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The Enigmas of TFP in China: A Meta-Analysis

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The Enigmas of TFP in China: A Meta-Analysis[1]

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The Enigmas of TFP in China: A Meta-Analysis

Abstract:

This paper presents a meta-analysis of 5308 observations of total factor productivity growth (TFPG) in China from 150 primary studies to provide some insightful explanations to the controversies about productivity growth in China in the current literature. The main findings include that (1) The mean TFPG of the aggregate economy at the national level in the current literature is only about 2% after 1978, which barely contributes to 20% economic growth; (2) There are three cycles for TFPG after 1978 and each circle lasts about ten years; (3) Sector-specific TFPGs are generally larger than aggregate economic TFPGs; (4) Regional disparities of TFPG are significant and specifically the TFPG in East China is higher than that in Central and West China; (5) TFPG after 1978 is in general greater than that before 1978; and (6) Peer-review process and paper languages are significantly correlated with TFPG results.

Keywords: Economic growth, TFP, Meta-Analysis, China

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1. Introduction

Since the market-oriented reform and the open-up policies were launched in 1978, China has experienced rapid economic growth with an average annual growth rate of 9.8% in the past three decades. GDP per capita increased rapidly from 381 *Yuan* in 1978 to 29678 *Yuan* (USD 4481) in 2010. It is called an economic miracle. Along with the remarkable performance in economic growth, a lot of arguments have been raised regarding the fundamental driving forces behind the economic miracle, particularly regarding the role of productivity growth (Hsieh and Klenow, 2009).

Some economists believe that the key driving force behind the economic miracle is the soaring input use (Krugman, 1994; Young, 2003) and the contribution of productivity growth is very limited. Many studies point out that the TFP growth rates in China are lower than 1.5% and the contribution to economic growth is less than 20% (e.g., Wang, 2000; Liang, 2000; Young, 2003), while the main contributors are the soaring increases in inputs, such as labor (increase in labor participation rate, rural-urban migration, and improvement of education) (Young, 2003), and capital. For instance, the nominal gross capital formation increased to more than 90 times as much as its initial value from 1978 through 2010[2]. In addition, China has benefited a lot from the demographic bonus during the past three decades resulting from a rise of the labor force ratio due to family planning and rural-urban migration (Cai and Wang, 1999; Chen and Feng, 2000). According to the estimate of Cai and Wang (1999), the contributions of the rise of the labor force ratio and of the rural-urban migration to

[2] Data source: <China Statistical Yearbook>, (2009).

economic growth in China from 1982 to 1997 are 24% and 20%, respectively.

However, some other studies argue that the improvement of productivity or TFP plays a key role in China's rapid economic growth, and they claim that the TFP growth rates are more than 3% per year and contribute to more than 30% of the economic growth in China (e.g., Hu and Khan, 1997; Chow and Li, 2002; Zhang and Shi, 2003; Bosworth and Collins, 2008)

Why is there such a big divergence in the results regarding Chinese TFP growth rates in the current literature? What causes the differences? Which results are more credible? Given the importance of the Chinese economy in the whole world, these questions are very important both from a policy perspective and from an academic perspective. Unfortunately, the determinants of TFPG heterogeneities in China haven't been studied systematically and quantitatively. In this paper, we try to find out the causes of the differences in TFPG for China by conducting a meta-analysis, which is now made possible by a large number of studies on Chinese TFP in the current literature.

The paper is organized as follows: Section 2 discusses different approaches to TFPG estimation and other possible determinants that may affect TFPG; Section 3 then briefly introduces the approach of meta-analysis and discusses the problems with respect to data processing; Section 4 provides a brief introduction to the data on Chinese TFPG collected from the recent primary studies and presents a descriptive statistic analysis; Section 5 presents the results of the meta-analysis and has some discussion, which is followed by the conclusion in Section 6.

2. TFPG Measurement

Economic growth can be decomposed into input contribution and productivity growth. Economists prefer the concept of total factor productivity (TFP) to measure the improvement of productivity with exclusion of input contribution. TFP is a measure of an economy's long-term productivity growth or the quality of growth, and regarded as the transformation ratio of total inputs into total outputs (Diewert and Nakamura, 2007).

