How does the urban–rural income gap affect the quality of China's economic growth?

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Abstract

Purpose – Based on the theoretical definition of the quality of economic growth as well as the availability and reliability of the given data, the purpose of this paper is to build an evaluation system of a regional economic growth quality on three levels: conditions, processes and results.

Design/methodology/approach – From the perspective of economic quality, this paper offers a theoretical interpretation on how the urban–rural income gap affects the quality of economic growth and takes an empirical test on the sample panel data from 30 provinces and regions through difference GMM and system GMM models.

Findings – The results show that the excessively large income gap will influence economic growth in terms of the foundation, operation and the outcome, thereby, restricting the quality of economic growth. In addition, investments in human and physical capital and improvements in terms of transport infrastructure, industrial structure and economic openness play an active role in economic growth quality, whereas government expenditure scale, financial development and the deviation of industrial structure have a negative effect.

Originality/value – There has been a substantial amount of experience and evidence on the research about the issue of China's income distribution and the quantity of economic growth, whereas there are relatively fewer discussions about the income distribution and the quality of economic growth. This paper, based on what has been mentioned above, tries to give a theoretical interpretation and an empirical test to describe the relationship between urban–rural income gap and the quality of economic growth from the quality point of view.

Keywords Urban–rural income gap, Human capital investment, Quality of economic growth

Paper type Research paper

1. Introduction and relevant literature review

China has witnessed a rapid economic growth over the past four decades since the reform and opening-up, proposing an alternative economic model with Chinese-characteristics to the world (Beijing consensus). However, there are also some structural imbalances presenting in the fast-paced development of the national economy. Large-scale empirical research studies indicate that, since the 1990s, the urban–rural income gap reflects the main income gap in China to a great extent, which has been expanding continuously. Taking 2016 as an example, the urban–rural income gap was RMB 21,253, and the urban–rural income ratio was 2.72: 1 (Lin *et al.*, 1998; Chen *et al.*, 2010).

Current literature mainly discusses the income distribution from the perspective of the quantity of economic growth, forming five major viewpoints. The first one is the incentive theory of capital accumulation. This theory holds that the excessively large income gap restricts the investment opportunities for the poors and discourages them from wealth accumulation, which is unfavorable to the quantity of economic growth (Banerjee and Newman, 1993). The second is the division of labor theory. This theory states that lower-skilled people prefer no division of labor. A balanced structure of income distribution promotes participation and cooperation and hence boosts the economic growth in quantity (Fishman and Simhon, 2002).

The third is consumption demand. This viewpoint believes that the excessively large gap in income distribution will lower consumer demand and therefore limit the quantity of economic growth (Murphy *et al.*, 1989; Rudai and Shi'e, 2007). The fourth is human capital investment. When the capital market is not well developed, and the human capital investment is indivisible, the large gap in income distribution will provide fewer opportunities for the poors to receive education. They tend to raise more children but spend less on physical and human capital investment, holding up the quantity of economic growth (Galor and Zeira, 1993; Croix and Doepke, 2004; Lu *et al.*, 2005). The fifth is in terms of political economy. The income gap affected by revenue and social conflicts may harm the quantity of economic growth (Yin *et al.*, 2005).

A comprehensive definition of economic growth should give equal priority to external quantity and internal quality. With increasing concerns about the quality of the economic growth at the end of the twentieth century, the research on the quality of economic growth has become a hot topic in academic economic analysis. Regarding to income distribution, we not only consider its mechanisms in the quantity of economic growth but also (its) internal influences on the quality of economic growth. Barro (2002) considers that the quality of economic growth is a wild-ranging concept with respect to the quantity of economic growth. International empirical research results show that the expanding income gap not only has a prominent influence on the quantity of economic growth, but closely connects with other variables such as economic structure, educational level, crime rate, suicide rate and the proportion of religious groups. Chinese empirical research studies indicate that the expansion of the income gap has a major impact on factors such as industrial structure, economic efficiency social welfare, etc. (Tian *et al.*, 2009). Suggestions for further reforms of income distribution system clarifies that the general requirements for further reforms of income distribution system are to optimize the income distribution structure and to give full play to the function of the redistribution system. There has been a substantial amount of experience and evidence on the research about the issue of China's income distribution and the quantity of economic growth, whereas there are relatively fewer discussions about the income distribution and the quality of economic growth. This paper, based on what has been mentioned above, tries to give a theoretical interpretation and an empirical test to describe the relationship between urban–rural income gap and the quality of economic growth from the quality point of view.

