Do Agricultural Loans Help Reduce Rural-Urban Income Inequality? Evidence from Chinese Provincial Data 1978-2013

Wenli Cheng† and Yongzheng Wu‡

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Abstract:
We hypothesize that (1) dualism (i.e., low agricultural productivity relative to economy-wide productivity) is an important contributing factor to rural-urban inequality; and (2) the degree of dualism is influenced by the agricultural sector’s ability to obtain loans. We present evidence from Chinese provincial data for the period 1978-2013 which confirm our hypotheses, and contend that improving access to agricultural loans would help reduce rural-urban income inequality.

Keywords: rural-urban income inequality in China, agricultural loans, agricultural productivity, dual economy

JEL Classification Numbers: O15, O53

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1. Introduction

The root of China’s rural-urban income inequality lies in the heavy-industry development strategy of the centrally planned system before 1978 (Yang, 2002). To implement this strategy, the government monopolized procurement and sale of agricultural commodities which suppressed prices, organized agricultural production in the people’s communes which lowered productivity, and introduced the household registration system (*hukou*) which restricted rural to urban migration. Through these policies, the government extracted agricultural surplus to meet the capital needs of urban industries and to provide urban-based subsidies. As a result, the urban-rural disparity grew to be a major economic and social problem.

As part of reforms that began in the late 1970s, the government raised procurement prices for agricultural products, endorsed the household responsibility system and loosened restrictions on labor mobility. These changes helped to produce rapid increases in rural household income and reduced rural-urban income inequality in the first half of the 1980s. However, as shown in Figure 1, rural-urban income inequity began to rise in the mid-1980s, and followed an upward trend for about a decade. After a few years of improvement between 1995 and 1998, inequality started to climb again, reaching a peak in 2003 and stayed at about that level until the end of the 2000s. There are however encouraging signs of declining rural-urban inequality since 2010.

The time pattern of rural-urban inequality as shown in Figure 1 suggests a possible Kuznets inverted-U relationship between inequality and economic development, but obviously there were other factors driving the evolution of rural-urban inequality. This paper will first test whether the Kuznets thesis applies to the Chinese experience over the post-reform period of 1978-2013 and then study other drivers of inequality, paying special attention to the role of duality (i.e., low agricultural productivity relative to economy-wide productivity). In particular, we show that (1) dualism is an important contributing factor to rural-urban inequality; and (2) the degree of dualism is influenced by the agricultural sector’s ability to obtain loans.

Our paper draws on three strands of literature. The first is that on the Kuznets hypothesis which postulates an inverted-U relationship between income inequality and economic development. Building on Kuznets’ original insight that urbanization plays an important role in explaining the initial rise and subsequent fall in inequality, later researchers (Robinson, 1976,
Knight, 1976, and Fields, 1979) have demonstrated theoretically that in a two-sector economy, as a larger share of the population moves to the urban sector, the level of inequality will follow an inverted-U path. While a number of authors have detected the Kuznets relationship between inequality and development in cross-country studies (see for instance, Ahluwalia, 1976), little research effort has been devoted to testing the Kuznets hypothesis in the Chinese economy. In an earlier paper (Cheng and Wu, 2015), we have identified the Kuznets relationship in the Chinese provincial data for the period 1978-2011. In this paper, we extend our data period to 2013 and confirm the relationship again. However, the main purpose of this paper is not to test the Kuznets hypothesis, but to examine other drivers of inequality, in particular duality and agricultural loans, after having controlled for the Kuznets process.

The second strand of literature this paper builds on is the theory of dual economies. Standard neoclassical economic theory predicts that if marginal productivity is higher in one sector than another, factors of production will be attracted to the higher-productivity sector. The factor movement will continue until marginal productivities are equalized across all sectors. In real economies (especially developing economies), however, such factor movements may be significantly constrained so that we have dual economies. In this paper, we refer to dualism as the persistent and significant productivity difference between the rural sector and the rest of the economy and measure it by the ratio of economy-wide average productivity to agricultural productivity.