There are two types of productivity growth: Embodied technical progress and disembodied technical progress. The former represents the technical progress or productivity growth stemmed from changes in input factors, such as an increase in the quality of inputs, whereas the latter refers to the productivity growth that does not stem from the inputs, but takes place like manna from heaven in the form of better methods and organization that improve the efficiency of both new and old factor inputs (Solow, 1957; Chen, 1997). However, the concept of TFP is only applicable to disembodied, exogenous and Hicks neutral technical progress in neoclassical economics. Furthermore, if inputs are not measured correctly, the TFP contains not only disembodied technical progress but also some embodied technical progress (Chen, 1997; Zheng, 1998; Felipe, 1999).

Several stages are required for measuring TFP and its growth rate: Model specification, variable selection, parameter setting, data processing and et al. Hence, the heterogeneities in final TFPG may emerge on each stage. Nadiri (1970) concludes several factors that may influence TFPG: first, specifications of the production function; second, the proper measurement of factor inputs; third, the weight assigned to different inputs; fourth, time period chosen in the study. Felipe (1999) suggests that the measurement of TFPG depends critically on assumptions about production function, measurement of output, measurement of capital, quality adjustment of inputs, cyclical smoothing, time period studied, errors of measurement in the variables, and so on. Chen (1997) also believes that the measurement of TFPG is quite sensitive to the measurement of factor inputs, especially to the extent and scope of the adjustments of quality improvements made to factor inputs. Similar argument can also be found in other studies (Sun and Ren, 2005; Zhang and Gui, 2008; Liu et al., 2009).

Regarding the different results in primary studies, Alston et al. (2000) categorized all factors that might account for the variation in primary studies into five broad groups: (1) characteristics of the results in primary studies (e.g., real or nominal, marginal or average); (2) characteristics of the analysts (e.g., published or unpublished); (3) characteristics of the research (e.g., geographic region); (4) evaluation characteristics (e.g., ex post or ex ante, method); (5) random measurement errors. Nelson and Kennedy (2009) suggest that heterogeneities between primary studies can be attributed to two basic causes: Factual factors and methodological factors. Following their studies, we first discuss the methodological factors and then briefly introduce the factual factors in this section.

2.1 Methodological Factors

2.1.1 Approaches to TFPG Measurement

There are many different approaches to estimate TFPG and a lot of papers already present comprehensive reviews on this issue (e.g., Solow, 1957; Jorgenson and Griliches, 1967; Nadiri, 1970; Chen, 1997; Felipe, 1999; Hulten, 2000; Lipsey and Garlaw, 2004; Guo and Jia, 2005; Raa and Shestalova, 2011).

The first way to measure TFPG is the growth accounting approach, where TFP is estimated by removing the contributions of all inputs. The residual is then presumed to be attributable to technical progress. Two commonly used growth accounting approaches are the Arithmetic Index Number Approach (AINA) and the Solow Residual Method (SRM). When using the AINA, TFP is taken as the ratio of the output index and the input index, while the production function is not specified. The SRM is also called production function method. In this method, TFPG is the residual after subtracting the growth rates of all inputs from the growth rate of total output, so that a production function needs to be specified (Solow, 1957). Based on the assumptions of cost minimization for producers, perfect technical efficiency, constant return to scale and Hicks neutral technical progress, TFPG equals the technical progress.

In addition, two other approaches are also widely used in TFPG estimation: namely the Latent Variable Approach (LVA) and the Potential Output Approach (POA). In the LVA, TFPG is taken as a latent variable, and in the POA, also called Frontier

Production Function Approach (FPFA), TFP change arises not only from technological innovation but also from the improvements in technical efficiency, allocative efficiency and the scale effect (Brummer et al., 2006; Jin et al., 2010; Brandt et al., 2011; Li and Liu, 2011).