2. Theoretical interpretation of the influence that the urban–rural income gap has on the quality of economic growth

Theoretically, the quality of economic growth is a standard value judgment. The current research on the quality of economic growth includes both narrow and broad perspectives. Scholars who hold the narrower view believe that the quality of economic growth refers to its efficiency, namely, the ratio of the factor input in consumption and the total output of the economic activities (Kamayev, 1983; Wang, 2000; Liu, 2002). Scholars with the broader perspective emphasize that the quality of economic growth is related to the quantity of economic growth, including education, health, environment, law, order and many other aspects (Thomas and Wang, 2001; Barro, 2002; Liu, 2007; Chao and Ren, 2011).

Corresponding to the quantity of economic growth, the quality of economic growth describes the nature and laws of economic growth, which not only focuses on its dynamic process but also on the initial conditions as well as the final results of economic growth. That is to say, the quality of economic growth is defined through three levels: conditions, processes and results. Concerning the conditions of economic growth, it reflects the basic situation of the overall quality of the national economy. When it comes to the process of economic growth, it refers to the basic situation of the economic growth structure. In terms of the result of economic growth, it refers to the effectiveness of economic growth and the improvement of social welfare.

According to system theory, the economic growth system will generally show an orderly and high-quality upward trend as the quantity of economic growth reaches a certain stage

where the basic conditions of the economic growth is well developed, all the factors corporate with each other, as well as the relationships among various interest groups and that between the interest groups and the eco-system are well balanced. The urban–rural income gap will not only, through investment channels, restrict the improvement of the basic conditions of economic growth, but will also have an impact on both the process and the results of economic growth as well.

2.1 The influence that urban–rural income gap has on the quality of economic growth
The prerequisite of economic growth is related to the basic conditions and capability of a country, by which it can effectively develop and utilize diverse resources in the long run and hence create national wealth, organically combining various internal elements of a national or regional economic system. High-quality economic growth is based on the quality of national economy, and human capital investment plays an instrumental role in the capability of economic growth. Massive theoretical and empirical research studies have demonstrated that the poors tend to raise more children but spend less expenditure on education in the case of excessively large urban–rural income gap, degrading the average educational level of a society (Galor and Zeira, 1993; Croix and Doepke, 2004). This means that the excessively large urban–rural income gap will hinder rural residents from human capital investment and restrict the capability of economic growth, which might be detrimental to the quality of economic growth.

In China, the impact of resource constraints is different in the urban and rural areas, in terms of individual education and human capital investment. To a large extent, a person's birthplace will determine his or her access to education and skills, resulting in the severe urban–rural differences. The empirical research studies conducted by Yang *et al.* (2008) and Lu *et al.* (2005) indicate that the excessively large urban–rural income gap not only restricts physical capital investment but also affects the acquisition of education and human capital investment. Currently, the working-age population in China shows a constant downward trend, whereas the dependency ratio of the population is continuously rising. As the era of unlimited labor supply and the demographic dividend coming to an end, improving the quality of the laborers through human capital investment will become the basic condition for advancing economic operations and the important content of the quality of economic growth.

2.2 The influence that urban–rural income gap has on the structure of economic growth
Economic growth manifests itself as the interaction of the diverse elements in the entire economic system. From the perspective of demand structure, when income distribution is unequal, the lower-income group with relatively high marginal propensity to consume has limited purchasing power. Conversely, the high-income group with a relatively low marginal propensity to consume tends to show a preference to buy luxury consumer goods, inhibiting the aggregate consumption demand (Murphy *et al.*, 1989; Rudai and Shi'e, 2007). At present, expenditure on education and medical treatment conducts increasing influence on inhabitant consumer behavior in China. Low-income individuals have to spend a large amount of their increased income on education and medical investment, relatively reduce other types of consumption and further constrain the consumer demand to some extent. This means that the expanded urban–rural income gap will limit consumer demand, bringing about the imbalance of the demand structure and therefore inhibiting the promotion of the quality of economic growth.

