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FINANCIAL DEVELOPMENT AND INCOME DISTRIBUTION: A SYSTEM GMM PANEL ANALYSIS WITH APPLICATION TO URBAN CHINA

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Financial development has strongly influenced the pattern of income distribution in post-reform China. In this paper, using Chinese provincial data over the period of 1986-2000 and applying the Generalized Method of Moment (GMM) techniques, we investigate the finance-inequality nexus in urban China. Empirical results show that China's financial development significantly helps to reduce urban income inequality. However, these positive distributional gains from financial sector development have been severely offset by the increased urban unemployment and massive layoffs brought about by the implementation of radical urban reforms and the restructuring of state-owned enterprises.

Keywords: Financial Development, Income Inequality, Chinese Economy
JEL classification: D31, G20, P30

1. INTRODUCTION

The last decade has witnessed intensive economic restructuring and rapid market-oriented transformation in urban China. Radical urban reforms, including the restructuring of state-owned enterprises (SOEs) as well as comprehensive reforms in the systems of social security and welfare provisions such as housing, pensions, education, healthcare and insurance, have greatly altered the patterns of China's urban wealth accumulation and wealth distribution.

Moreover, the abolition of lifetime guaranteed employment and the introduction of market-based reward system have successfully released workers' potentials and significantly raised production efficiency, which substantially contributed to China's urban income growth. However, although efficiency gains from China's market-oriented

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transformation can be large, recent major urban reforms and especially the radical enterprise restructuring in the state sector have resulted in worsening urban income distribution. According to the official statistics, China's urban Gini coefficient rose sharply from 0.15 in 1980 to 0.32 in 2000. The deterioration of urban income distribution has threatened China's social stability and long-term sustainability of growth, which has also posed serious challenges to the Chinese government.

Rising income inequality in urban China has attracted considerable attentions from both academics and policy makers. A question is often raised as to whether deteriorating income distribution is merely a transitory phenomenon or inevitable costs for economic transformation from a planned to a market-oriented economy. More specifically, what kinds of development strategy and policy measures should be taken to maintain sustainable growth and to ensure the equal share of gains from economic reforms? These issues have become the focus of recent debate (e.g., Gustafsson & Li (1997); Khan & Riskin (2001); Chang (2002)).

To better understand the characteristics of China's urban wealth distribution, great efforts have been made to investigate the evolving pattern of urban income inequality in post-reform China (e.g., Aaberge & Li (1997); Khan *et al.* (1999); Meng *et al*. (2005)). In addition, by employing survey data on urban household expenditures and incomes, a number of studies have examined the sources of recent increases in China's urban inequality (e.g., Knight & Song (1991); Fang *et al.* (2002); Gibson *et al.* (2003); Meng (2004)).

However, the role of financial development in influencing China's wealth distribution has been highly neglected in the literature. To our knowledge, due to the lack of systemic data, no attempt has been made to investigate the finance-inequality nexus for the case of China. This paper attempts to fill this void by using recently released provincial data to empirically explore the relationship between finance and inequality in urban China, and thus contributes to the ongoing debate on the nature of China's wealth distribution.

The remainder of this paper is organized as follows. The next section provides a brief theoretical review on the relationship between financial development and income distribution. Section 3 highlights recent trend of financial development and urban inequality in China. Econometric model and estimated methodology are described in Section 4. With the help of Chinese provincial data over the period of 1986-2000, we examine the impacts of financial development on urban inequality in China. Empirical results are presented in Section 5. Finally, this paper concludes with Section 6.

2. FINANCIAL DEVELOPMENT AND INCOME DISTRIBUTION: THEORETICAL FRAMEWORK

A growing body of literature suggests that financial development can affect the distribution of income through multifaceted channels. However, alternative theories

have made distinct predictions on the finance-inequality relationship, resulting in two broad schools of thought with two contrasting theoretical hypotheses, i.e., the inverted U-shaped hypothesis (e.g., Greenwood & Jovanovic (1990)) and the linear hypothesis (e.g., Banerjee & Newman (1993); Galor & Zeira (1993)).

2.1. The Greenwood-Jovanovic Inverted U-shaped Hypothesis

The first school of theories suggests an inverted U-shaped relationship between financial development and income distribution. In their pioneering work, Greenwood and Jovanovic (1990) investigate the finance-inequality linkage in the context of an endogenous growth model. Consider an economy populated by a continuum of agents on the interval [0,1]. At the period *t*, agent that owns wealth k_t will make the decision on the allocation of wealth between consumption c_t and investment i_t, with $k_t = c_t + i_t$. The maximization condition of the expected lifetime utility for an agent can be given by $Max\left\{E\left[\sum_{t=0}^{\infty}\beta^t u(c_t)\right]\right\}$ with the discount rate $\beta \in (0,1)$.

Two kinds of production technologies are available in the economy: the first one offers a safe but relative low return δ for per unit capital; while the other one yields a more risky rate of return but with higher expected value that can be expressed by a composite technology shock of $(\theta_t + \varepsilon_t)$, where $\theta_t \in (\underline{\theta}, \overline{\theta})$ denotes the aggregate shock, $\varepsilon_t \in (-\overline{\varepsilon}, \overline{\varepsilon})$ is the idiosyncratic shock with $E(\varepsilon_t) = 0$, and the lower bound of the composite shock is assumed to be positive.

The development of financial intermediations can overcome the information friction on risky investment through collecting and analyzing information of a large number of projects so as to discover the true aggregate shock θ_t. Moreover, financial intermediary development contributes to smooth away the idiosyncratic shock ε_t through risk diversification, trading and pooling.