The FPFA usually includes the non-parametric and the parametric approach. The former mainly refers to the data envelopment analysis (DEA) and the latter basically refers to the stochastic frontier approach (SFA). The non-parametric approach may be more flexible because it does not require specification of a production function and price information of the inputs. However, the SFA is more capable of distinguishing the effects of statistical noises from those of inefficiency, particularly when measurement errors are present (Lovell, 1996). Since it is impossible to eliminate all measurement errors, the parametric approach might be more reasonable. Consequently, the estimates of TFPG by means of the SFA would be smaller due to the elimination of some measurement errors. Meanwhile, SFA converges to SRM if all assumptions aforementioned hold.

While in practice, it is very difficult to satisfy the assumptions of perfect technical efficiency and constant returns to scale. If technical efficiency is considered, as in SFA and DEA, TFPG not only includes the technical progress, but also the efficiency change. As Nishimizu and Page (1982) suggested, technical efficiency change in developing country is quite obvious and important for TFP growth. In the case of China, as some studies (e.g., Kalirajan et al., 1996; Wu, 2000; Meng and Li, 2004; Zhang and Gui, 2008 et al.) find, the technical efficiency deteriorated from 1952 to

1978, while the success of economic reform started in 1978 helped regional economies to catch up with the frontier producers, which indicates a significant increase in technical efficiency from 1978 to 1985; after 1985, technical efficiency improvement slowed down, even became negative in agricultural sector after the mid of 1990s, mainly due to the deterioration of extension system and land infrastructure, particularly with regard to the existing water conservation systems that prevent farmers from applying the best practice production techniques (Bruemmer et al., 2006), as well as the disequilibrium that occurs during the expansion of crop production (Jin et al., 2009). The efficiency change in China implies that TFPG calculated by SFA and DEA should be relatively smaller before 1978 and larger at the beginning of the reform than those calculated by other approaches with an assumption of perfect technical efficiency. Similarly, we can also argue that if the assumption of constant return to scale does not hold in China, TFPG estimated by SRM may be biased. Jefferson et al. (1992) finds a slightly increasing return to scale in state and collective industries in 1980s, while Zhang and Gui (2008) think the scale economy is deteriorating after 1978. Similarly, Bruemmer et al. (2006) also find a decreasing return to scale in Chinese agriculture sector after the economic reform in 1978. In this paper we use a dummy variable to distinguish these studies with an assumption of constant return to scale from those without the assumption in SRM.

2.1.2 Inputs

Since TFP is the residual by removing the contribution of all inputs from the output, the measurement of inputs is critical in estimating TFPG. Here, three issues arise: (1) how many inputs are included in the production function; (2) how to weight each input (or output elasticity with respect to inputs appropriately); and (3) how to deal with the heterogeneity of inputs.

In most TFP studies on the aggregate economy, only labor and capital are included in production function, such as Li (1992), Woo (1998), Chow (2002) and Zhang and Shi (2003). Others, such as Bosworth and Collins (2008), Zheng and Hu (2005, 2008) and Liu and Hu (2008), also take human capital as an additional input by separating it from physical inputs. Particularly, Fleisher et al. (2010) find that education can contribute to TFP growth both at regional level and at firm level. For the studies on sector-specific TFPG, more inputs are often included in the econometric exercises. For instance, Tang (1986) uses four inputs to estimate agricultural TFPG: Labor, capital, land and intermediate inputs. Lin (1992) uses fertilizer as an intermediate input, and Fan (1997) even includes 7 inputs, namely labor, land, fertilizer, machinery, animal power, irrigation and organic fertilizer. However, most studies for calculating TFPG in manufacturing still use the three main inputs: labor, capital and intermediate inputs , such as in Zhu and Li (2005), Wang and Gu (2005), and Li and Li (2008). Obviously, more inputs included in production functions often result in a lower TFPG. In this paper, we use a dummy variable to distinguish the studies using more than two inputs from those only using labor and capital.

