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Financial development and income inequality in China:

An application of SVAR approach

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Abstract

This paper studies the relationship of financial development and income inequality in China over the period of 1978-2013. Using the structural vector auto-regression (SVAR), the empirical results are consistent with the G-J hypothesis of an inverted U-shaped relationship between financial development and income inequality. An economy in its initial stages of financial development would present increasing inequality and only in a second or even third stage of development would inequality actually decrease. The evidence is valid for two indicators defined to measure the scale and the efficiency of financial development, respectively. Financial reform aimed at forming an appropriate financial system should be accelerated to help to reducing income inequality in China.

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Keywords: financial development; income inequality; SVAR; financial scale; financial efficiency

1. Introduction

Many scholars have attempted to investigate the reasons for the growing income inequality from various perspectives. However, there is not enough attention paid to analyze the effects of financial development on income inequality theoretically and empirically. As China's financial reform is in a crucial period, a multi-directional and multi-level financial system is emerging, which will promote the efficiency of the allocation of financial resources to boost the economy.

This paper, however, attempts to fill the gap in the literature on financial development and income inequality in China. I empirically examine the relationship of financial development and income inequality by employing the structural vector auto-regression (SVAR) approach to co-integration. The sample period used in this study covers the data from 1978 to 2013. And financial development is defined as expansion of the scale and the

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improvement of the efficiency. In addition, effects of both urbanization and fiscal expenditures are taken into consideration during the empirical process. The key finding is quite consistent with G-J hypothesis. The result implies that financial development is beneficial both to the rich and the poor in the long run. Therefore, certain policies regarding finance reform need to be adjusted and accelerated not only to reduce the imperfections of financial market, but narrow the income gap at the same time as well.

The rest of the paper is organized as follows. Section 2 provides a review of both theoretical and empirical studies on the relationship between financial development and income inequality. Section 3 describes the dataset and Section 4 explains the empirical methodology. Section 5 is the empirical results and some discussions. Section 6 draws conclusions and offers some policy suggestions.

2. Literature Review

2.1. Theoretical review

Since 1990s, the relationship between financial development and income inequality has attracted attention and the theoretical research, to date, can be broadly categorized into three schools of thought.

First, the inverted U-hypothesis. Greenwood & Jovanovic [10] develop a theoretical model that predicts the inverted U-shaped relationship between financial development, income inequality, and economic development (G-J hypothesis). In their model, there are two investment opportunities for each agent of the economy: the first offers a safe but low return and the second yields a high return but is more risky. Eventually most of the agents have their access to the financial services, and the economy enjoys the reversal trend of income gap. Therefore, financial development may widen income inequality at the early stages of development while tend to reduce income inequality as the average income increases. Based on G-J Model, Matsuyama [13] develop their models to analyze the effects of initial wealth distribution, credit market development on the income inequality in the long run through trickle down effects respectively, and their conclusions are consistent with G-J hypothesis. With analytical and numerical methods, Townsend & Ueda [21] calibrate and make tractable a prototype canonical model which simplifies and improves the G-J Model.

Second, the inequality-narrowing hypothesis. This theory holds that financial development narrows the income gap as the poor enjoy more opportunities to the financial services. Galor & Zeira [18] investigate the role of wealth distribution in macroeconomics through investment in human capital. According to their research, the wealth initial affects aggregate output and investment both in the short and in the long run in the presence of an imperfect credit market and indivisibilities in investment in human capital. With the development of the credit market, an increasing number of agents of the economy are able to get sufficient money investing in human capital thus to decrease income equality. Similarly, Banerjee & Newman [1] construct a three-sector model, in which two of the technologies require indivisible investment. The capital market imperfections prevent the poor to run these indivisible, high return technologies while the reverse is true for the rich. Therefore, the initial wealth distribution has long-run effects on income distribution and growth in the presence of capital market imperfections. Ghatak & Jiang [14] simplify the model proposed by Banerjee & Newman [1] and have the same conclusions with them. Mookherjee & Ray [5] argue that when human capital accumulation generates pecuniary externalities across professions, and capital markets are imperfect, persistent inequality in utility and consumption is inevitable in any steady state. Low inequality of initial wealth distribution leads to a low inequality of equilibrium income.

Last, the inequality-broadening hypothesis. This viewpoint is held by few scholars. Gregorio [12] construct a life-cycle model with endogenous growth where individuals face borrowing constraints and have to decide during their youth how much time to devote to education. Financial development enables individuals with different endowments make their choices whether human capital investment is needed. Financial development increase income inequality as those with more endowments for learning become entrepreneurs. According to

Ryo Horii et al. [22], firms switching to a more productive and capital-intensive technologies for the improvement of the financial infrastructure widen income inequality.