In addition, as in Townsend (1978), the condition of costly financial market entry is introduced into the model by assuming that there exists a fixed entry cost q for participation in the financial market. Given this entry cost, not every agent will join the financial market immediately, and the participation into the financial market may be restricted to agents with the amount of wealth superior to a certain threshold level. Therefore, for a given period, all the agents can be categorized into two groups, i.e., the agents who are already in the financial market (i.e., the participant), and the agents who are currently not in the financial system (i.e., the non-participant).

For the agent that does not participate the financial market, if he decides to invest a fraction ϕ_t of his portfolio into the high-risk technology at period *t*, then the investment output at the beginning of period $t+1$ will be

$$k_{t+1} = i_t[\phi_t(\theta_t + \varepsilon_t) + (1-\phi_t)\delta]. \quad (1)$$

It implies that the wealth of the non-participant is greatly influenced by the uncertainty of the idiosyncratic shock.

As for the agent that already participates in the financial market, he can get a promised return $r(\theta_t)$ for per unit of capital invested in the financial system, and it is the financial intermediaries that will make the decision on project investments and fund allocation based on their advanced information collection and analyses. Therefore, for an agent who invests the amount of capital i_t into the financial market at period *t*, his wealth at the beginning of period $t+1$ can be written as

$$k_{t+1} = i_t\, r(\theta_t). \tag{2}$$

Note that in Equation (2), the return function is described only with reference to aggregate shock θ_t, because the idiosyncratic shock ε_t is smoothed away by financial intermediaries.

As in Greenwood and Jovanovic (1990), we define $w(k)$ as the value function of an agent who is outside the financial market, and $v(k)$ as the value function of the financial participant. In addition, let $F(\theta)$ and $G(\varepsilon)$ denote the cumulative distribution functions of θ and ε respectively.

In period t, the investment decision for an agent who is currently outside the financial market (i.e., the non-participant) will depend on the maximization of the following function:

$$\begin{aligned} &w(k_t) = \max_{i_t,\phi_t}\left\{u(k_t - i_t) + \beta\int \max\left[w(k_{t+1}), v(k_{t+1} - q)\right]\, dF(\theta_{t+1})dG(\varepsilon_{t+1})\right\} \\ &subject\ to:\ k_{t+1} = i_t[\phi_t(\theta_t + \varepsilon_t) + (1-\phi_t)\delta]. \end{aligned} \tag{3}$$

As for the financial market participant, the corresponding functioning equation can be written as follows:

$$\begin{aligned} &v(k_t) = \max_{i_t}\left\{u(k_t - i_t) + \beta\int \max[v(k_{t+1})]\, dF(\theta_{t+1})\right\} \\ &subject\ to:\ k_{t+1} = i_t r(\theta_t). \end{aligned} \tag{4}$$

Note that in Equation (4), v is defined without reference to w, and we have $v(k) > w(k)$ for any given endowment of capital k. This indicates that k is worth more to an individual within the financial system than to one outside of it, thus an individual will never exit after his entry into the financial market.

The theoretical model of Greenwood and Jovanovic (1990) yields a dynamic solution to the relationship between finance and inequality: in the early stage of development when financial intermediaries are less developed, the economy grows

slowly; in the intermediate stage of development, widening income inequality coincides with faster economic growth and more deepening financial development; by maturity, when an extensive financial structure is fully developed with more agents gaining access to the financial intermediary sector, the degree of income inequality will decline and ultimately become stable.

Therefore, Greenwood and Jovanovic (1990) predict an inverted U-shaped relationship between financial development and income distribution, i.e., financial development might widen income inequality at the early period, but then tend to lower it when average income increases and more households gain access to financial market.

2.2. The Linear Hypothesis on the Finance-Inequality Linkage

In contrast to the Greenwood-Jovanovic inverted U-shaped hypothesis, some other theoretical works suggest a negative and linear relationship between financial development and income inequality (e.g., Galor & Zeira (1993); Banerjee & Newman (1993)).

Galor and Zeira (1993) model the dynamic pattern of income distribution in an economy with investment indivisibility, where agents live for two periods, and generations are linked through the bequests. Agents can either work as unskilled labors for both periods, or make an indivisible investment in human capital in the first period and then work as skilled labors in the second period. However, due to financial market imperfections, opportunity for investment in human capital may be restricted to agents with sufficiently large inheritance or those who can obtain external credits to cover the funds required for human capital investment.

Consider now an economy with a single consumption good that can be produced with either the skilled-intensive technology or the unskilled-intensive one. The wage of skilled and unskilled workers are w_s and w_u respectively, with $w_s >> w_u$. An agent with wealth y that lives for two-periods will consume c only in the second period, and will bequeath the capital amount b to his children, with $b = y - c$. The fund required for investment in human capital is h. Individuals who borrow will pay an interest rate i, which is greater than the rate r that they earn when they lend.

Assume that the utility function of an agent is $U = c^{\alpha} b^{1-\alpha}$, thus the solution to the utility maximization subject to $y = c + b$ is given by $b^* = (1-\alpha)y$ and $U^* = \theta y$, with $\theta = \alpha^{\alpha}(1-\alpha)^{1-\alpha}$. Therefore, for an agent who inherits x but chooses not to invest in human capital, his utility ($U_u^*(x)$) can be written as follows:

$$U_u^*(x) = \theta[(x + w_u)(1 + r) + w_u]. \tag{5}$$

If an agent with inheritance greater than the capital required for education investment (i.e., $x \geq h$) chooses to invest in human capital, his utility (U_{sl}^*) is given by

$$U_{sl}^{*}(x) = \theta[(x-h)(1+r) + w_s]. \tag{6}$$

Based on Equation (5) and (6), we find that people will choose to invest in education if and only if $U_{sl}^{*} \geq U_u^{*}$. This condition can also be written as $w_s - h(1+r) \geq w_u(2+r)$.