In the recent literature, three ways are presented to construct the output elasticities of inputs: (1) calculating: under the assumption of cost minimization, producers will equate an input's output elasticity to the product of that input's cost share and the scale elasticity, which implies that all factors including education are paid at their marginal productivity (Fleisher and Wang, 2004, 2005; Fleisher et al., 2010); (2) regressing: output elasticity can also be estimated by regressing the production function, which implies that elasticity is constant over time; (3) assuming: some literature assigns the input share subjectively. As aforementioned, output elasticities are not required in DEA and AINA; and in SFA and LVA, They are estimated by regressing the production function. While in SRM, all three ways are used. It is not easy to conclude the general impacts of the methods on estimated TFPG. However, the only thing we know is that calculating and assuming approaches automatically assume constant return to scale, while if the input share is measured independently (such as regression without restriction or adjustment), TFPG can be derived without the assumption of constant return (Hulten, 2000). This paper uses also dummy variables to control for the influence of the estimating methods for output elasticities on TFPG.

Strictly speaking, the definition of an input, for example, the quality and utilization efficiency, should be consistent across a study, which is not yet satisfied in the current literature. Nadiri (1970) notes that labor and capital as aggregate elements, are heterogeneous in longevity, impermanence, productive quality, mobility, etc. Consequently, inconsistent definitions are used in the previous studies which lead to diverse TFPG results. In particular, we take a brief look at the definitions of labor and capital.

First, labor input should be defined as the working time with standard labor intensity, not as the number of workers, because the latter doesn't reflect heterogeneities in working hours per worker (Solow, 1957; Jorgenson and Griliches, 1967; Owyong, 2000). Additionally, the contributions of labor input for different occupations are also different, so that in order to calculate the labor input precisely we should sum up individual labor input time and assign different weights to the heterogeneous quality, such as occupations. However, this cannot be realized in practice due to data limitations. The most commonly used approach is to use labor's marginal output value to measure the quality, and labor heterogeneity can be mirrored by education and work experiences which then are used as the weights for calculating labor input. Nevertheless, information on these variables is not widely available in China, and labor input usually is just measured by the number of labor forces or just by population in most studies. For instance, Wang and Yao (2003), and Zhang and Shi (2003) use the total number of workers as a proxy for labor inputs, while Graham and Wada (2001) use population. Other measures include working time (Kong et al., 1999), total wage (Lu and Jin, 2005), and a labor index calculated from working time and wage (Sun and Ren, 2005).

On the other hand, the ratio of working forces in total population in China has increased sharply from 61.50% in 1982 to 73.14% in 2008 due to the so-called demographic bonus[3]. In other words, working forces grew faster than the population during this period, so that the labor input will be underestimated when the population

[3] Data source: *China Population and Employment Statistics Yearbook*, 2009.

is used as a proxy for labor input, and consequently the TFPG will be overestimated. However, the TFPG will be underestimated if the wage is used as a proxy for labor input, because the wage increased much faster than labor input[4]. For instance, the real wage in China in 2008 is about 8-fold higher than that in 1978[5].

Second, the measurement of capital input is also very crucial for TFPG estimation particularly in China where there are no official statistics for it. Jorgenson and Griliches (1967) as well as Norsworthy et al. (1979) made important contributions in this field. Following Diewert's (1980) definition, capital consists of constructions, land, natural resources, machinery equipment, other durable facilities and the private inventories. Chen (1997) introduces a three-step method to calculate capital input index: first, decide what kind of the capital inputs should be taken into account; second, adjust capital input for capacity utilization; third, adjust capital for physical depreciation. While most researchers, such as Li et al. (1996), Li (1997) and Ezaki and Sun (1999) use capital stock as capital input because of lacking necessary data on capital quality and utilization efficiency; some other researchers, including Wen (2005) and Zhao et al. (2005), use total investment in fixed assets as a proxy for capital input. To calculate capital stock, three steps are introduced in the prevalent perpetual inventory approach: (1) selection of a base period; (2) calculation of investment in each year; and (3) use of constant prices to calculate the capital stock in each year under an appropriate depreciation rate. Different base periods, depreciation rates and price indices can lead to different results for capital stocks calculation, which

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[4] Young (2003) find that the weighted wages grow at 12.5% per year from 1978-1998, which is 1.5 times higher than implied employment growth rate.

