP	NBSC (2013)

Note: sample period is over the period 1979-2013.

2.2. Proposed models. Following Lee and Wong (2005), a multiple regression model is used to analyze the relationship between financial development and economic growth as shown below:

$$\dot{GDP}_t = \alpha + \beta_1 \dot{L}_t + \beta_2 \dot{K}_t + \beta_3 \dot{FD}_t + \\ + \beta_4 \dot{EX}_t + \beta_5 \dot{P} + e_t, \quad (1)$$

where $\dot{GDP}_t$ refers to economic growth in year *t*; $\dot{L}_t$ refers to labor force growth in year *t*; $\dot{K}_t$ refers to capital growth in year *t*; $\dot{FD}_t$ refers to financial development index in year *t*; $\dot{EX}_t$ refers to export growth rate in year *t*; $\dot{P}_t$ refers to the inflation rate in year *t*; α is the intercept of regression line; β are the marginal effect of independent variables; e_t is the error term.

Moreover, similar regression models are set to examine the effect of financial development on the growth of primary, secondary, and tertiary industry in China, which is shown as follows:

$$\dot{PI}_t = \alpha + \beta_1 \dot{L}_t + \beta_2 \dot{K}_t + \beta_3 \dot{FD}_t + \beta_4 \dot{EX}_t + \\ + \beta_5 \dot{P}_t + e_t, \quad (2)$$

$$\dot{SI}_t = \alpha + \beta_1 \dot{L}_t + \beta_2 \dot{K}_t + \beta_3 \dot{FD}_t + \beta_4 \dot{EX}_t + \\ + \beta_5 \dot{P}_t + e_t, \quad (3)$$

$$\dot{TI}_t = \alpha + \beta_1 \dot{L}_t + \beta_2 \dot{K}_t + \beta_3 \dot{FD}_t + \beta_4 \dot{EX}_t + \\ + \beta_5 \dot{P}_t + e_t, \quad (4)$$

where $\dot{PI}_t, \dot{SI}_t, \dot{TI}_t$ denotes the output growth rate of primary, secondary, and tertiary industry in year *t*, respectively; and the remaining symbols have same definition as in equation (1) above.

3. Results

3.1. Descriptive statistics. Table 2 shows summary statistics of all variables. Notably, the unit of them is percentage as they are measured in growth rate. The minimum and maximum values of annual GDP growth rates $\dot{GDP}$ are 3.80% and 15.2%, respectively; and *GDP* has grown at an average annual rate of 9.8% during 1979-2013. Due to the liberalization of foreign trade and investment, exports and capital have experienced a high growth rate after 1978. The export growth rate ($\dot{EX}$) and capital growth rate ($\dot{K}$) have averaged 22.45% and 16.84%, respectively.

Table 2. Descriptive statistics

Variables	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
$\dot{GDP}$	9.800	2.720	3.800	15.200	-0.053	0.042
$\dot{PI}$	4.580	2.610	-1.500	12.900	1.223	3.503
$\dot{SI}$	11.290	4.400	1.900	21.200	0.145	0.279
$\dot{TI}$	10.780	3.370	2.300	19.300	0.330	1.235
$\dot{L}$	0.990	0.410	0.500	1.700	0.131	-1.432
$\dot{K}$	16.840	10.750	1.900	55.800	1.526	6.089
$\dot{EX}$	22.450	19.150	-18.300	97.200	1.518	3.873
$\dot{FD}$	5.510	6.690	-10.400	26.000	0.542	1.941
$\dot{P}$	5.390	6.160	-1.400	24.100	1.576	1.985

Naughton (2007) argue that the 1978 market-oriented reform can lead to changes in industrial structure. Specifically, China has transferred its attentions from primary industry to secondary and tertiary industry after 1978. According to the descriptive statistics shown in Table 2, the growth rate of primary industry ($\dot{P}I$) has averaged 4.58% during 1979-2013. Different from primary industry, the secondary and tertiary industries have much higher average annual growth rate, and both of them have more than twice the growth rate of primary industry. Specifically, the annual growth rate of secondary industry ($\dot{S}I$) has averaged 11.29% and the annual growth rate of tertiary industry ($\dot{T}I$) has averaged 10.78%. The population (L) has grown at an average rate of 0.99% and the growth rate of *M*2/*GDP* ($\dot{F}D$) has averaged 5.51 during 1979-2013. The inflation rate ($\dot{P}$) has averaged 5.39%, which is higher than the inflation rate (averaged 3.8%) in Japan, but similar to the inflation rate (averaged 5.1%) in Taiwan as reported by Lee and Wong (2005).