Moreover, as for the agent with inheritance $x < h$ who chooses to borrow for investment in human capital, his utility (U_{sb}^{*}) is given by

$$U_{sb}^{*}(x) = \theta[(x-h)(1+i) + w_s]. \tag{7}$$

Note that for those who have to borrow for education, they choose to invest in human capital if and only if $U_{sb}^{*} \geq U_u^{*}$. Based on Equation (5) and (7), this critical condition can be written as

$$x \geq f \equiv \frac{w_u(2+r) - w_s + h(1+i)}{i-r}. \tag{8}$$

It indicates that only agents with sufficiently large inheritance will invest in human capital and then become the skilled labors, while the other agents will remain unskilled. Let x_t denotes the inheritance received by the agent born at time *t*. The bequest that he leaves for his children (i.e., $b(x_t)$) can be given by

$$b(x_t) = \begin{cases} (1-\alpha)[(x_t + w_u)(1+r) + w_u] & if\ x_t < f \\ (1-\alpha)[(x_t - h)(1+i) + w_s] & if\ f \leq x_t < h \\ (1-\alpha)[(x_t - h)(1+r) + w_s] & if\ x_t \geq h \end{cases}. \tag{9}$$

This result has important implications. It implies that initial wealth distribution matters for the long run level of income, and income inequality will be perpetuated through bequests between generations. In the long run, there will be a polarization of wealth between high-income skilled labors and low-income unskilled ones: the rich and better-educated families will converge to the high-income steady state, whereas the poor and less-educated ones will converge to the low-income steady state.

However, the development of financial market will provide broader and easier credit access for poor households: as financial market develops, the credit constraints faced by low-income agents will be alleviated, which will in turn help to reduce income inequality. Similar predictions can also be found in the model of Banerjee and Newman (1993).

In sum, both of these theoretical models predict a negative and linear relationship between finance and inequality, in which the development of financial market and financial intermediation, by eliminating capital market imperfections and providing more opportunities for the poor to borrow and invest in human capital or high-return

projects, contributes to the improvement in income distribution.

2.3. Empirical Studies on the Finance-Inequality Nexus

Few empirical studies have been conducted to test these alternative theories. The recent work of Clark *et al*. (2003) is a notable exception. By employing panel data from both developing and developed countries between 1960 and 1995, Clark *et al*. (2003) examine the impacts of financial development on income distribution. They find that inequality is lower in countries with better-developed financial sector, and that income inequality decreases along with the development in financial markets and financial intermediaries. Therefore, their empirical results provide strong support to the linear hypothesis suggested by Banerjee and Newman (1993) and Galor and Zeira (1993), yet they find no evidence of an inverted U-shaped relationship between finance and inequality.

The importance of financial development in reducing income inequality has also received considerable empirical supports from a number of recent studies. By employing data for 40 developed and developing countries from 1947 to 1994, Li *et al*. (1998) find that better-functioning financial markets are strongly associated with lower income inequality. In a more recent work, Beck *et al*. (2004) use a broad cross-country sample of 52 developing and developed countries between 1960 and 1999 to investigate the relationship between financial intermediary development and changes in income distribution. They find that income inequality falls more rapidly in countries with higher levels of financial intermediary development, and that financial intermediary development reduces income inequality by disproportionately boosting the income of the poor.

Unfortunately, in all of these cross-country studies, Mainland China is excluded from the country sample because of data limitation. In the present study, with the help of a new panel data set covering 29 Chinese provinces over the period of 1986-2000, we add to the literature by empirically exploring the finance-inequality nexus in urban China. To the best of our knowledge, this is the first paper looking at the relationship between financial development and urban income distribution for China.

3. RECENT TREND OF FINANCIAL DEVELOPMENT AND URBAN INEQUALITY IN CHINA

Successive reforms and institutional innovations in China's financial sector have strongly influenced the pattern of urban wealth distribution. A number of recent studies show that China's financial system is highly urban-biased (e.g., Wei & Wang (1997); Zhang *et al*. (2003)). Moreover, due to the critical role of banking sector in financing state enterprises, China's financial reforms are closely associated with the process of state enterprise restructuring and economic transition in urban China.

3.1. Development of Financial Market and Financial Intermediation in China

Since the initiative of China's financial reforms in the late 1970s, substantial changes have occurred in China's financial sector. Comprehensive institutional reforms in the banking system, intensive development and multidimensional innovations in China's emerging capital market highlight this gradual reform process.

The abandon of mono-banking system and the creation of two-tiered banking system in the late 1970s marked the beginning of China's financial reforms. Four state-owned specialized banks, authorized with specialized functions concerning different scopes of economic activities, were separated from the People's Bank of China (PBC), and the PBC itself was reorganized as the central bank of China in the mid-1980s.[1] Since then, various forms of financial institutions have been successively set up. China's financial system has been gradually transformed from a mono-banking system into a diversified financial institutional system.