[5] Data source: *China Population and Employment Statistics Yearbook*, 2009.

obviously affects the final TFPG estimates.

However, such information is not available in most studies, so that we cannot control for these variables in our meta-analysis even we know they are important. What we can do here is to add a dummy variable to control for the differences caused by the adjustment of input quality. As discussed earlier in the paper, once quality of input is adjusted, some technological progress embodied in input will be taken away from the residual, hence the TFPG will be possibly biased downward.

2.1.3 Dummy Variables

In order to control for unobserved heterogeneities and structural changes in the data, some primary studies include dummy variables in the production function (SRM, SFA and LVA). For instance, Kong et al. (1999) and Zhao and Zhang (2006) add regional dummies; Sheng and Zhao (2006), and Wang et al. (2009) add time dummies; and Lin (1992) and Mead (2003) include both regional and time dummies. Obviously, dummy variables also influence the TFPG estimations. In General, inclusion of dummy variables usually lowers the TFPG estimates because they capture some effects of the TFPG.

2.1.4 Price and Discounting

TFPG estimates can also be influenced by the prices of inputs and outputs. In particular, both real and nominal values for inputs and outputs are used in the current literature. For instance, Liu and Wang (2003) and Jin (2006) use nominal values, while most others use real values (e.g., Kalirajan et al., 1996; Woo, 1998; Coelli and Rao, 2005; Sun and Ren, 2005). In order to capture the impacts of prices on final TFPG estimates, we include a dummy variable to compare the studies using real values with those using nominal values.

2.1.5 Peer-Review Process and Published Journals

Peer-review process and the flavor of an academic journal might also account for the variation in estimated TFPG (Alston et al., 2000). For instance, the studies that generate TFPGs that fall outside the range of "conventional wisdom" prevailing in the profession at the time may be discriminated in the publication process, thus published work and unpublished work may have different estimations.

Accordingly, variation of the TFPGs might also be attributed to the characteristics of an academic journal. For instance, Chinese journals may get some pressure from the government and the Chinese scientific community, such that the studies with low TFPG or with politically sensitive contents might not be allowed to be published, while English journal usually have more freedom.

To control for the potential biases resulting from peer-review process and the flavor of an academic journal, we include two dummy variables respectively to distinguish published studies from unpublished paper, and to distinguish Chinese paper from English ones.

2.2 Factual Factors

After discussing the methodological factors, we now shed some light on the factual factors. A large body of literature has estimated Chinese TFPGs for different periods, different regions, and different economic sectors, which of course have heterogeneous TFPGs, particularly given the fact that China is a huge country

2.2.1 Time Difference

TFPG is a dynamic concept measuring the technological changes over time. Most studies show that TFPG is very low or even negative in China before 1978 (e.g., Kalirajan et al., 1996; Chow and Li, 2002; Wang and Yao, 2003), but becomes positive and significantly contributes to economic growth only after 1978 (e.g., Hu and Khan, 1997; Chow and Li, 2002).

2.2.2 Regional Difference

China is a huge country with a lot of regional heterogeneities. The current literature indicates that the TFPG values in different regions are quite heterogeneous even in the same period (Li and Meng, 2006). Fu et al. (2009) find that the average TFP growth rate in the central region is lower than the eastern region, but higher than the western region, consistent with our common wisdom, and however, it is still below the nation average level. Fleisher et al. (2010) suggest that human capital might be related to the regional inequality.

2.2.3 Sectoral Difference

The TFPG significantly varies in different economic sectors. For instance, Dekle and Vandenbroucke (2010) point out that agricultural labor productivity is much lower than non-agricultural labor productivity.

In order to analyze heterogeneities of TFPG in different economic sectors, together with aggregation-economy level, this paper classifies economic activities into three sectors according to the standards of the Chinese National Bureau of Statistics (CNBS)[6]: Agriculture, manufacturing, and service sector.