There are several reasons why dualism may be a prominent feature of developing economies. For example, in early stages of development, the level of capital accumulation is low which means the urban sector cannot absorb all the rural labor willing to migrate to urban areas. This gives rise to the phenomenon of “unlimited supplies of labor” in the sense that the supply of labor to the urban sector exceeds the demand at the prevailing wage which is determined by the earnings in the rural sector (Lewis, 1954). Another reason that frustrates labor movement away from the low productivity rural sector is that urban wages may be set above the competitive level by institutional forces, which lowers labor demand (Todaro, 1969; Harris and Todaro, 1970). In the Chinese context, perhaps the most important factor restricting labor movement from rural to urban areas is the hukou system. During the early years of the reforms, the hukou system in effect prevented rural to urban migration. As migration rules gradually relaxed in the 1990s, migration was still significantly restricted since rural migrants were denied permanent residency
in cities, which meant they did not have access to government services including unemployment insurance, health insurance, pension and their children’s public education. It was not until 2002 when middle-sized cities began granting permanent residency to some migrants (Meng and Zhang, 2001; Lin et al., 2004). Today the *hukou* system remains a barrier to free migration within China.

We argue that, in addition to restrictions on labor mobility created by the *hukou* system, another contributing factor to dualism in China is the lack of access to finance by the agricultural sector. To develop our argument, we draw on the third strand of literature which is that on the relationship between finance and development. According to this literature, a well-developed financial system enhances economic development because it promotes efficient accumulation and allocation of capital at the macroeconomic level (King and Levine, 1993; Levine, 1997). At the microeconomic level, abundant empirical evidence show that access to finance promotes business start-ups (Aghion et al, 2007), innovation and productivity (Ayyagari et al, 2011).

Given the importance of access to finance on agricultural productivity, it is unfortunate that rural financial reforms in China have not been consistent in their efforts towards improved credit access. When rural financial reforms began in the 1980s, the authorities delegated decision rights to rural financial institutions (the rural credit cooperatives), and permitted entrepreneurs to enter the rural financial intermediation market. Meanwhile, Agricultural Bank of China relaxed its loan conditions, including waiving collateral requirements for household businesses. These reforms considerably eased credit constraint for rural households and businesses. However, many of these initial reforms were reversed in the 1990s when all forms of informal finance were declared illegal and collateral requirements were reinstated and tightened (Huang, 2012). Moreover, the big four state-owned banks withdrew from rural lending at grass roots levels, which further tightened the credit condition in rural areas. Starting from 2003, the government launched a new round of rural financial reforms, which, among other things, provided capital support to rural credit cooperatives and gave them greater autonomy in both their operational decisions and choice of organizational forms (Zhu, 2014). The government has also gradually eased their restrictions on informal finance and tried to bring them into the regulated sector. For instance, the government enacted the law on micro-credit companies in 2008, which allowed

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1 Huang (2012) contends that the reversal in rural financial reforms was driven by “urban technocrats” who needed to mobilize financial resources to meet the requirement of large urban infrastructure projects that they favored.
informal financial institutions to set up micro-credit companies and village banks, or gain a legal status through investing in rural credit cooperatives and rural commercial banks (Beck and Yang, 2015). It is hoped that these recent reforms will in time significantly ease credit constraints for the rural sector.

A contribution of this paper is that it investigates how the changes in rural credit access may have affected agricultural productivity relative to economy-wide productivity (i.e., dualism) in China. It finds that, over the period 1978-2013, better access to agricultural loans was associated with higher relative agricultural productivity (i.e., lower levels of dualism); which in turn was related to lower rural-urban inequality. This result suggests that policies that improve rural credit access may also be effective in promoting income equality between rural and urban areas.

The rest of this paper is organized as follows. Section 2 specifies our empirical models. Section 3 describes the data. Section 4 presents the estimation results, and section 5 concludes.

2. Model specifications

Our research proceeds by answering the following questions in sequence: (1) was there a Kuznets inverted-U relationship between rural-urban inequality and the level of economic development? (2) Is so, was this relationship driven by the process of urbanization? (3) Having controlled for the Kuznets relationship (and other relevant factors), was dualism a contributor to rural-urban income inequality? (4) Was access to agricultural loans a determinant of dualism? (5) Did agricultural loans help reduce rural-urban income inequality?