From the angle of dual economic structure, when there is an excessively large urban–rural income gap, the rural residents at a lower wealth level, instead of choosing human capital investment, tend to work in the traditional department as unskilled labor force, which not only hampers the transition from unskilled labor force to skilled labor force, and the transformation of dual economic structure, but is also detrimental to the production efficiency of the traditional production department (Chao and Shen, 2014). Schulz (1987) believes that traditional sectors of

any country are promised to contribute significantly to its economic growth. The reason why they cannot become a new source of economic growth lies in their low production efficiency. The production function of the traditional sectors will be revolutionized if the labor force of traditional sectors could get promoted. Consequently, the expanded urban–rural income gap will restrict the promotion of the labor force and hinder the transformation of the dual economic structure, thereby, affecting the quality of economic growth.

2.3 The influence that urban–rural income gap has on the results of economic growth
The economic growth theory focuses more on the improvement of the overall residents' welfare through the economic growth, but not just the process of economic growth. It could upgrade people's income levels as well as people's physical conditions in terms of basic necessities of life such as food, clothing, housing and travel. It also provides the residents with better health care and higher education quality, in an effort to improve individuals' quality. Only when the overall welfare level of the residents is improved can the goal of the economic growth is finally realized. Nevertheless, to improve the welfare level not only depends on the overall level, but also lies in the distribution of the economic growth results among residents. Economic growth would not be of high quality if the residents' welfare level is improved in general, whereas the distribution of economic growth results is deteriorated. The continuous inequality of income distribution not only does harm to the economic results sharing of a nation, but also restrains the economic growth through various mechanism and channels. Only when the fruit of economic growth is shared by the majority can we regard it as high quality. Through conclusive analysis, Defen (2002) believes that the residents' well-being is the core of the quality of economic growth. Regarding to the essence of development, the ultimate goal of pursuing high-quality economic growth is to provide people with better living conditions. Humans are the subject of both economic growth and development. In this connection, it could be concluded that excessively large urban–rural income gap is detrimental to develop the inclusiveness of economic growth and hence affects the quality of economic growth.

3. The empirical test of the influence that urban–rural income gap has on the quality of economic growth
On the basis of the above theoretical analysis, this paper adopts the panel data from 1998 to 2015, which are collected from 30 provinces and regions in China (excluding Tibet, Hong Kong, Macao and Taiwan), and further examines the relationship between urban–rural income gap and the quality of economic growth in China.

3.1 The evaluation of the quality of china's economic growth
The key to the research on the relationship between the urban–rural income gap and the quality of economic growth is the measurement of the quality of regional economic growth. This paper uses the evaluation system of the economic growth quality proposed by Chao and Hui (2009), Chao and Ren (2011) as references. Based on the theoretical definition of the quality of economic growth as well as the availability and reliability of the given data, the research builds an evaluation system of a regional economic growth quality on three levels: conditions, processes and results. Specifically, the conditions of economic growth include the average years of education, the proportion of higher education population, the proportion of research and development in GDP, the number of patent applications processing, the proportion of social expenditure as well as education expenditure shared in the fiscal expense. The economic growth structure chooses the following statistics as the basic measurement index: the ratio of the output value between the tertiary industry and the secondary industry, structural deviated Theil index, consumption rate, investment rate, the proportion of deposit and loan balance from financial institutions in GDP and the

proportion of total imports and exports in GDP. The results of economic growth select the following statistics as the basic measurement index: the growth rate of total factor productivity, capital productivity, labor productivity, energy consumption of total output value per unit area, air pollution degree of per unit output, wastewater discharging of per unit output, population-weighted urban–rural income ratio and Engel coefficient. Therefore, it provides 21 basic indicators as the index for evaluating the quality of economic growth in various regions of China. Data from 1998 to 2015 were selected as the sample, all of which derive from China Compendium of Statistics from 1949 to 2008, Data of Gross Domestic Product of China (1952–2004), the China Statistical Yearbook, Almanac of China's Population and the China Statistical Yearbook on Science and Technology.

This paper mainly adopts principal component analysis, which inputs the equalized covariance matrix as the principal component and selects all the coefficients of basic measurement from the first principal component as the corresponding weights. Then the quality of economic growth in various regions of China from 1998 to 2015 is measured, the results are shown in Figure 1[1].

Figure 1 shows the changes in indexes in the quality of economic growth in various regions of China from 1998 to 2015. On overall, since 1998, the quality of economic growth in various regions of China has been promoted to some extent. Nevertheless, in the lens of the regions, there are huge differences among diverse provinces, cities and autonomous regions in terms of the quality of economic growth. In this connection, research studies should be considered on the basis of conditions, processes and results, in an effort to study the factors affecting the quality of regional economic growth. As mentioned in the theoretical analysis, the difference in urban–rural income gap is also a predominant factor.