2.2.4 Data Difference

Data sources also play a significant role when estimating TFPG. Both time series data and panel data have been widely used in the current literature. It is however worth to note that the SFA and DEA can only be applied with panel data. Different types of data sources may lead to different results. For instance, panel data would be better for capturing unobservable heterogeneities than time series data.

In addition, some studies use microeconomic data while others employ macroeconomic data. This could also lead to TFPG heterogeneities in the current literature.

3. Meta-Analysis

A meta-analysis is a qualitative analysis of a body of similar related studies and is used to summarize them or to evaluate the reliability of their findings (Card and Krueger, 1995). This technique has been widely used in the economics literature (Nelson and Kennedy, 2009).

[6] The agricultural sector includes plantations, forestry, animal husbandry and fishery as well as services supporting these industries. The manufacturing sector comprises mining and quarrying, manufacturing, electricity production, water and gas supply, and construction. The service sector in turn includes all other economic activities not included in the agricultural and manufacturing sectors.

In a standard regression model for a meta-analysis, the dependent variable is given by the results from primary empirical studies (effect size), which is TFPG in this paper. The independent variables are all factors that could cause differences in the results in the primary studies. As aforementioned, these factors could include sectors, time, region, data characteristics, model specifications, sample size and other quality variables, such as the time of publication and the origin of the published journals.

In particular, Nelson and Kennedy (2009) point out that three characteristics of the primary studies have strong implications for the choice of a meta-analysis model: (1) Sample heterogeneity, which could be handled by adding dummies to capture those effects; (2) heteroskedasticity of effect-size variances, which can be eliminated by taking sample sizes as proxies for the weights in Weighted Least Squares Regression (WLS); and (3) non-independence of primary studies, which can be controlled by employing fixed-effects or random-effects regression models. In this paper, WLS model is chosen to deal with heteroskedasticity because the variance of a sample would decrease as the sample size increases. .

In addition, Walker, Hernandez, and Kattan (2008) point out that the selection criteria of the primary studies could cause sample selection bias problem, which makes the results of the meta-analysis inconsistent and unreliable. In this study, we try our best to include all related papers we could find to avoid such bias.

4. Data and Summary Statistics

4.1 Sources of Primary Studies

The sources of economic growth in China have been of particular interest for economists since the 1980s, as China achieved a prolonged period of rapid economic growth after the reforms in 1978. We did our best endeavors and collected 150 papers with 5308 TFPG observations using Google scholar and from the database of the China National Knowledge Infrastructure (CNKI). The detailed information of the primary studies can be found in the Appendix.

Note that if the TFPG is measured for a period with more than one year, we assume that it is the TFPG of the medium year in that period. In order to distinguish these observations from the estimates for each single year, we define them as Period TFPGs and Single-year TFPGs, respectively. Finally, 3292 observations are single-year TFPG, and 2016 are periodical TFPGs.

4.2 Summary Statistics of TFPGs

Since TFPGs are of particular interest in our study, we now present the summary statistics of TFPGs from different aspects.

4.2.1 TFP Growth Trend

Table 1 shows the summary statistics for all single-year TFPG observations by 5-year period between 1950 and 2009. The mean of all single-year TFPGs between 1950 and 2009 is 0.0288, which is a substantial growth rate. Particularly, the average TFPG before the reform in 1978 is -0.008, which indicates that there were basically no technological progress during the planned economic system; the average TFPG after the reform reaches 0.0345, which is an remarkable figure, and the contribution to economic growth would be more than 30% according to the research of Hu and Khan

(1997) and Chow and Li (2002).

Figure 1 demonstrates the annual changes in TFPG between 1950 and 2009 both for the full sample (regardless of sectors and regions) and for the national-level aggregate economy. It indicates that they have quite similar trends. We find that (1) The TFPG in China fluctuates drastically around zero before the 1978 economic reform; and (2) The TFPGs are generally positive after 1978, and there are three cycles and each circle is about ten years (namely 1978-1988, 1989-1998, and 1998-now). Even though we cannot give a specific explanation to this cyclic phenomenon, it might be linked to the conjectures of business cycles in China: Institutional reform cycle, state-owned enterprise reform, and WTO and housing boom cycle.