To answer these questions, we estimate the following equations:

\[
\ln(\text{TT}_{it}) = \alpha_0 + \alpha_1 \ln(\text{RGDPP})_{it} + \alpha_2 (\ln(\text{RGDPP})_{it})^2 + v_{it} + u_{ita} \tag{1}
\]

\[
\ln(\text{TT}_{it}) = \beta_0 + \beta_1 \ln(\text{URBAN})_{it} + \beta_2 (\ln(\text{URBAN})_{it})^2 + \beta_3 \ln(\text{DUAL})_{it} + \beta_4 \ln(FDI)_{it} + \beta_5 \ln(CPI)_{it} + \beta_6 \ln(SEDU)_{it-5} + \beta_7 T1992 + \beta_8 T2002 + \beta_9 T2008 + v_{2i} + u_{2ia} \tag{2}
\]

\[
\ln(\text{DUAL})_{it} = \gamma_0 + \gamma_1 \ln(\text{LOANAG})_{it} + \gamma_2 T1992 + \gamma_3 T2002 + \gamma_4 T2008 + v_{3i} + u_{3ia} \tag{3}
\]

\[
\ln(\text{TT}_{it}) = \lambda_0 + \lambda_1 \ln(\text{URBAN})_{it} + \lambda_2 (\ln(\text{URBAN})_{it})^2 + \lambda_3 \ln(\text{LOANAG})_{it} + \lambda_4 \ln(FDI)_{it} + \lambda_5 \ln(CPI)_{it} + \lambda_6 \ln(SEDU)_{it-5} + \lambda_7 T1992 + \lambda_8 T2002 + \lambda_9 T2008 + v_{4i} + u_{4ia} \tag{4}
\]
In the above equations, all variables are in natural log form. $TT$ is the Theil index used to measure rural-urban inequality; $RGDPP$ is real GDP per person; $URBAN$ is urbanization, $DUAL$ is dualism measured by the inverse of agricultural productivity relative to economy-wide productivity, $FDI$ is the ratio of foreign direct investment to GDP; $CPI$ is consumer price index; $SEDU$ is secondary education enrollment; $LOANAG$ is agricultural loans as a share of total loans; $T1992$, $T2002$ and $T2008$ are time dummies which separate the data period into 4 sub-periods, 1978-1992, 1993-2002, 2003-2008, and 2009-2013; $v_{jt}$ ($j=1,2,3,4$) is provincial fixed effects in equation (j); and $u_{jt}$ is the error term for equation (j).

The estimation of equation (1) allows us to test the Kuznets relationship in the simplest conventional way, which measures the level of development by real GDP per person. If there is a Kuznets inverted-U relationship between inequality and economic development, then $\alpha_1$ is positive and $\alpha_2$ is negative.

In the event of equation (1) identifies a Kuznets process, we proceed to estimate equation (2) to examine whether the non-linear relationship is driven by urbanization, and to investigate whether dualism ($DUAL$) contributes to rural-urban inequality in China, controlling for other variables, namely, foreign direct investment ($FDI$), inflation ($CPI$), and education ($SEDU$).

If dualism proves to be a significant driver of rural-urban inequality, we then estimate equation (3) to investigate whether access to loans by the agricultural sector ($LOANAG$) is a significant explanatory variable of dualism ($DUAL$).

Finally if agricultural loans ($LOANAG$) is found to be a driver of dualism, we estimate equation (4) to study the effect of agricultural loans on rural-urban inequality.

We explain our model specifications further below. In equation (2), we replace real GDP per person ($RGDPP$) with urbanization ($URBAN$) to test Kuznets’ contention that urbanization is driving force behind the non-linear relationship between inequality and development (Kuznets, 1955). If his contention applies to the Chinese experience, we would find the coefficient of $ln(URBAN)$ to be positive and that of $(ln(URBAN))^2$ to be negative.