3.2 Setting econometric model and variables

The continuity of the quality of economic growth requires introducing the first-order lags in the econometric model. Therefore, we set the dynamic panel data model revealing the relationship between urban–rural income gap and economic growth quality as follows:

$$QEG_{it} = \alpha_0 + \alpha_1 QEG_{it-1} + \alpha_2 ine_{it} + \alpha_3 edu_{it} + \alpha_4 ine_{it} \cdot edu_{it} + \sum_{j=1}^{8} \beta_j X_{jit} + \lambda_i + \varepsilon_{it}.$$
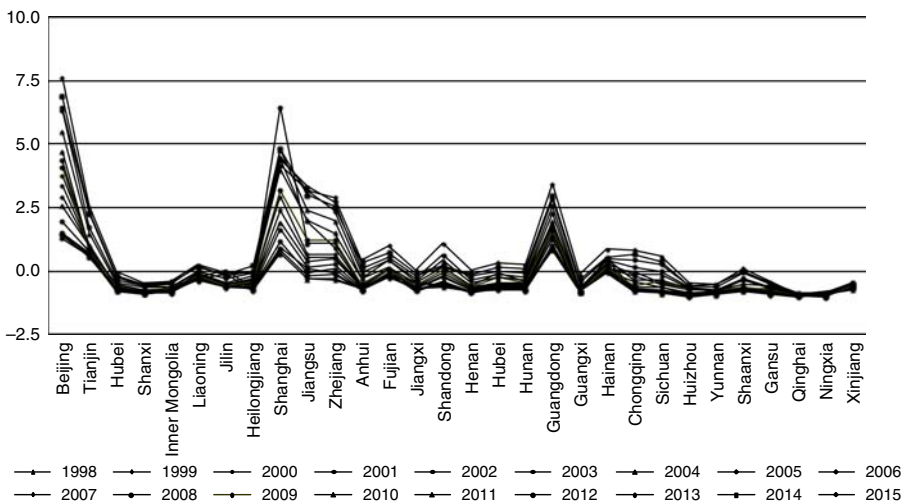

Figure 1.
The quality of economic growth in China, 1998–2015

In the model, the subscripts i stand for the regions ($i = 1, 2, …, 30$); and the subscripts t represent the years ($t = 1998, 1999, …, 2015$); λ_i represents the permanent effects of individuals; ε_{it} represents stochastic errors. We use QEG_{it} to reveal the level of the quality of economic growth in various regions. QEG_{it-1} means the level of economic growth quality in region i during a specific $t-1$ period. *ine* stands for the urban–rural income gap shown through the ratio of urban–rural per capita income. *edu* represents human capital investment measured by the average education length. The interaction between the urban–rural income gap and human resource is presented by *ine.edu*, the interaction item of the two factors. Furthermore, since there are many other factors that are likely to affect the quality of economic growth, it is also required to control some possible variables. X is a collection of control variables. We follow the relevant report on the quality of economic growth by first controlling the variables affecting the operating conditions of the quality of economic growth, including *inv*, the investment represented by capital stock; *gov*, government expenditure scale represented by the proportion of government expenditure in GDP, *highway*, the transport infrastructure represented by the highway freight volume and *finance*, the scale of financial development represented by the proportion of loan balance from financial institutions in GDP. Furthermore, we control the variables affecting the process of economic growth, including *indop*, the industrial structure upgrading represented by the ratio of the output value between tertiary industry and secondary industry, the reasonable ration of the industrial structure represented by Theil index and *private*, the degree of non-nationalization represented by the proportion of fixed assets investments, as well as *open*, the extent of economic openness represented by the proportion of both imports and exports in GDP (Table I).

3.3 Statistics and demonstration

This paper selected the statistics from 1998 to 2015 as the sample interval. The reasons are as follows: notwithstanding reform and opening-up policies have been implemented for more than three decades, the urban–rural income gap in China has rapidly expanded since the middle and the late years of the 1990s; and the availability of relevant statistics on the primary index of the economic growth quality is limited. Besides, due to the low quality of Tibet data, this paper selected panel data from 30 provinces, cities and autonomous regions for empirical tests.

Data used in this paper are all obtained from the China Statistical Yearbook, the China Compendium of Statistics 1949–2008, Data of Gross Domestic Product of China (1952–2004) and the Almanac of China's population over the years. Since the revision of historical GDP data for most parts started from 1993, the data from 1998 to 2004 used in this paper were collected from the revised version of Data of Gross Domestic Product of China (1952–2004). Data for other years derive from the corresponding annual versions of Almanac of China's population. Table II shows the basic statistics of major variables.