Dielman (2001) states that multicollinearity can decrease the accuracy of the estimated regression model as independent variables are highly correlated with each other, and thus the real effect of an individual independent variable on dependent variable can be distorted by other independent variables. According to Dielman (2001), if the absolute value of the correlation coefficient between independent variables is smaller than 0.80, the multicollinearity problem can be rejected. As shown in Table 3, Panel A presents the correlation between various independent variables, and Pane1B presents the correlation between various industries. The correlation between inflation rate ($\dot{P}$) and capital growth rate ($\dot{K}$) has the highest value of 0.534; and the correlation between financial development ($\dot{F}D$) and capital growth ($\dot{K}$) has the lowest value of -0.409. That is, the correlation coefficients between all independent variables range from 0.409 to 0.534, with their absolute values being lower than 0.80, and thus suggesting that no serious multicollinearity problems exist. Besides the correlation coefficient, the multicollinearity problem is tested by computing tolerance coefficient and Variance Inflation Factor (VIF) of each independent variable (see more details in Panel C of Table 3). According to Dielman (2001), if the tolerance value is greater than 0.1 and VIF is smaller than 10, the rejection of the multicollinearity problem can be accepted. Based on our VIF results the value of the tolerance coefficient of all independent variables is ranging from 0.414 to 0.613, which is greater than 0.1; and the VIF of all independent variables is ranging from 1.63 to 2.413, which is smaller than 10. Therefore, the rejection of multicollinearity problem can be accepted, and all five independent variables can be used in our proposed regression models.

Table 3. Correlation coefficients

Panel A

	$\dot{F}D$	$\dot{L}$	$\dot{K}$	$\dot{E}X$	$\dot{P}$
$\dot{F}D$	1				
$\dot{L}$	.281*	1			
	(.051)				
$\dot{K}$	-.409***	-.003	1		
	(.007)	(.493)			
$\dot{E}X$	-.048	.292*	.162	1	
	(.391)	(.044)	(.177)		
$\dot{P}$	-.381**	.405***	.534***	.401***	1
	(.012)	(.008)	(.000)	(.008)	

Panel B

	PI	*SI*	*TI*
PI	1		
SI	-.211	1	.
	(.223)		
TI	.330	.543**	1
	(.053)	(.001)	

Panel C. Collinearity test

Independent variables	Tolerance coefficient	VIF
$\dot{F}D$	0.613	1.630
$\dot{L}$	0.588	1.701

Table 3 (cont.). Correlation coefficients

Panel C. Collinearity test		
Independent variables	Tolerance coefficient	VIF
$\dot{K}$	0.664	1.554
$\dot{E}X$	0.617	1.224
$\dot{P}$	0.414	2.413

Note: ***, **, and * denotes significance level of correlation is 0.01, 0.05, 0.1, respectively.

3.2. Empirical results. Table 4 shows the results for the economic growth ($\dot{G}DP$) regression model. The results suggest that financial development has a negative effect on economic growth at the 99% confidence level, and the marginal effect of financial development on economic growth is -0.167. That is, increasing 1% of the financial development index tends to decrease the annual GDP growth rate by 0.167% when other independent variables, such as inflation and labor rates are taken into account.

Table 4. Regression model for $\dot{G}DP$

	Coefficient	Standard error	*t*-statistic	*p*-value	Confidence Interval	
					Lower 95%	Upper 95%
Intercept	6.726	1.016	6.620	0.000	4.648	8.804
$\dot{F}D$	-0.167	0.057	-2.926	0.007	-0.283	-0.050
$\dot{L}$	1.297	0.960	1.351	0.187	-0.667	3.262
$\dot{K}$	0.194	0.035	5.602	0.000	0.123	0.265
$\dot{E}X$	0.025	0.017	1.428	0.164	-0.011	0.060
$\dot{P}$	-0.207	0.075	-2.742	0.010	-0.361	-0.053
Model parameters						
R^2	0.652					
R^2 adj.	0.592					
F-statistic	10.887					
P-value				0.000		

Note: $\dot{G}DP$ is the dependent variable.