Table 1 presents some useful financial indicators that characterise the development of financial intermediation in China. We find that the scale of deposits and loans in China's financial institutions grew rapidly over the last decade. The deposits-to-GDP ratio increased from 0.76 in 1990 to 1.63 in 2002; the loans-to-GDP ratio also rose from 0.95 to 1.25 during the same period. Moreover, the ratio of Money and Quasi-Money (M2) to GDP experienced a remarkable increase and amounted to 1.77 in 2002, more than doubled the number in 1990.

Table 1. Recent Trend of Financial Intermediary Development in China: 1990-2002

	1990	1995	1996	1997	1998	1999	2000	2001	2002
Deposits / GDP	0.76	0.92	1.014	1.11	1.22	1.33	1.38	1.48	1.63
Loans / GDP	0.95	0.86	0.90	1.01	1.10	1.14	1.11	1.15	1.25
M2 /GDP	0.82	1.04	1.12	1.22	1.33	1.46	1.50	1.63	1.77

Source: *China Statistical Yearbook* (various issues), and *Almanac of China's Finance and Banking* (various issues).

Meanwhile, the past ten years have also witnessed rapid development in China's emerging capital market. Since the opening of Shanghai Stock Exchange and the Shenzhen Stock Exchange in the early 1990s, the stock markets have substantially expanded in China. However, China's stock markets, although having experiencing fast

[1] These four state-owned specialized banks are: The Agricultural Bank of China (ABC), the China Construction Bank (CCB), the Bank of China (BOC) and the Industrial and Commercial Bank of China (ICBC). In addition to these four state-owned specialized banks, two other institutions, i.e., the People's Insurance Corporation of China (CPIC) and the China International Trust and Investment Corporation (CITIC), were also established.

growth in the last decade, remain relatively small in size and scale when compared to that of the whole banking sector.

Therefore, China's financial system is still highly bank-based. Meanwhile, in China, the state-owned banks strongly dominate the banking sector, resulting in a highly state-monopolized bank-based financial structure. Consequently, China's financial system has become an important instrument for the Chinese government to finance its policy-lending targets. With strong government intervention and strict internal control in the banking sector, a large proportion of China's bank credits are allocated to the state-owned enterprises, while private enterprises receive a much lower share than warranted by their importance in the overall economy.

However, heavy burdens of "policy lending," poor banking operation and management, soft budget constraints, and the lack of efficient regulation and surveillance system, have resulted in large scales of non-performing loans in China's banking sector, which seriously impedes the further development of financial intermediation.

Great efforts have been conducted to reform the banking sector and to turn the state-owned banks into competitive and modern commercial banks. The promulgation of the Central Bank Law and the Commercial Bank Law in 1995 further strengthened China's financial system, and laid the basis for building a modern banking system in China. Moreover, to solve the problems of non-performing loans, the Central government injected a total of 270 billion yuan (32.6 billion US dollars) into the four major state-owned banks in 1998. In addition, four Asset Management Corporations (AMCs) were established in 1999 to relieve the four major state-owned banks of heavy burden by taking over 1.4 trillion yuan (169 billion US dollars) of non-performing loans and bad debts from them. However, due to the lack of appropriate mechanism transformation and institutional reforms in the financial systems, the effects of these policy measures were quite limited. By the end of 2003, the total amount of non-performing loans in China's four major state-owned banks has reached nearly 2 trillion yuan (242 billion US dollars), which accounted for 20% of their total assets.

With China's accession into the WTO, further penetration of the foreign banks and increasingly intensive competition are expected. Under China's commitment to the WTO, China's banking sector will be fully open to foreign competition by 2006. In order to speed up China's financial reform process and to accelerate banking restructuring, a series of new policy measures have recently been adopted and implemented to strengthen banks' corporate governance, reduce non-performing loans, improve financial performance, and enhance their competitiveness.

In December 2003, the Chinese government injected 45 billions US dollars of its foreign reserve into the Bank of China (BOC) and the China Construction Bank (CCB), to increase the adequacy of bank reserve and strengthen banks' capital base in preparation for their restructuring into joint-stock commercial banks and stock market public listing. Meanwhile, the Central Huijin Investment Company was set up in 2003 to manage these injected funds and to supervise the banking reforms of the BOC and the

CCB. In the near future, the other two major state-owned banks, i.e., the Industrial and Commercial Bank of China (ICBC) and the Agricultural Bank of China (ABC), are expected to be re-capitalized; moreover, the joint-stock system reforms of these two banks have also been put on the agenda.

3.2. Urban Inequality in China

Rising urban inequality in China has recently attracted much concern. Figure 1 presents the dynamic changes in income inequality for urban China between 1980 and 2000. We find that urban Gini coefficient rose sharply from 0.15 in 1980 to a much higher level of 0.32 in 2000, an increase by more than 100% during this period.

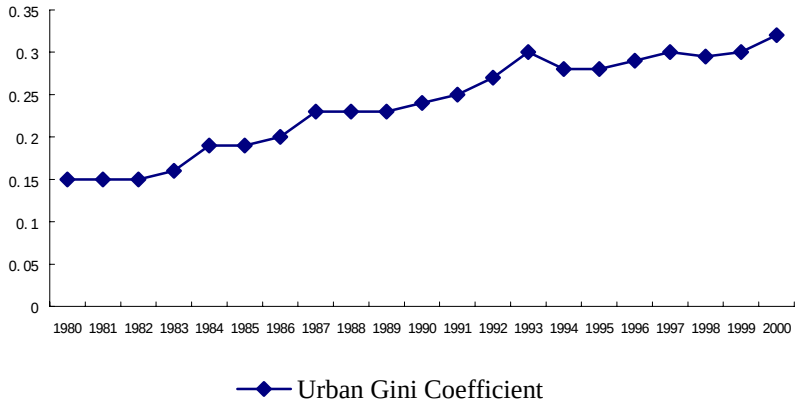

Figure 1. Urban Income Inequality in China 1980-2000 (Gini Coefficient)

When China began its economic reforms in the late 1970s, China was still in the list of highly egalitarian societies, and a low level of urban income inequality was reported in China. Full employment and permanent job guarantees from the state (i.e., the “iron rice bowl” system), along with many other forms of subsidies, benefits and welfare provisions such as highly subsidized housing, education, healthcare and relative social services, have long been recognized as the main reasons for the low level of urban inequality during the earlier reform period. However, these highly subsidized welfare provisions have also become the heavy burden for the state sector.