Besides urbanization, dualism ($DUAL$) is the other variable that we focus on. As noted in the last section, dualism measures the productivity difference between agriculture and the economy as a whole. In ideal model economies, marginal productivity levels of different sectors tend to equalize through factor mobility across sectors. In real economies, however, this
productivity equalization tendency is thwarted by restrictions and polity distortions to factor movements. In China for example, the *hukou* system restricts rural to urban labor migration, and government policies at various times have favored urban development at the expense of rural development. As a result, agricultural productivity has been persistently and significantly below that of the economy as a whole. Since productivity is the most important determinants of income generating capacity, we expect that the more agricultural productivity lags behind that of the economy as a whole (i.e., a higher value of $DUAL$), the greater rural-urban income equality will be. In other words, we expect $\beta_3$ to be positive.

We have three control variables in equation (2), foreign direct investment ($FDI$), inflation ($CPI$) and education ($SEDU$).

Foreign direct investment ($FDI$) is a measure of openness. Since most foreign direct investment goes to urban rather than rural areas, we expect that $FDI$ would increase rural-urban inequality, i.e., $\beta_4$ is positive.

Inflation ($CPI$) driven by an increase in money supply can affect inequality through two different channels. One is the short-run trade-off between inflation and unemployment as depicted by the Philips curve. Since a reduction in unemployment tends to benefit the urban poor more, measured rural-urban inequality may rise. Another channel is the so-called Cantillon effect. Cantillon (1755) argues that when money supply increases, some people receive the new money first. As they spend it, the money is passed on to their suppliers, who in turn pass it on through spending. For the early recipients of the new money, their income rises before the prices of the goods they buy, whereas for the late recipients, prices rise before their income does, therefore inflation benefits the early recipients at the expense of the late recipients. Since high income earners especially those in the urban region tend to have better access to finance (Bai and Cheng, 2014), inflation is likely to redistribute wealth from the rural poor to the urban rich, therefore exacerbate rural-urban inequality. We thus expect a positive relationship between inflation and rural-urban inequality, i.e., $\beta_5$ is positive.

Secondary education ($SEDU$) is generally regarded in the literature as an equalizer of income in the long run for two reasons. First, for low income families, human capital can be more easily acquired (through education) than physical or financial capital. Secondly, human capital is less prone to concentration than physical capital as the accumulation of human capital
involves learning and skills acquisition across the wider population (Ahluwalis, 1976). However, as more educated rural residents are more likely to migrate to cities, the “brain drain” might increase measured rural-urban inequality. Nevertheless, we consider that on balance, the expansion of secondary education would have a beneficial effect of reducing rural-urban inequality. That is, we expect \( \beta_6 \) to be negative.

We have included 3 time dummies, \( T1992, T2002, \) and \( T2008 \) in equation (2) which impose 3 structural breaks in the data. \( T1992 \) captures Deng Xiaoping’s southern tour in 1992 which sped up the pace of urban reforms in China; \( T2002 \) captures a major relaxation of the hukou system which allows some (relatively well-off) rural migrants to gain permanent residency in middle-sized cities; \( T2008 \) captures the Chinese government’s large urban-biased fiscal stimulus following the global financial crisis. Since all three events favored urban development, we expect the coefficients of all three dummy variables to be positive.

In equation (3), agricultural loan as a share of total loans (\( \text{LOANAG} \)) and the 3 time dummies are specified as explanatory variables for dualism (\( \text{DUAL} \)). As discussed in the introduction section, a lack of access to finance by the agricultural sector has been a constraint to progress in agricultural productivity. While initial rural financial reforms improved access to finance in rural areas, the reversal of reforms in the 1990s tightening the credit constraint faced by the rural sector. More recent policy initiatives aim to enhance credit access in rural areas. These changes in credit access in rural areas are likely to have played a significant role in determining agricultural productivity. We hypothesize that an increase in agricultural loan as share of total loans (\( \text{LOANAG} \)) would narrow the productivity gap between agriculture and the economy as a whole. That is, we expect \( \gamma_1 \) to be negative. The coefficients of the time dummies in equation (3) are expected to have the same signs as those in equation (2).

Equation (4) is the same as equation (2) except that \( \text{DUAL} \) is replaced by \( \text{LOANAG} \). Since better access to agricultural loans is expected to improve relative agricultural productivity which in turn will increase relative rural income, we expect that improved access to agricultural loans to reduce rural-urban inequality, that is, we expect \( \lambda_3 \) to be negative. The coefficients of other variables in equation (4) are expected to have the same signs as those in equation (2).
3. Data and variable definition


The definitions of all variables in our model together with their corresponding data sources are presented in Table 1. Some summary statistics are provided in the Appendix.