3.4 Methods and results of variable inspection

Economic development is a systematic process. From the aspects of condition, process and result, the quality of economic growth is unavoidably interrelated with factors such as human capital investment, physical capital investment, the degree of economic openness and other factors; and it is most likely that there is endogeneity between variables of the models. Difference GMM (DiffGMM) and system GMM (SYSGMM) are two main common methods on dynamic panel data model. DiffGMM can effectively overcome endogeneity in explanatory variables and residual heteroskedasticity. Based on DiffGMM, SYSGMM introduces level equation, which estimates level equation and difference equation at the same time and hence improves the effectiveness and consistency of the estimation. Therefore, this paper adopts DiffGMM and SYSGMM

Variable symbol	Variable name	Variable description
QEC	The quality of economic growth	First, the reciprocal form is applied to all the inverse indicators, making them positive. Using the mean value method to apply dimensionless treatment to the original data, and then using the principal component analysis (PCA) approach to obtain an exponential value on the quality of economic growth of various regions
ine	Urban–rural income gap	Ratio between per capita disposable income and rural per capita net income
edu	Human capital investment	Measured by the average education length, it can be obtained by multiplying the average education length of each population group classified according to education level with the rate of each group among the total population, and then adding up all the values reached. In terms of average education length, 0 is set for illiteracy, 6 years for elementary schools, 9 years for middle schools, 12 years for high schools and technical secondary schools and 16 years for junior colleges or above
inv	Physical capital investment	First, the annually fixed capital formation is uniformly converted to the constant price in 1998, according to the regional fixed asset investment price index. Then using the basic formula to estimate the physical capital stock over the years, based on the set depreciation rate and base period capital stock
gov	Government expenditure scale	The ratio of government expenditure in GDP
highway	Transportation infrastructure	Freight traffic of highways
finance	The scale of financial development	The proportion of the loan balance from financial institutions in GDP
indop	Upgrading of an industrial structure	The proportion of output value between tertiary industry and secondary industry
ration	Structural deviated Theil index	Structural deviated Theil index is a comprehensive index that combines employed persons and the proportion of output value. This reflects the proportion of industrial output weighted by population. The detailed calculation formula is as follows In the formula, *TL, Y, L, I* and *n* represent the structure deviation degree, the output value, the employment figure, the industry and quantity of industrial sectors, respectively, the value of *n* is 3: $TL = \sum_{i=1}^{n} (Y_i/Y)\ln\left((Y_i/L_i)/(Y/L)\right)$
private	Degree of denationalization	Regional non-state economic fixed asset investment accounts for the proportion of regional economic fixed asset investment
open	Economic openness	The proportion of imports and exports in GDP

Table I.
Variables and
definitions

respectively to estimate dynamic panel data model. Initially, we adopted the three-order lagged variables as instrumental variables to carry out GMM for difference equation. Table III shows the results.

In Table III, all the null hypotheses that the model coefficient is zero (except the intercept term) are rejected by Wald test, and the overall coefficient of models has shown statistical significance. As a consistent estimation, the precondition for the DiffGMM is that there is no autocorrelation in the disturbance term. This can be judged by checking whether there is a first-order and a second-order autocorrelation in the difference of the disturbance term. The results of the autocorrelation test in Table III shows that there is a first-order autocorrelation in the difference of the model perturbation terms, but no second-order autocorrelation, then we accepted the original hypothesis that the disturbances do not have autocorrelation before using DiffGMM for estimation in the next step. In addition, due to the utilization of multiple

Variable symbol	Variable name	Mean value	SD	Minimum value	Maximum value
QEC	Quality of economic growth	−1.64E-07	3.407662	−11.31203	18.04
ine	Urban–rural income gap	2.935063	0.6146735	1.622584	4.758562
edu	Human capital investment	46.32925	15.47185	25.051	114.2142
inv	Physical capital investment	13,553.08	14,045.32	383.6754	83,755.28
gov	Government expenditure scale	16.98487	7.793642	5.676461	61.21074
highway	Transportation infrastructure	53,952	45,813.77	3,743	296,754
finance	Scale of financial development	1.02115	0.3483679	0.0128022	2.584716
indop	Upgrading of an industrial structure	0.942387	0.3988392	0.4970531	3.367583
stru	Dual economic structure	0.1987531	0.0918849	0.0667036	1.536254
private	Degree of denationalization	57.12573	16.9737	11.43783	88.0716
open	Economic openness	0.3164312	0.4038578	0.0320445	1.764581

Table II.
Description of
statistical
characteristic of
major variables

instrumental variables in the difference model, over-identification tests are also required. The Sargan test results in Table III shows that, at the 1 percent level of significance, each model cannot reject the null hypothesis that all instrumental variables are valid.