Meanwhile, it is well acknowledged that under the traditional planned economic system, bureaucratic paternalism of the government usually led to soft budget constraint for many state-owned enterprises (SOEs), and the SOEs with financial difficulties were expected to receive subsidies or refinancing from the government to compensate their losses and to be bailout. Moreover, low-cost bank credit with weak lending standard has

become one of important channels through which the government provided financial support to the SOEs.

However, as China's economic reforms deepened, market-oriented transformation gradually weakened the government's power in resource control and allocation. Intensive banking reforms further "hardened" the budget constraint of the SOEs. Moreover, due to increased market competition from the private sector, a significant number of state- and collectively-owned enterprises have experienced large financial loss.

Since the very beginning of the 1990s, a wide range of welfare system reforms have been carried out in urban China to reduce the welfare burden of the state sector. In addition to the implementation of large-scale welfare reforms, the radical restructuring of state-owned enterprises has led to substantial layoffs and massive retrenchment in the urban sector. According to the official statistics, the amount of laid-off workers increased rapidly from 3 million in 1993 to 17.24 million in 1998. After Zhu Rongji came into power in 1998, the Chinese government set off a new upsurge of restructuring reforms for the SOEs. With ambitious plan in an attempt to solve the difficulties of the SOEs within three years, the central government decided to speed up the reform process. During the period of 1998 to 2002, more than 27 million workers have been laid off in the state sector.

Increased urban unemployment and massive layoffs in the SOEs have resulted in rapid rise in urban poverty and severe deterioration in urban income distribution. In order to help the unemployed and the laid-off workers in urban areas, the Chinese government has adopted a series of policy measures, among which the implementation of the "reemployment engineering" project has received considerable attention. The project of "reemployment engineering" was firstly launched in 1993 on an experimental basis in 30 selected cities, and then it was officially spread and implemented throughout the country in 1995. By providing job recommendation, re-employed vocational guidance and job training, the "reemployment engineering" project generally served the unemployed and helped them to find new jobs.

However, to better reduce urban inequality and to alleviate urban poverty, more effective reform policy measures are still needed to be forwarded in the future, among which the establishment of an effective social safety net and further reforms in the financial sector are at the center of public concerns. In the present study, we primarily focus on the role of financial development in influencing income inequality in urban China. Meanwhile, due to the divergence in the theoretical predictions on the financial-inequality relationship, it is of great interest to understand the transmission mechanisms through which financial development affects income distribution.

4. ECONOMETRIC MODEL METHODOLOGY AND DATA

Theoretical studies have shown that financial development can affect income distribution through multifaceted channels. In this study, we attempt to empirically explore the impacts of financial development on income inequality in urban China. Because distinct predictions on the finance-inequality relationship have been made by alternative existing theories, thus in the following analyses, different theoretical hypotheses (i.e., the linear hypothesis and the inverted U-shaped hypothesis) will be tested successively with the help of Chinese provincial data and the methodology of system GMM estimations.

4.1. Econometric Model

In our empirical estimations on the relationship between financial development and income inequality, Chinese provincial urban Gini coefficients ($GINI$) will be employed as the dependent variable.[2] In order to measure the level of financial development, three financial indicators have been constructed and included into the econometric model, i.e., $FGDP$, defined as the share of financial sector in GDP; $FDEPTH$, defined as the ratio of total credits to gross fixed capital formation; and $FPRIVATE$, defined as the share of credits allocated to private sector.[3] More specifically, to test the linear hypothesis suggested by Banerjee and Newman (1993) and Galor and Zeira (1993), the econometric model can be written as follows:

$$\begin{aligned} GINI_{i,t} = {} & \alpha + \beta_0 GINI_{i,t-1} + \beta_1 FINANCE_{i,t} + \beta_2 Y_{i,t} + \beta_3 Y_{i,t}^2 + \beta_4 EDU_{i,t} \\ & + \beta_5 RSOE_{i,t} + \beta_6 OPEN_{i,t} + \beta_7 UNEM_{i,t} + \mu_i + \varepsilon_{i,t}, \end{aligned} \tag{10}$$

where $GINI$ is the urban Gini coefficient; $FINANCE$ is a vector of financial variables; Y is the logarithm of real urban per capita disposable income, and Y^2 is its squared term; EDU is the variable of education development, measured by the share of population with educational attainment of college and higher level; $RSOE$ is the ratio of employment in urban state-owned units to the total urban employment; $OPEN$

[2] Chinese provincial Gini coefficients are calculated from the Urban Household Income and Expenditure Survey (UHIES) conducted by China's National Bureau of Statistics (NBS) over the period of 1986 to 2000.