Our result is consistent with other empirical studies, such as Hasan et al. (2009) and Adusei (2013) who find that there is a negative relationship between financial development and economic growth in China and Ghana. Hasan et al. (2009) argue that the negative finance-growth relationship in China is caused by high non-performing loan in the states-owned banks. They point out that the Chinese banking sector is mainly dominated by state-owned banks. However, many state-owned banks do not perform well as they mainly provide loans to state-owned enterprise regardless of whether the enterprise can repay loans. Moreover, Adusei (2013) argues that the negative finance-growth relationship in Ghana is caused by the lax supervision of the government, which leads to over-lending and careless-lending in banking sectors. Our results also show that the annual growth rate of CPI ($\dot{P}$) is negatively associated with economic growth at the 99% confidence level. The annual growth rate of gross capital formation ($\dot{K}$) is positively associated with the economic growth at the 99% confidence level. More than 65% of the variation in the economic growth ($\dot{G}DP$) is explained by three predictors, namely the annual growth rate of gross capital formation ($\dot{K}$), the financial development ($\dot{F}D$) and the annual growth rate of *CPI* ($\dot{P}$), as shown in Table 4.

By contrast, some empirical studies show a positive relationship between economic growth and financial development in China (see for example, Zheng and Yu, 2009; Zhang et al., 2012). We suggest that these conflicting results with our findings are mainly due to the time-period selection. Specifically, the time period selected by Zheng and Yu (2009) and Zhang et al. (2012) does not include the first phase of economic reform (i.e. before 1994). However, our paper's time-frame (i.e. 1979-2013) includes both the first phase (i.e. 1978-1994) and the second phase (i.e. 1994 to date) of economic reforms that have been pursued in China.

Table 5 shows the results for the growth in primary industry ($\dot{P}I$) regression model. Since the *P*-value of the coefficient of the financial development is greater than 0.1, therefore, financial development

has no significant effect on the growth of primary industry. The result is consistent with Fang and Jiang (2014) findings who also found out that financial development has no significant influence on the growth of the primary industry. Fang and Jiang (2014) explain that the banking sector is mainly making loans to secondary and tertiary industries, as the primary industry has enjoyed slow growth since 1998. Our results also show that the primary industry is less developed than the secondary and tertiary industry over the period 1979-2013. Specifically, the annual growth rate of secondary and tertiary industry has averaged 11.29% and 10.78%, respectively, which is more than twice the average annual growth rate of the primary industry (4.58%). The development trends of the three industries in China are consistent with the three-sector theory carried out by Clark (1940). Clark (1940) argues that countries tend to shift their attention from primary industry (i.e. sector for proving goods) to secondary industry (i.e. sector for providing goods) and from the secondary industry to tertiary industry (i.e. sector for providing services) along with the economic development as the demand for goods and services will increase along with the economic development.

Table 5. Regression model for $\dot{P}I$

	Coefficient	Standard error	*t*-statistic	*p*-value	Confidence Interval	
					Lower 95%	Upper 95%
Intercept	2.211	1.525	1.450	0.158	-0.909	5.330
$\dot{F}D$	0.006	0.085	0.065	0.948	-0.169	0.180
$\dot{L}$	2.329	1.442	1.616	0.117	-0.619	5.278
$\dot{K}$	0.052	0.052	1.009	0.321	-0.054	0.159
$\dot{E}X$	0.006	0.026	0.242	0.811	-0.047	0.059
$\dot{P}$	-0.185	0.113	-1.635	0.113	-0.416	0.046
Model parameters						
R^2	0.143					
R^2 adj.	0.004					
F-statistic	0.971					
P-value				0.452		

Note: $\dot{P}I$ is the dependent variable.

Table 6 shows the results for the growth in secondary industry ($\dot{S}I$) regression model. The *P*-value of coefficient of financial development ($\dot{F}D$) is also greater than 0.10, which means that financial development has no significant effect on the growth of secondary industry. However, our results show that the annual growth rate of gross capital formation ($\dot{K}$) is positively associated with the growth of the secondary industry ($\dot{S}I$) at the 99% confidence level. More than 60% of the variation in the secondary industry ($\dot{S}I$) is explained by only one variable namely the annual growth rate of gross capital formation ($\dot{K}$), as shown in Table 6.

Table 6. Regression model for $\dot{S}I$

	Coefficient	Standard error	*t*-statistic	*p*-value	Confidence Interval	
					Lower 95%	Upper 95%
Intercept	5.775	1.677	3.443	0.002	2.344	9.205
$\dot{F}D$	-0.130	0.094	-1.378	0.179	-0.322	0.063
$\dot{L}$	0.809	1.585	0.511	0.614	-2.433	4.052
$\dot{K}$	0.303	0.057	5.309	0.000	0.187	0.420
$\dot{E}X$	0.041	0.028	1.443	0.160	-0.017	0.099
$\dot{P}$	-0.112	0.124	-0.902	0.374	-0.367	0.142
Model parameters						
R^2	0.636					
R^2 adj.	0.573					
F-statistic	10.134					
P-value				0.000		

Note: $\dot{S}I$ is the dependent variable.