2.2. Empirical review

A considerable number of empirical works has been carried out to analyze the above hypotheses based on various econometric models. For the majority of the empirical works, Gini coefficient is taken for the measure of income inequality, while others employ the Theil Index or the income ratio of rural-urban residents. As for the measure of financial development, some use the M2/GDP proposed by Mckinnon or FIR (Financial Interrelations Ratio) proposed by Goldsmith, while others measure it through different sectors of financial system including security market, insurance market and credit market.

Based on a sample of 573 observations covering 49 countries, Li et al. [18] construct their regression model to investigate the relation between financial development and income inequality. According to their research, inequality is largely determined by factors that change only slowly within countries but are quite different across countries while financial development has a positive effect on reducing income inequality. Using a panel data set of 91 countries for the period of 1960-1995, Clarke et al. [7] examine the relation and find strong evidence that inequality decreases as economies develop their financial intermediaries, which is consistent with Galor & Zeira [18] and Banerjee & Newman [1]. Law & Tan [23] analyze the role of financial development in influencing income inequality in Malaysia over the period of 1980-2000 empirically based on ARDL bounds test. The results suggest financial development is insignificantly in narrowing income gap in Malaysia. Tan & Law [9] implement the dynamic panel data model to investigate the dynamics of the finance-inequality nexus in 35 developing countries, and the empirical results provide new evidence that highlights the non-linear U-shaped relationship between financial development and income distribution.

3. Data

For empirical analysis, this paper prepares the time series dataset of China, transformed into natural log, covering 1978-2013. Table 1 presents the descriptive statistics of each variable.

Table 1. Descriptive statistics of each variable 1978-2013

Variable	Mean	Median	Maximum	Minimum	Standard Deviation
GAP	0.964469	0.961850	1.203822	0.600287	0.184671
FIR	0.133424	0.100428	0.725131	-0.646744	0.406038
FER	0.018915	0.079539	0.429345	-0.488994	0.309392
URB	-1.153576	-1.212298	-0.621199	-1.719253	0.326489
FISC	-1.686146	-1.686525	-1.153561	-2.193559	0.274188

Source: China Economic Information Network Statistics Database (available online at http://db.cei.gov.cn)

3.1. Income inequality variables

For China, income inequality of rural-urban residents is among the main inequality holding back economic development. To avoid above problems and take China's real conditions into consideration, the income ratio of rural-urban residents (GAP) is chosen to measure the overall income inequality.

$$GAP_t = I_{1,t} / I_{2,t} \tag{1}$$

where $I_{1,t}$, $I_{2,t}$ represent the income of urban and rural residents in the year, respectively.

3.2. Financial development variables

For the measure of financial development, M2/GDP proposed by Mckinnon is frequently used by most of the empirical research. However, as financial innovation is speed up bringing a wide range of derivative financial instruments, this indicator is no longer proper to reflect such trend.

Financial development is not only represented by the expansion of the scale, but the improvement of the efficiency as well. In this paper, financial development is defined as two above aspects, i.e. the expansion of the scale and the improvement of the efficiency.

For the measure of the scale, this paper use FIR proposed by Goldsmith.

$$FIR_t = \sum_{i=1}^{n} A_{i,t} / GDP_t \tag{2}$$

where $A_{i,t}$ represents the gross amount of financial asset i and GDP_t for gross domestic product in the year t.

For the measure of the efficiency, FER (Financial Efficiency Ratio) is calculated by the ratio of savings deposits and loans of financial institutions as below.

$$FER_t = \sum_{i=1}^{n} D_{i,t} / L_{i,t} \tag{3}$$

where $D_{i,t}$, $L_{i,t}$ represent the savings deposits and loans of financial institutions i in year t.

3.3. Control macro-economic variables

According to Lu & Chen [16], Wang & Fan [25], urbanization (URB) and fiscal expenditures (FISC) have positive effects on income inequality. Therefore, they are taken as control variables, measured by the ratio of urban population to the entire population, the ratio of fiscal expenditures to GDP, respectively.

4. Methodology

4.1. The SVAR model

In order to estimate the dynamic impact of financial development on income inequality and control for reciprocal causality, the SVAR model appears appropriate for this study. However, classic theory of VAR model requires the stationarity of all the variables for the purpose of the stability of the model. According to Sims et al. [4], VAR approach is constructed to identify the relation of the variables instead of parametric estimation. Even some of the variables do not pass the unit root test, it is improper to take the differential form to the model for tendency in the variables will be lost. As for this paper, all variables are taken in logarithms instead of differential form.