The Theil index \((TT)\) is our measure of income inequality. The Theil index has its origin in Shannon’s (1948) information theory. If we consider a population that is divided into \(i\) groups each with \(j\) subgroups, the Theil index can be written as follows (Conceicao and Galbraith, 2000):

\[
TT = \sum_{i} \sum_{j} \frac{Y_{ij}}{Y} \ln \left( \frac{Y_{ij}}{Y} \cdot \frac{N_{ij}}{N} \right)
\]

To calculate the provincial panel Theil index, we rewrite equation (A2) to

\[
TT = \sum_{i=1}^{2} \frac{Y_i}{Y} \ln \left( \frac{Y_i}{Y} \cdot \frac{N_i}{N} \right)
\]

where \(Y_i\) = total annual disposable income of urban households

\(Y_2\) = total annual net income of urban households

\(Y = Y_1 + Y_2\)

\(N_1\) = urban population

\(N_2\) = rural population

\(N = N_1 + N_2\)

\(RGDP\) is real GDP per person at 2005 prices. At the beginning of our data period of 1978, \(RGDP\) was 1924 Chinese yuan, by the end of the data period of 2013, \(RGDP\) was 32880 Chinese yuan, which was 17 times the 1978 level.

\(URBAN\) is the degree of urbanization measured by the share of urban population in total population. The degree of urbanization has increased substantially over our data period. In 1978, on average 22% of the population resided in urban areas. By 2013, the figure had risen to 54%.

\(DUAL\) is measured by the inverse of agricultural labor productivity relative to economy-wide labor productivity, thus a larger value of \(DUAL\) indicates a lower relative productivity of
agriculture. Since the primary sector in China contains mainly agriculture, it is often treated as being “equivalent to” agriculture in the literature (Fan et al. 2003). Hence we use primary sector productivity as a proxy for agricultural productivity. $DUAL$ fell in the 1980s, but rose in the 1990s and 2000s.

$FDI$ is the ratio of foreign direct investment to GDP. In 1979, the ratio of FDI to GDP was about 0.12%, this rose to 4.98% in 1995, but fell to between 2-3% in the 2000s. Unfortunately provincial data on $FDI$ are only available for the period 1979-2012 instead of 1978-2013.

$CPI$ is the consumer price index. The coefficients of $LN(CPI)$ in our estimation equations (2) and (4) measure the effects of a percentage change in CPI on rural-urban inequality, that, the effects of inflation on rural-urban inequality.

$SEDU$ is secondary education enrollment per 100 population (lagged by 5 years). Secondary enrollment increased from 4.1 in 1973 to 7.3 in 2008.

4. Estimation results

We use Generalized Method of Moments (GMM) (Hansen, 1982) for our panel data estimation. Explanatory variables lagged one period are used as instruments. The estimation results are presented in Table 2.

Our estimation of equation (1) show that the coefficient of $ln(RGDPP)$ is significantly positive and that of $(ln(RGDPP))^2$ is significantly negative. That is, there is an inverted-U relationship between rural-urban inequality and economic development.

From the estimation results of equation (2) and equation (4), we see that the coefficient of $ln(URBAN)$ is positive and significant; and that of $(ln(URBAN))^2$ is negative and significant. This suggests that consistent with Kuznets’ original explanation, urbanization was driving the nonlinear relationship between rural-urban inequality and development.

Our estimation of equation (2) also shows that $ln(DUAL)$ had positive and significant effect on $ln(TT)$. Recall that a high value of $ln(DUAL)$ indicates a larger gap between agricultural productivity and economy-wide productivity, the estimate confirms our hypothesis that relatively low agricultural productivity would contribute to high rural-urban income inequality. This result is consistent with Nielson (1994) and Bourguignon and Morrison (1998) who find a similar effect of dualism on inequality in cross-country analyses.
Having identified the significant role of dualism on inequality from estimating equation (2), we estimate equation (3) to test whether access to agricultural loans played a significant role in determining dualism. The results show that the coefficient of $\ln(\text{LOANAG})$ is negative and significant, which means that a higher level of agricultural loans was associated with a smaller productivity gap between agriculture and the economy as a whole (a lower level of dualism). This confirms our conjecture that access to agricultural loans is a significant determinant of agricultural productivity, which in turn should affect rural-urban inequality.