We found that the mechanism of urban–rural income gap affecting the quality of economic growth during the process of the Chinese economic development does exist through Table III. Model 1 in Table III only examines the relationship among the quality of economic growth, the ratio of urban–rural income, human capital investment and their interactions. The results show that the urban–rural income ratio has a significant negative correlation with the quality of economic growth, whereas the effect of human capital investment has a significant positive correlation with the quality of economic growth. The interaction between urban–rural income gap and human capital inhibits the quality of economic growth. To obtain more accurate information, we separately introduce control variables that affect the basic conditions and operational processes of economic growth. As shown in Models 2, 3 and 4, the expanded urban–rural income gap does generate an inhibitory effect on the quality of economic growth, while increased human capital investment has an inverse positive impact on the quality of economic growth. The same as the test results of Model 1, the coefficient of interaction between the ratio of urban–rural income and human capital investment is always significantly negative. We discarded the interaction items in Model 5, and the control variables, *ration* and *open*, in Model 6. Next, in the further research studies, we found that the effects brought by the ratio of the core variable urban–rural income and human capital investment on the quality of economic growth are consistent with the theoretical analysis. At present, Chinese have developed into a stage where education costs are relatively higher than per capita income. The expansion of the urban–rural income gap restricts the education of low-income families, which is overshadowed by the positive effect of education promotion in high-income families. More low-income families are facing constraints of time and funds, thereby, reducing the enrollment rate of education at all levels, and ultimately reducing the graduation rate and per capita education level of the whole society. As a result, the basic conditions for the operation of economic growth are limited, and improvements in the quality of economic growth are also constrained.

In addition, our empirical research studies also found other factors that influence the quality of economic growth. The estimation results of the models in Table III indicates that, from the perspective of the variables affecting the operating conditions of economic growth, at a 1 percent level of significance, the impact of improvements of physical capital investment and transport infrastructure shows an apparently positive correlation with the quality of economic growth. The relationship between the quantity of financial development and the quality of economic growth is not significant in several models. It is likely that, due

			Difference GMM			
Explanatory variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
ine	−1.189*** (0.0506)	−1.153*** (0.231)	−0.962*** (0.0874)	−0.904*** (0.272)	−0.0988*** (0.0215)	−1.023*** (0.155)
edu	0.575*** (0.0263)	0.570*** (0.0782)	0.562*** (0.0477)	0.452*** (0.105)	0.148*** (0.0187)	0.574*** (0.0561)
ineedu	−0.154*** (0.00678)	−0.144*** (0.0281)	−0.121*** (0.0115)	−0.102*** (0.0326)		−0.119*** (0.0188)
inv		3.65e-06*** (5.78e-07)		4.89e-06*** (8.09e-06)	5.79e-06 (9.70e-07)	5.04e-06*** (1.12e-07)
gov		−0.0129*** (0.00166)		−0.00218 (0.00267)	−0.00518*** (0.00252)	−0.00723*** (0.00233)
highway		4.33e-07*** (4.01e-07)		1.17e-06*** (66.63e-07)	1.23e-06*** (4.64e-07)	8.32e-07*** (4.69e-07)
finance		0.0821*** (0.0140)		0.0202* (0.0111)	0.00472 (0.0142)	0.00581 (0.0109)
indop			0.382*** (0.0630)	0.408*** (0.113)	0.483*** (0.0910)	0.442*** (0.0523)
ration			−0.808*** (0.0551)	−0.709*** (0.116)	−0.644*** (0.109)	
private			−0.00274*** (0.000893)	−0.00541*** (0.00127)	−0.00376*** (0.00105)	−0.00434*** (0.000994)
open			0.599*** (0.0582)	0.701*** (0.0673)	0.626*** (0.0906)	0.627*** (0.0164)
L.QEG	0.814*** (0.00423)	0.749*** (0.00937)	0.730*** (0.0138)	0.683*** (0.0170)	0.695*** (0.0189)	
_constant	−4.530*** (0.207)	−4.677*** (0.673)	−4.723*** (0.406)	−4.199*** (0.974)	−1.859*** (0.244)	−5.103*** (0.499)
Observed value	480	480	480	480	480	480
Wald test	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sargan test	1	1	1	1	1	1
AR(2) test	0.2423	0.2326	0.2622	0.2859	0.2764	0.2485