[3] In our study, the financial variables used for estimations are calculated at the aggregate provincial level (not just the urban sector). Ideally, one may want to use the urban measures of financial development. However, due to the limitation of China's statistics, the data for urban financial development are not available at the provincial level for China. Therefore, the financial variables calculated at the aggregate provincial level are applied here as proxies to measure China's financial development in urban areas for all the Chinese provinces.

is the variable of openness, calculated as the ratio of the sum of exports and imports to GDP; $UNEM$ is the urban registered unemployment rate;[4] and the subscripts i and t index provinces and time respectively. In addition, this specification also contains an unobservable province-specific effect μ and an error term ε. Table 2 presents the definitions of variables. Descriptive statistics for all these variables can be found in Table 3.

Moreover, to test the Greenwood-Jovanovic hypothesis of an inverted U-shaped relationship between finance and inequality, the squared terms of financial variables are added and included into Equation (10), and thus the regression model can be rewritten as follows:

$$\begin{aligned} GINI_{i,t} = {} & \alpha + \beta_0 GINI_{i,t-1} + \beta_1 FINANCE_{i,t} + \beta_2 FINANCE_{i,t}^2 + \beta_3 Y_{i,t} + \beta_4 Y_{i,t}^2 \\ & + \beta_5 EDU_{i,t} + \beta_6 RSOE_{i,t} + \beta_7 OPEN_{i,t} + \beta_8 UNEM_{i,t} + \mu_i + \varepsilon_{i,t}. \end{aligned} \tag{11}$$

Table 2. Definitions of Variables

Variable	Definition
Dependent Variable:	
GINI	urban Gini coefficient
Financial Variables:	
FGDP	the share of financial sector in GDP
FDEPTH	the ratio of total credits to gross fixed capital formation
FPRIVATE	the share of credits allocated to private sector
Control Variables:	
Y	the logarithm of real urban per capita disposable income
EDU	the indicator of education development, measured by the share of population with educational attainment of college and higher level
UNEM	urban registered unemployment rate
RSOE	the ratio of employment in urban state-owned units to the total urban employment
OPEN	the variable of openness, measured as the ratio of the sum of exports and imports to GDP

[4] Because the official statistics on urban unemployment are not available in China, the urban registered unemployment rate is used in our estimations as an alternative indicator to reflect the urban unemployment condition.

Table 3. Descriptive Statistics of Variables

	Mean	Std. Dev.	Minimum	Maximum	Observations
GINI	0.2275	0.0372	0.14	0.35	432
FGDP	0.0563	0.0224	0.0086	0.1529	435
FPRIVATE	0.0882	0.0669	0.0030	0.3362	435
FDEPTH	2.9113	0.7860	1.4798	5.3954	435
Y	7.0757	0.3946	6.2641	8.4023	435
EDU	0.0256	0.0260	0.0019	0.1913	433
UNEM	0.0287	0.0130	0.003	0.08	433
OPEN	0.2151	0.2699	0.0213	1.9284	435
RSOE	0.6701	0.0984	0.3420	0.8543	435

GINI: urban Gini coefficient; FGDP: the share of financial sector in GDP; FDEPTH: the ratio of total credits to gross fixed capital formation; FPRIVATE: the share of credits allocated to private sector; Y: the logarithm of real urban per capita disposable income; EDU: the level of education development; UNEM: urban registered unemployment rate; OPEN: the variable of openness; RSOE: the ratio of employment in urban state-owned units to the total urban employment.

4.2. Methodology of GMM Estimators for Panel Models

The methodology of Generalized Method of Moments (GMM) for panel data analyses, proposed by Arellano and Bond (1991) and then further developed by Blundell and Bond (1998), is employed here to control for endogeneity in our estimations.[5] Consider the following model

$$Z_{i,t} = \gamma_1 EX_{i,t} + \gamma_2 EW_{i,t} + \nu_i + \eta_{i,t}, \qquad i = 1,..., N;\ t = 1,..., T, \tag{12}$$

where Z is a given dependent variable, *EX* is a vector of strictly exogenous covariates; *EW* denotes a vector of predetermined covariates and endogenous covariates (predetermined variables are assumed to be correlated with past errors, while endogenous ones are assumed to be correlated with past and present errors); ν_i is the unobserved group-level effect, and η_{it} is the error term, with the assumption that ν_i and η_{it} are independent for each i over all t, and that there is no autocorrelation in the η_{it}.

First, in order to eliminate the unobservable group-specific effects, we difference Equation (12) and then it can be rewritten as

[5] The literature on the GMM estimator is enormous and continually expanding. Useful recent summary of GMM estimation and some further discussion can be found in e.g., Green (2000, Chapter 11) and Wooldridge (2002, Chapter 8 and Chapter 14).

$$Z_{i,t} - Z_{i,t-1} = \gamma_1(EX_{i,t} - EX_{i,t-1}) + \gamma_2(EW_{i,t} - EW_{i,t-1}) + (\eta_{i,t} - \eta_{i,t-1}). \quad (13)$$

Second, instrumental-variable approaches are applied to deal with the endogeneity of explanatory variables in Equation (13), where the predetermined and endogenous variables in first differences are instrumented with appropriate lags of the specified variables in levels, while strictly exogenous regressors are first-differenced for use as instruments in the first-differenced equation.

However, the efficiency of this instrumental approach may be relatively weak, given the fact that lagged levels are often poor instruments for first differences. Therefore, Blundell and Bond (1998) propose the System-GMM approach, in which the first-differenced estimator (i.e., Equation (13)) is combined with the estimator in levels (i.e., Equation (12)) to form a more efficient "system estimator": for the first-differenced equation, the instruments are the same as that discussed above; for the levels equation, predetermined and endogenous variables in levels are instrumented with appropriate lags of their own first differences, while the strictly exogenous regressors can directly enter the instrument matrix for use in the levels equation.