The SVAR model is estimated according to the method developed by Sims and Zha [2], and it ensures the model is not affected by unit-root problems, which permits to take all variables in levels and to increase the number of degrees of freedom. For this paper, there are 5 variables for the construction of SVAR model, and SVAR with lag length p, SVAR (p), is shown as below.

$$C_0 y_t = \Gamma_1 y_{t-1} + \Gamma_2 y_{t-2} + \cdots + \Gamma_p y_{t-p} + u_t \quad t = 1, 2, \cdots, T \tag{4}$$

where

$$y_t = \begin{pmatrix} GAP \\ FIR \\ FER \\ URB \\ FISC \end{pmatrix}, C_0 = \begin{bmatrix} 1 & -c_{12} & \cdots & -c_{15} \\ -c_{21} & 1 & \cdots & -c_{25} \\ \vdots & \vdots & \ddots & \vdots \\ -c_{51} & -c_{52} & \cdots & 1 \end{bmatrix}, \Gamma_i = \begin{bmatrix} \gamma_{11}^{(i)} & \gamma_{12}^{(i)} & \cdots & \gamma_{15}^{(i)} \\ \gamma_{21}^{(i)} & \gamma_{22}^{(i)} & \cdots & \gamma_{25}^{(i)} \\ \vdots & \vdots & \ddots & \vdots \\ \gamma_{51}^{(i)} & \gamma_{52}^{(i)} & \cdots & \gamma_{55}^{(i)} \end{bmatrix}, i = 1, 2, \cdots, p, u_t = \begin{bmatrix} u_{1t} \\ u_{2t} \\ \vdots \\ u_{5t} \end{bmatrix}.$$

The SVAR model is sensitive to the lag length p, and the latter is commonly determined by AIC (Akaike information criterion) and SC (Schwarz criterion) with reference to LR (Likelihood Ration), LPE (Final Prediction Error) and HQ (Hannan-Quinn information criterion). In this paper, the lag length p is 2 for the model.

4.2. Contemporaneous restrictions, Stability test and Co-integration tests

For SVAR(p) with k variables, the number of short-run constraints is $k(k-1)/2$. However, there are 5 endogenous variables in SVAR(2), so 10 of short-run constraints should imposed on SVAR(2).

In order to conduct the impulse response function and variance decomposition, stability test should be done to prove the stability of the model, i.e. SVAR(2). SVAR satisfies the stability condition when no root lies outside the unit circle.

This paper uses JJ test to show the co-integration relation of all the variables. According to Table 2, there are at least 4 co-integrating equations at the 0.05 level, which strengthens the reliability of SVAR(2) constructed in this paper. Otherwise, it is meaningless for SVAR without the co-integrated relation of the variables.

Table 2. JJ test results

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.862060	147.4056	79.34145	0.0000
At most 1 *	0.658615	80.05386	55.24578	0.0001
At most 2 *	0.517152	43.51256	35.01090	0.0049
At most 3 *	0.422995	18.75872	18.39771	0.0445
At most 4	0.001821	0.061962	3.841466	0.8034

Notes: * denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michelis (1999) p-values.

5. Empirical Results and Discussions

The impulse response functions showed in Fig. 1 display the responses of GAP to a variation of one standard deviation of the variables including FIR and FER. With reference to similar results for various model specifications, a robust relationship can be easily found of both variables. Inspection of Fig. 2 highlights the response of GAP to financial development (FIR and FER) is significant, indicating stable relationship. However, both FIR and FER seem to exert a strong positive short run impact on GAP levels from period 1 to period 7 and they both peaked around peirod 4, which implies financial development increases income inequality in the short run.

While in the long run, response of GAP to FIR declines from period 7, hits the bottom in period 9 and climbs to low positive level till perido 14, which means during this period income gap is narrowed by the development of financial scale. As for the response of GAP to FER, it shares the same qualities as FIR. In other words, income inequality tends to be reduced by financial development in the long run, no matter FIR or FER.

Overall, this result is quite consistent with G-J hypothesis, which suggests an economy in its initial stages of financial development would present increasing inequality and only in a second or even third stage of development would inequality actually decrease. According to Greenwood & Jovanovic [10], with the rising of average income, financial structure becomes more extensive, economic growth becomes more rapid, and income inequality widens. In a mature economy with a fully developed financial structure, there exists a stable distribution of income, and its growth rate is much higher than in infancy. Distribution of income, and its growth rate is much higher than in infancy.