We then proceed to look at the effect of access to agricultural loans on rural-urban inequality directly by estimating equation (4) in which $\ln(\text{DUAL})$ is replaced by $\ln(\text{LOANAG})$. The estimated coefficient of $\ln(\text{LOANAG})$ is negative and significant, which means that, as expected, a higher level of agricultural loans was associated with a lower level of rural-urban income inequality.

Our estimation results presented above therefore enable us to answer the 5 research questions posed at the beginning of section 2 as follows: During China’s post-reform period of 1978-2013, (1) there was a Kuznets inverted-U relationship between rural-urban inequality and the level of economic development; (2) this relationship was driven by the process of urbanization; (3) dualism was an important contributor to rural-urban income inequality; (4) access to agricultural loans was a determinant of dualism; and (5) agricultural loans had the effect of reducing rural-urban income inequality.

In addition to the above conclusions, our estimation of equations (2) and (4) finds that FDI had the effect of worsening rural-urban income inequality, which can be explained by the fact FDI were mostly received in urban areas during our data period. Inflation is shown to be a contributor to widening rural-urban income inequality. This is consistent with our conjecture inflation benefited the richer and more powerful at the expense of the poor. It is also in line with the finding of Ravallion and Chen (2007). Our results also suggest that the expansion of secondary education had the effect of narrowing rural-urban income inequality.

Finally, all the time dummy variables, $T1992$, $T2002$, and $T2008$ are positive and significant, which is consistent with our conjecture that the events in these years indicated policy biases in favor of urban development, and therefore contributed to widening rural-urban income inequality.
5. Conclusion

In this paper, we have studied some determinants of rural-urban inequality in China over the post-reform period of 1978-2013. We have identified a Kuznets inverted-U relationship between rural-urban inequality and economic development as measured in real GDP per person. We have shown that, in line with Kuznets’ initial conjecture, the inverted-U relationship was driven by the process of urbanization.

We have further hypothesized that controlling for the Kuznets process, dualism (i.e., the productivity gap between agriculture and the economy as a whole) was a significant contributor to rural-urban inequality and that access to agricultural loans was an important determinant of agricultural productivity. Our empirical analyses have confirmed our hypotheses. We have also found that FDI and inflation had the effect of widening rural-urban income inequality, whereas the expansion of secondary education had effect of narrowing it.

Our analysis suggests that measures that raise agricultural productivity will not only increase efficiency, but also enhance equity between rural and urban regions. Our paper shows that improving access to finance by the rural sector can narrow the productivity gap between agricultural and the rest of the economy, thereby contributing to reducing rural-urban income disparity.

References


Table 1. Definitions of variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Definitions</th>
</tr>
</thead>
</table>
| TT        | Rural-urban inequality measured by the Theil Index  
\[
TT = 100 \sum_{i=1}^{2} \frac{Y_i}{Y} \ln \left( \frac{Y_i}{N_i/N} \right)
\]
where \( Y_i \) = total annual disposable income of urban households  
\( Y_2 \) = total annual net income of urban households  
\( Y = Y_1 + Y_2 \)  
\( N_i \) = urban population (year-end)  
\( N_2 \) = rural population (year-end)  
\( N = N_1 + N_2 \) |
| RGDPP     | Per capita real GDP at 2005 prices |
| URBAN     | Urbanization  
\[
URBAN = \frac{\text{Urban population}}{\text{Total population}} \times 100
\]
| LOANAG    | Share of agricultural loans  
\[
LOANAG = \frac{\text{Agricultural loans}}{\text{Total loans of Financial Institutions}} \times 100
\]
| DUAL      | Dualism  
\[
DUAL = \frac{\text{Average productivity}}{\text{Primary industry GDP/Primary industry employment}}
\]
| FDI       | Share of Foreign Direct Investment in GDP  
\[
FDI = \frac{\text{Value of foreign direct investment}}{\text{GDP}} \times 100
\]
| CPI       | Consumer price index |
| SEDU      | Secondary education (lagged by 5 years)  
\[
SEDU = \frac{\text{Enrollment in secondary schools}}{\text{Total population}} \times 100
\]
| T1992     | Dummy variable = 1 for years 1993-2002; 0 otherwise |
| T2002     | Dummy variable = 1 for years 2003-2008; 0 otherwise |
| T2008     | Dummy variable = 1 for years 2009-2013; 0 otherwise |