The GMM estimator has been widely employed in recent empirical works, particularly in the studies of macroeconomics and finance. This method has a number of advantages. For instance, Beck *et al*. (2000) argue that the GMM panel estimator is good in exploiting the time-series variation in the data, accounting for unobserved individual specific effects, and therefore providing better control for endogeneity of all the explanatory variables. Following Beck *et al*. (2000), we use the GMM estimator to investigate the finance-inequality nexus in urban China.

4.3 Data

Our empirical work is based on a panel data set covering 29 Chinese provinces over the period of 1986-2000.[6] Data used in our empirical test are from *China Statistical Yearbook* (various issues), *Almanac of China's Finance and Banking* (various issues), *China Labour Statistical Yearbook* (various issues), *Comprehensive Statistical Data and Materials on 50 Years of China*, individual Provincial Statistical Yearbooks, and China's National Bureau of Statistics.

[6] The 29 provinces included in our sample are: Beijing, Tianjin, Hebei, Shanxi, Inter Mongolia, Liaoning, Jilin, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Hainan, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang. Tibet has been excluded from our sample because of serious problems of omitted data and missing value for this region. Chongqing municipality area, established quite recently and separated from Sichuan province in the year 1997, will still be included in the calculation of Sichuan province, because data before 1997 do not allow us to distinguish between Sichuan and Chongqing.

5. EMPIRICAL RESULTS

Based on the methodology of the system-GMM estimator, we use Chinese provincial data to empirically test alternative theoretical hypotheses on the relationship between financial development and income inequality. For each regression, we test the specification of equation with the Hansen test of over-identifying restrictions, and then with the Arellano-Bond test for the second order serial correlation. The test results show that all the regressions satisfy the specification tests, which indicates that our instruments are valid and there exists no evidence of second order serial correlation in our regressions.

For the empirical test of the linear hypothesis (e.g., Banerjee & Newman (1993); Galor & Zeira (1993)), estimated results are reported in Table 4. In our estimations, all the financial variables are significant with the expected signs. First, the coefficients of FGDP are negative and significant at the 5% level in regression (1), and at the 10% level for regressions (2) and (3), which suggests that urban income inequality is lower in provinces with better-developed financial sector. Secondly, we find that FDEPTH is significantly and negatively correlated with urban income inequality, indicating that the development of financial sector will lower urban inequality in China. Thirdly, it is also reported that the coefficient of FPRIVATE are negative and highly significant at the 1% level in regressions (2) and (3), and at the 10% level for regression (1), which suggests that an increase in the share of credits allocated to private sector will highly contribute to the reduction of China's urban inequality. Therefore, our empirical results show that financial development can significantly reduce income inequality in urban China, which provides strong support to the linear hypothesis.

As for the control variables, a positive and statistically significant impact of urban unemployment $(UNEM)$ on urban inequality is reported in Table 4, which indicates that the increase in urban unemployment has aggravated urban income inequality in post-reform China. Moreover, empirical evidence also suggests that urban income distribution is more equal in regions with higher proportion of state-owned employment $(RSOE)$; however, the development of education (EDU) tends to enlarge the income gap among the urban households. Meanwhile, we find that in all of the regressions, the coefficients of Y and its squared term Y^2 are statistically significant. The positive coefficient of Y and the negative coefficient of Y^2 suggest an inverted U-shaped relationship between growth and inequality, which is in consistent with the findings and insights of Kuznets (1955).

Table 4. Financial Development and Income Inequality in Urban China: Test for the Linear Hypothesis [1] (Dependent Variable = $GINI_{i,t}$: Urban Gini Coefficient)

	Regression (1)	Regression (2)	Regression (3)
$GINI_{i,t-1}$	0.8221***	0.8156***	0.7981***
	(16.16)	(16.61)	(14.78)
Financial Variable:			
$FGDP_{i,t}$	-0.1545**	-0.1178*	-0.1293*
	(-2.74)	(-1.74)	(-1.81)
$FDEPTH_{i,t}$	-0.0024**	-0.0033***	-0.0033***
	(-2.62)	(-4.38)	(-4.60)
$FPRIVATE_{i,t}$	-0.0298*	-0.0528***	-0.0486***
	(-1.96)	(-3.75)	(-3.41)
Per Capita Income:			
$Y_{i,t}$	0.0835*	0.1172*	0.1117*
	(1.88)	(1.83)	(1.76)
$Y_{i,t}^2$ (Squared term)	-0.0052*	-0.0078*	-0.0075*
	(-1.71)	(-1.76)	(-1.70)
Other Control Variables:			
$EDU_{i,t}$	0.0595	0.0640	0.0858*
	(1.01)	(1.34)	(1.70)
$RSOE_{i,t}$		-0.0331***	-0.0341***
		(-2.87)	(-3.06)
$OPEN_{i,t}$		0.0048	0.0066
		(1.28)	(1.61)
$UNEM_{i,t}$			0.1463*
			(1.79)
Constant	-0.2685*	-0.3479	-0.3255
	(-1.68)	(-1.53)	(-1.44)
Hansen test of over-identifying Restrictions	Chi2=24.01 Prob.>Chi2=1.000	Chi2=23.74 Prob.>Chi2=1.000	Chi2=19.29 Prob.>Chi2=1.000
Arellano-Bond test for second order serial correlation	Z=0.56 Prob.>Z=0.574	Z=0.55 Prob.>Z=0.582	Z=0.57 Prob.>Z=0.570
Observations	402	402	402
Provinces	29	29	29

Notes: [1)] This hypothesis suggests a negative and linear relationship between finance and inequality (e.g., Galor & Zeira (1993); Banerjee & Newman (1993)). [2)] ***: significant at the 1% level; **: significant at the 5% level; *: significant at the 10% level; for all regressions, T-statistics values are presented in parentheses.