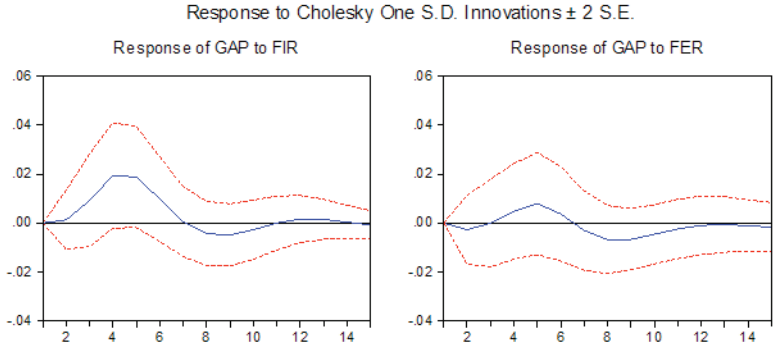

Fig. 1. Impulse response functions: response of GAP to FIR and FER

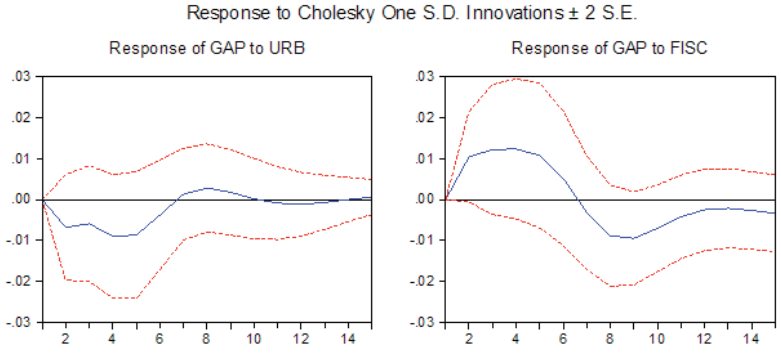

Fig.2. Impulse response functions: response of GAP to URB and FISC

Fig. 2 presents the response of GAP to control macro-economic variables (URB and FISC). Not surprisingly, URB seems to exert a negative effect on GAP in the short run, which is quite in accords with the reality, i.e. rural residents have more access to employment with urbanization. While from period 7 to 10, it is interesting to notice the effects of URB to GAP are somehow positive. As for the response of GAP to FISC, however, it is significantly positive from period 1 to 7 with a peak in period 4, which implies income inequality are increased by fiscal expenditures in the short run. Probably the policy discrimination against rural areas should be responsible for this anomaly as most of the fiscal expenditures are flowing into urban areas. While in the long run, the impact of FISC to GAP turns to be negative, which suggests fiscal expenditures narrows income gap and this is quite consistent with the economic reality. Both urban and rural residents could benefit from multiplier effects bought by public investments.

6. Conclusions

This paper studies the relationship of financial development and income inequality in the case of China. Since reforming and opening, the flourish of financial market has been promoting economic growth. However, there are limited econometric evidence to trace the link between financial development and income inequality in China.

In this paper, I defined financial development as expansion of the scale and the improvement of the efficiency, and selected the income ratio of rural-urban residents to measure the income inequality because of the unavailability and low effectiveness of China's Gini coefficient. I then estimated the dynamic impact of these variables on income inequality using the structural vector auto-regression (SVAR) model contain containing two control macro-economic variables, for a set of annual indicators of financial development and income inequality over the period of 1978-2013.

In general, the empirical results are consistent with the findings in Greenwood & Jovanovic [10], Matsuyama [13] and Townsend & Ueda [21]. An economy in its initial stages of financial development would present increasing inequality and only in a second or even third stage of development would inequality actually decrease. Financial development, no matter the expansion of the scale or the improvement of the efficiency, is an important determinant of income inequality dynamics. And income inequality depends more on the features of financial scale than on financial efficiency. Interestingly, I also found income inequality is increased by fiscal expenditures in the short run.

In terms of policy implications, I suggest besides promoting urbanization, financial reform aimed at forming an appropriate financial system should be accelerated to help to reducing income inequality in China. Not only will it boost the economy, but it will offer more employment for the poor. Specifically, more financial resources should be allocated to those who need them most, e.g. the small and medium-sized enterprises who create an increasing number of employment opportunities, which will make a great contribution to the growth of the income for the majority and narrowing the income gap. What's more, fiscal policy discrimination against rural areas need to be eliminated and more capital, including fiscal expenditures and private investments, should be encouraged to support the development of the countryside. In addition, as inflation has been becoming consistent headache for Chinese government over the past three decades, maintaining low inflation are crucial in its attempt to combat income inequality, too.

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