Notes: Wald test serves for testing the significance of the overall coefficient of models; The Sargan test is an over-identifying test of GMM estimators. It is used for verifying the effectiveness of the differential instrumental variables. First-order or second-order autocorrelation in disturbances, if any, can be found through AR (1) and AR (2) test; only probability values reported here. *, **, ***Significance at 10, 5 and 1 percent levels, respectively

Table III.
Results of difference GMM between the ratio of urban–rural income and the quality of economic growth

to the expansion on the scale of financial development, potential government intervention will strengthen, and thus, weaken the improvement of the effectiveness of economic growth. In addition, Wang (2012) concluded that financial development would enlarge the urban–rural income gaps, therefore, restricting the promotion of the quality of economic growth. From the perspective of the variables affecting the operation of economic growth, the upgrading of the industrial structure brings about a positive effect on the promotion of the quality of economic growth. The estimation result of the model in Table III also shows that the coefficient representing the explanatory variables by first-order lags of the quality index of economic growth is significantly positive, indicating that the change in the quality of economic growth is featured by continuity and the change in the quality of economic growth in the last period would affect that of the current period, like inertia effects.

Furthermore, we combined the difference equation and the horizontal equation as an integrated equation system and use the SYSGMM to estimate the model. The results are shown in Table IV. This shows that we can accept the null hypothesis where the disturbance term has no autocorrelation and where all instrumental variables are valid. The estimation results of each model are basically the same as the regression results of the DiffGMM in Table III. The impact of urban–rural income gap on the quality of economic growth is significantly negative. The increase in human capital investment and physical capital investment, the improvement of transport infrastructure, the optimization of the industrial structure and the expansion of opening-up all have significantly positive effects on the quality of economic growth, whereas the effects of government expenditure scale, financial development and the deviation of industrial structure conduct on the quality of economic growth are negative.

To further test the robustness of the regression results, urban–rural income ratio adjusted through weighted urban–rural population is used as a measuring index to measure the urban–rural income gap. The specific formula is as follows:

$$popine_{it} = \sum_{i=1}^{2} \left(\frac{p_{it}}{p_t}\right) \ln \left(\frac{(p_{it}/p_t)}{(z_{it}/z_t)}\right).$$

Among the formula, *popine* represents the urban–rural income ratio which has been adjusted through weighted urban–rural population, $i = 1, 2$ means urban and rural areas, respectively, z_{it} indicates the urban or rural population during period of t, z_t represents the total population for the period t and p_{it} indicates the total urban–rural income (represented by the product of the corresponding population and the per capita income), p_t stands for the total income for the period t. DiffGMM and SYSGMM are adopted to show the regression results that turn out to be consistent with the results of Tables III and IV. This further validates the conclusion of the theoretical analysis in this paper: the expansion of urban–rural income gap will restrict the promotion of the quality of economic growth.

4. Conclusions and policy advice

Urban–rural income gap should be analyzed not only from the perspective of the quantitative expansion of economic growth, but also from the quality of economic growth. Focusing on the quality of economic growth, this paper offers a theoretical interpretation on how the urban–rural income gap affects the quality of economic growth and takes an empirical test on the sample panel data, from 1998 to 2015, in 30 provinces and regions of China through DiffGMM and SYSGMM models. The conclusions are as follows: first, the excessive large urban–rural income gap will influence the basic conditions, operation and results of the economic growth, and thus, hinders quality of economic growth. Second, the evaluations of the dynamic panel data model through DiffGMM and SYSGMM both present a mechanism of urban–rural income gap affecting the quality of economic growth in China's economic advancement. The ratio of urban–rural income is significantly negatively