Furthermore, to test the Greenwood-Jovanovic hypothesis of an inverted U-shaped relationship between finance and inequality, the squared terms of the financial variables are included in the econometric estimations. Empirical results are presented in Table 5. In all our regressions, however, we find that the coefficients of both the financial variables and their squared terms are never statistically significant. Therefore, our empirical results offer weak support to the inverted U-shaped hypothesis.

Table 5. Financial Development and Income Inequality in Urban China: Test for the Inverted U-shaped Hypothesis [1] (Dependent Variable = $GINI_{i,t}$: Urban Gini Coefficient)

	Regression (1)	Regression (2)	Regression (3)
$GINI_{i,t-1}$	1.3465***	0.8316***	0.8028***
	(3.38)	(16.66)	(15.47)
Financial Variable:			
$FGDP_{i,t}$	0.9981	-0.0135	-0.0472
	(1.25)	(-0.07)	(-0.23)
$FGDP_{i,t}^2$	-8.1095	-0.7955	-0.6599
	(-1.41)	(-0.60)	(-0.50)
$FDEPTH_{i,t}$	0.0238	-0.0075	-0.0046
	(0.66)	(-1.00)	(-0.64)
$FDEPTH_{i,t}^2$	-0.0028	0.0006	0.0002
	(-0.64)	(0.57)	(0.20)
$FPRIVATE_{i,t}$	0.1316	-0.0356	-0.0255
	(1.11)	(-0.79)	(-0.59)
$FPRIVATE_{i,t}^2$	0.1928	-0.0248	-0.0478
	(0.46)	(-0.17)	(-0.32)
Per Capita Income:			
$Y_{i,t}$	-2.1835	-0.0808	0.0811
	(-1.63)	(-1.06)	(1.31)
$Y_{i,t}^2$	0.1504	0.0058	-0.0055
	(1.60)	(1.09)	(-1.27)
Other Control Variables:			
$EDU_{i,t}$	-0.0654	0.0848	0.1113*
	(-0.20)	(1.29)	(1.94)

$RSOE_{i,t}$		-0.0378***	-0.0339***
		(-3.25)	(-3.30)
$OPEN_{i,t}$		-0.0008	0.0059
		(-0.17)	(1.20)
$UNEM_{i,t}$			0.1690**
			(2.19)
Constant	7.7422*	0.3721	-0.2148
	(1.68)	(1.41)	(-1.00)
Hansen test of over-identifying Restrictions	Chi2=20.01 Prob.>Chi2=1.000	Chi2=15.24 Prob.>Chi2=1.000	Chi2=16.05 Prob.>Chi2=1.000
Arellano-Bond test for second order serial correlation	Z=0.23 Prob.>Z=0.816	Z=0.52 Prob.>Z=0.601	Z=0.56 Prob.>Z=0.578
Observations	402	402	402
Provinces	29	29	29

Notes:[1)] This hypothesis suggests that there exists an inverted U-shaped relationship between finance and inequality (e.g., Greenwood & Jovanovic (1990)). [2)] ***: significant at the 1% level; **: significant at the 5% level; *: significant at the 10% level; for all regressions, T-statistics values are presented in parentheses.

In sum, we find a negative and linear relationship between finance and inequality in urban China. Our empirical evident provides strong support to the linear hypothesis suggested by Banerjee and Newman (1993) and Galor and Zeira (1993), but not to the inverted U-shaped hypothesis predicted by Greenwood and Jovanovic (1990). These results are also consistent with the findings in Clark *et al*. (2003).

6. CONCLUSION

Theoretical predictions on the finance-inequality nexus are inconclusive and mixed. Greenwood and Jovanovic (1990) suggest an inverted U-shaped relationship between finance and inequality, while a negative and linear relationship is predicted in some other theoretical models (e.g., Banerjee & Newman (1993); Galor & Zeira (1993)).

In the present study, we attempt to test these alternative theoretical hypotheses in the context of China. With the help of a new panel dataset covering 29 Chinese provinces over the period of 1986-2000, we empirically investigate the impacts of financial development on income inequality in urban China.

We find that financial development can significantly help to reduce urban inequality in post-reform China. In order to better enhance the role of finance in reducing inequality and to improve the condition of income distribution in urban China, further

steps have to be forwarded to accelerate China's financial development, and effective policy measures should also be taken to strengthen China's financial systems.

Moreover, in our estimations, empirical results provide strong support to the linear hypothesis, but not to the Greenwood-Jovanovic hypothesis of an inverted U-shaped relationship between finance and inequality. Nevertheless, due to the limitation of our data series and statistics, this result should be interpreted with caution. More advanced studies with broader dataset that covers a longer data period are greatly encouraged to deepen our understanding on the finance-inequality linkage. Meanwhile, further researches based on more detailed survey data at the micro-level (if available) are also highly recommended to draw more convincing conclusion on this critical issue. A better understanding on the relationship between financial development and income inequality can shed light on the further development not only for China, but also for the other developing countries.

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