Table 7 shows that financial development has a negative effect on growth of tertiary industry at the 99% confidence level. The marginal effect of financial development on the growth of tertiary industry is -0.332. That is, increasing 1% of the financial development index tends to decrease the output growth rate of tertiary industry by 0.332% when other independent variables remain constant. In line with this finding, the annual growth rate of CPI ($\dot{P}$) is also negatively associated with economic growth at the 99% confidence level. By contrast, the annual growth rate of gross capital formation ($\dot{K}$) and the annual growth rate of total population ($\dot{L}$) are both positively associated with economic growth at the 99% confidence level. Finally more than 60% of the variation in the tertiary industry ($\dot{TI}$) is explained by the four significant variables as shown in Table 7.

Table 7. Regression model for $\dot{TI}$

	Coefficient	Standard error	*t*-statistic	*p*-value	Confidence Interval	
					Lower 95%	Upper 95%
Intercept	6.333	1.344	4.712	0.000	3.584	9.083
$\dot{F}D$	-0.332	0.075	-4.402	0.000	-0.486	-0.178
$\dot{L}$	5.204	1.271	4.095	0.000	2.605	7.803
$\dot{K}$	0.188	0.046	4.106	0.000	0.094	0.282
$\dot{E}X$	0.071	0.023	0.724	0.475	-0.030	0.063
$\dot{P}$	-0.449	0.100	-4.507	0.000	-0.653	-0.245
Model parameters						
R^2	0.601					
R^2 adj.	0.532					
F-statistic	8.730					
P-value				0.000		

Note: $\dot{TI}$ is the dependent variable.

Our results are in conflict with those by Fang and Jiang (2014). Their empirical results showed that there is a positive association between financial development and the growth of both secondary and tertiary industries. We argue that there can be three main reasons to justify those different results. Firstly, we use different time-frame (i.e., 1979-2013), but similar to Zheng and Yu (2009) and Zhang et al. (2012) studies, while Fang and Jiang (2014) chose time-period that only covers the second phases of economic reform. However, our investigation sample covers both first and second phase of economic reform. As explained above, in the first phase of economic growth, the financial development tends to impede economic growth, and in the second phase of economic reform, financial development tends to spur the economic growth. Therefore, it is not surprising that Fang and Jiang (2014) found out the positive relationship between financial development and growth in secondary and tertiary industry.

Secondly, our indicator of financial development is different. Particularly, Fang and Jiang (2014) used the ratio of bank loan to GDP as the proxy of financial development, whilst we use the ratio of M2 to GDP as the proxy for financial development. Finally, we use a different set of explanatory variables, as shown in Table 1. Fang and Jiang (2014) used different set of predictor variables apart from only one variable namely labor force when they examine the relationship between financial development and growth in each industry. In our study we use five explanatory variables to examine the relationship between financial development and growth in each industry following the framework of Lee and Wong (2005). In regression analysis, if some of the explanatory variables are omitted, the results might be different (Koop, 2000). We argue that this might explain the difference in results between our study and Fang and Jiang (2014).

Conclusions

Different from the most previous studies in China, this paper uses four multiple regression models to examine the effect of financial development on economic growth after 1978; and to examine the effect of financial development on the growth of the primary, secondary, and tertiary industries. Five independent variables, namely financial development, labor force, capital growth, export growth and inflation rate, are used in this investigation.

Our empirical results show that financial development has a negative effect on economic growth in general but the growth of the tertiary industry in particular. By contrast, our findings indicate that financial development has no effect on the growth of both the primary and secondary industries. We argue that the high ratio of M2/GDP in China can be affected by the economic reform and the fact that the Chinese capital market is under-developed. We recommend that the Chinese

government may need to pay more attention on developing the capital market, and thus provide more options for Chinese households to distribute their money. In addition, the government may provide more options for enterprises to obtain finance for investment.

Future research could consider alternative measures for financial development according to China's specific conditions. As the annual growth rate of total population is used in our paper to measure labor force, future research could be extended to by using working-age population to investigate whether different results could be found. Finally, to extend the analysis to investigate the causality effects between financial development and economic growth.

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