Explanatory variable	System GMM					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
ine	1.636*** (0.130)	0.939*** (0.229)	0.847*** (0.110)	0.332 (0.337)	0.0835*** (0.0281)	0.328 (0.227)
edu	0.809*** (0.0512)	0.626*** (0.103)	0.443*** (0.0489)	0.167 (0.128)	0.0659*** (0.0217)	0.370*** (0.113)
ineedu	−0.216*** (0.0168)	−0.1121*** (0.0282)	−0.106*** (0.0131)	−0.0331 (0.0414)		−0.0429 (0.0279)
inv		4.57e-06*** (7.36e-07)		9.54e-06*** (4.429e-07)	9.72e-06 (1.38e-06)	3.74e-06*** (1.01e-06)
gov		−0.0264*** (0.00374)		−0.00556*** (0.00230)	−0.00682*** (0.00235)	−0.0238*** (0.00484)
highway		1.72e-07*** (2.79e-07)		1.74e-06*** (5.68e-07)	2.04e-06*** (5.06e-07)	5.37e-07*** (4.55e-07)
finance		0.0626*** (0.0134)		−0.0351** (0.0175)	−0.0379*** (0.0139)	0.00627 (0.0116)
indop			0.238*** (0.0723)	0.587*** (0.114)	0.694*** (0.104)	0.322*** (0.0617)
ration			−0.832*** (0.0645)	−0.657*** (0.0883)	−0.635*** (0.0910)	
private			0.000728 (0.000858)	−0.00233** (0.000948)	−0.00143 (0.00104)	0.00148 (0.00139)
open			0.271*** (0.0530)	0.754*** (0.0824)	0.761*** (0.0716)	0.735*** (0.0249)
L.QEG	0.831*** (0.00752)	0.736*** (0.0194)	0.729*** (0.0134)	0.603*** (0.0439)	0.591*** (0.0389)	
constant	−6.282*** (0.409)	−4.739*** (0.844)	−3.705*** (0.424)	−2.144** (1.089)	−1.525*** (0.181)	−3.022*** (0.917)
Observed value	510	510	510	510	510	510
Wald test	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sargan test	1	1	1	1	1	1
AR(2) test	0.2423	0.2326	0.2622	0.2859	0.2764	0.2485

Note: *, **, ***Significance at 10, 5 and 1 percent levels, respectively

Table IV.
System GMM
estimation results
about the ratio of
urban–rural income
and the quality of
economic growth

correlated with the quality of economic growth. Third, the empirical research studies also found other factors affecting the quality of economic growth. For instance, improvements in human capital investment, physical capital investment, transportation infrastructure and economic openness would generate a positive impact on the quality of economic growth, whereas government expenditure scale, the scale of financial development and the deviation of industrial structure would pose a negative impact on the quality of economic growth. Fourth, the coefficients representing explanatory variables by first-order lags of the quality index of economic growth displayed positive significance, indicating that the changes in the quality of economic growth are featured by continuity. In this connection, according to the results of the research studies, the policy recommendations are offered as follows.

First and foremost, both the primary distribution and the secondary distribution need to pay attention to the urban–rural income gap. Through effective government taxation, transferred payment activities and well-developed human capital investment incentives, the urban–rural income gap can be shrunk, in favor of keeping a sustainable high-quality economic growth of China in the long term. Efficiency and fairness should definitely not stand against each other. The continuous expansion of urban–rural income gap not only goes against the sharing of the fruits of economic development among people, but inhibits the quality of economic growth through various mechanisms. The decrease of the urban–rural income gap in China not only contributes to achieve the equity on the level of morality, but also demonstrates an inherent consistency between narrowing the urban–rural income distribution gap and the improvement of the quality of economic growth.

Second, in future economic growth, more attention should be paid to financial development and industrial structure. The transformation and upgrading of industrial structure can promote the quality of economic growth of China through financial openness and reform. Among factors affecting the quality of economic growth, the impact of the scale of financial development and industrial structure variables is significantly negative. This reflects, to a certain degree, the defects through the expansion of financial development and the upgrading of the industrial structure would bring a restrictive function on the quality of economic growth. For the further promotion of quality of economic growth, it is also necessary to attach great importance to the scale of financial development and industrial structure to ensure the sustainable economic growth, apart from continuously giving full play to the government expenditures, transportation infrastructure and opening-up policy.

Last but not least, the change of the quality of economic growth is featured by continuity to some extent. High-quality economic growth will push forward the economy into a virtuous circle. The current and future economic growth and development level can be greatly upgraded by promoting the quality of the national economy, improving the structure of economic growth, strengthening the inclusiveness of shared achievements and raising the resource utilization efficiency.

Note

1. In this paper, the provinces, autonomous regions and municipalities are referred to as regions. Limited by the data available, Tibet is not considered in this research.

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