Note: The provincial data used are from *China Compendium of Statistics 1949-2009*, 2010-2014 issues of *China Statistical Yearbook for Regional Economy*, and 2010-2014 issues of *China Statistical Yearbook*. 
Table 2. Estimation results

<table>
<thead>
<tr>
<th>Equation NO.</th>
<th>Equation 1</th>
<th>Equation 2</th>
<th>Equation 3</th>
<th>Equation 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable</td>
<td>ln(TT)</td>
<td>ln(TT)</td>
<td>ln(DUAL)</td>
<td>ln(TT)</td>
</tr>
<tr>
<td>Intercept</td>
<td>-7.9644***</td>
<td>-8.1146***</td>
<td>0.8637***</td>
<td>-7.4843***</td>
</tr>
<tr>
<td>ln(RGDPP)</td>
<td>1.8852***</td>
<td>5.6327***</td>
<td>5.3167***</td>
<td>0.2716***</td>
</tr>
<tr>
<td>(ln(RGDPP))^2</td>
<td>-0.0877***</td>
<td>-0.8269*</td>
<td>-0.7848*</td>
<td>-0.4639***</td>
</tr>
<tr>
<td>ln(URBAN)</td>
<td>5.6327***</td>
<td>0.1905**</td>
<td>0.2455***</td>
<td>0.1153*</td>
</tr>
<tr>
<td>(ln(URBAN))^2</td>
<td>-0.0877***</td>
<td>-0.8269*</td>
<td>-0.7848*</td>
<td>-0.4639***</td>
</tr>
<tr>
<td>ln(LOANAG)</td>
<td>0.2716***</td>
<td>0.0392**</td>
<td>0.0424**</td>
<td>-0.4639***</td>
</tr>
<tr>
<td>ln(DUAL)</td>
<td>0.2716***</td>
<td>0.0392**</td>
<td>0.0424**</td>
<td>-0.4639***</td>
</tr>
<tr>
<td>ln(FDI)</td>
<td>0.0392**</td>
<td>0.1905**</td>
<td>0.2455***</td>
<td>0.0392**</td>
</tr>
<tr>
<td>ln(CPI)</td>
<td>0.0392**</td>
<td>0.1905**</td>
<td>0.2455***</td>
<td>0.0392**</td>
</tr>
<tr>
<td>ln(SEDU)</td>
<td>0.2716***</td>
<td>0.0392**</td>
<td>0.0424**</td>
<td>-0.4639***</td>
</tr>
<tr>
<td>Time Dummies</td>
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<tr>
<td>T1992</td>
<td>0.4137***</td>
<td>0.1489**</td>
<td>0.2132***</td>
<td>0.1153*</td>
</tr>
<tr>
<td>T2002</td>
<td>0.4793***</td>
<td>0.4938***</td>
<td>0.5067***</td>
<td>0.5461***</td>
</tr>
<tr>
<td>T2008</td>
<td>0.2751**</td>
<td>0.5153***</td>
<td>0.5755***</td>
<td>0.5534***</td>
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<td>Diagnostic test</td>
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<td></td>
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<tr>
<td>R-Bar-Squared</td>
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<td>0.7604</td>
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<td>1085</td>
<td>865</td>
<td>1067</td>
<td>860</td>
</tr>
</tbody>
</table>

Note: Figures in parentheses are standard errors.

*, **, *** indicate statistical significance at 10%, 5%, and 1% levels respectively.
Figure 1. Rural-urban inequality

Note: Rural-urban inequality is measured by the provincial average of the Theil index calculated by the authors.
### Appendix. Summary statistics

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