[Insert Table 1 and Figure 1]

4.2.2 Sectoral Difference

As aforementioned, the TFPGs vary across different sectors and regions, as is indicated in Table 2. Particularly, we find the average TFPG for manufacturing sector between 1950 and 2009 is 0.0759, significantly higher than other sectors: The figures for service sector and agricultural sector respectively are 0.055 and 0.020. The mean TFPG for the aggregate-economy during this period is only about 0.023.

Figure 2 presents the trends of national-level TFPGs by different sectors: aggregate-economy, agriculture, and the manufacturing[7]. Before the reform in 1978, we observed that the TFPG of the manufacturing sector is quite stable and barely over zero, significantly different from the aggregate-economy and agriculture which were

[7] The service sector is not demonstrated due to small number of observations.

drastically fluctuating around zero. Then, the period between 1978 and 1995 generally sees indifference of TFPG between different sectors. However, the TFPG in manufacturing sector then overtakes other sectors after 1995, which makes China "the World Factory" now.

[Insert Table 2 and Figure 2]

4.2.3 Regional Difference

Table 2 also indicates that TFPG differences between regions are substantial. The means of TFPG for East China, Central China, West China, and the whole nation respectively are 0.042, 0.026, 0.028, and 0.022 from 1950 to 2009. It indicates that (1) the TFPG in East China is higher than the rest of China, which does make sense, (2) and the TFPG in the whole nation however is lower than that in each region, which is contradictory to our common wisdom. It is plausible that some regional-level economic data are manipulated or that intermediate inputs across regions are not captured, or the economic sectors in different regions are different.

In order to consistently compare TFPGs between different regions, we now only shed light on the TFPGs of the aggregate economies for different regions from 1978 to 2009, which are reported in four panels of Figure 3. Interestingly, Panel 3.A indicates that average TFPGs in East, Central and West China respectively are 0.021. 0.024, and 0.029 in the period between 1978 and 1989, and surprisingly, West China is the highest. It is plausible that the economic reform starts from west and central rural China. Also, that the "Third-Line Movement" in 1960s moved a lot of manufacturing industries from the east to west in order for preparing the possible wars in the East could be another reason. However, the trend changes dramatically after 1989. Both Panel 3.A and 3.B demonstrate that TFPGs in the East are the highest, followed by the Central and the West China.

During the whole period after 1978, the average TFPGs of the aggregate economies for the East, the Central, the West and the whole nation respectively are 0.034, 0.020, 0.019, and 0.020. The results are consistent with our common wisdom that the TFPG is highest in the eastern and coastal rich areas. More importantly, the results indicates that the average TFPG of the aggregate economy at the national level after the 1978 reform is only about 2%, which is a moderate high speed of technological progress, so that the contribution rate to economic growth is only about 20%[8] in whole China.

[Insert Table 3 and Figure 3]

4.3 Summary Statistics of the Primary Studies

The selected 150 primary studies can be classified by the characteristics of the published journal and paper, region, sector, data type, model specification, price and input, which are reported in Table 3. For instance, within the 150 papers, 103 are written in Chinese language, and the rest 47 are written in English; 136 are published by peer-review process, and the rest 14 are unpublished working papers.

In the next section, taking into all these factors, we use econometric models to quantitatively study the heterogeneities of TFPGs in China.

[8] The average annual economic growth rate in the past three decades is about 9.8% , as indicated in the beginning of the paper.

5. Empirical Results

Similar to other meta-analyses, the dependent variable is the TFPGs in primary studies and the independent variables include region, sector, approaches to estimate TFPG, characteristics of the paper and journal, data type, measures of capital and labor, number of inputs, price information, inclusion of dummies and time. The definitions of the variables are presented in Table 4.

[Insert Table 4]

5.1 Full Sample

We pooled all observations together and estimated four different econometric models, including an OLS model with time trend and time squared, a WLS model with time dummy, a WLS model with time trend and a WLS model with time trend and time squared. The results are reported in Table 5, and quite consistent, as there is no substantial difference among the four models. We prefer WLS models because they can deal with heteroskedasticity of effect-size variance (Nelson and Kennedy 2009). However, we also find that both time and time squared are significant at the 1% level in the respective model, which makes the WLS model with linear and quadratic time variables the best. Hence our discussion is based on it.

[Insert Table 5]

First, our estimation results indicate that the coefficient for East China is 0.018 and statistically significant at the 1% level in all models. It implies that the results are quite robust and not overly affected by model specifications, and TFPGs in the eastern areas is on average 0.018 higher than the national-level TFPG, while the central and western areas are not significantly different from the national level, after controlling for the above-mentioned factors.

Regarding the sectoral difference, TFPGs in agriculture, manufacturing and service are 0.011, 0.031 and 0.026 higher than the aggregate-economy TFPG, respectively. The results are all statistically significant and robust, and not affected by model specifications. That the sector-specific TFPGs are considerably larger than those of the aggregate economy is contradictory to our common wisdom. The reasons might be that some sectoral-level economic data are manipulated or that intermediate inputs across sectors are not captured.

Second, we find peer-review process and paper language significantly influence the estimates. TFPGs with peer-review process are 0.011 higher than those in working papers; and English studies have higher TFPGs than Chinese ones by 0.007. It is plausible that there is a sample-selective bias in the peer-review process that low TFPG estimates are dropped out. Regarding the higher estimates in English papers, further research is needed to identify the reasons.

Third, the number of inputs included in econometric models of primary studies also affects the results. If more inputs are included in the regression besides labor and capital, TFPG will fall by 0.015, implying that more inputs will result in smaller TFPGs. It is obvious that more inputs will result in less unexplained factors in error terms which are looked as technological progress in the context of Solow models (Solow 1956).

Fourth, the following methodological factors, such as TFP estimation approaches, data type, quality adjustment and price have no significant impact on TFPG.

Finally, we also find an increasing trend for TFPG, and the TFP growth rate is significantly higher after 1978. As the coefficient for the term of time squared is negative, it implies that TFP grows with a diminishing rate. .

5.2 Subsamples and Sensitivity Analysis

In the previous section we pooled all data and obtained some general results. Now we take a close look at the heterogeneity of subsamples. It is possible that there are structural differences between different subsamples, which can be tested by Likelihood Ratio Tests.

Our tests reveal that there are indeed significant differences between region-specific samples and the national sample, as well as between sector-specific samples and the aggregate-economy sample. Therefore, it is necessary to estimate each subsample separately. The estimation results for national sample, the region-specific samples, the aggregate-economy sample and the sector-specific samples are reported in Table 6 from column 1 to 4.

[Insert Table 6]

The main results of these regressions can be summarized as follows:

(1) TFPGs in East China are significantly higher than those at the national level in all regressions, and also higher than the TFPGs in Central and West China by 0.017 and 0.013, respectively.

(2) TFPGs in all sectors are still significantly higher than the aggregate-economy TFPGs. Furthermore, TFPGs in manufacturing sector are 0.011 higher than that in agriculture, which is consistent with the fact of shrinking share of agriculture in national output.

(3) Model specifications now have substantial impacts on TFPG estimates in some subsample estimations, but the effect varies across sub-samples. For instance, the result obtained by employing the DEA is higher than the AINA in region-specific sample, and the SFA yields a higher TFPG in nation-level sample than the AINA. It could be explained by the fact that the DEA and the SFA take technical efficiency into account and there is an improvement in technical efficiency.

(4) Consistent with the results in full sample, the selection bias from peer-review process and journal characteristics can still be found here. Particularly, the studies with peer-review process have higher TFPG estimates than the unpublished working papers in region-specific and sector-specific samples, and TFPGs in English papers are significantly higher than those in Chinese ones in all sub-samples.

(5) In the aggregate-economy model, TFPGs estimated by micro data are 0.027 lower than those by macro data. That could be explained by the following reasons: first, the micro data is more precise than macroeconomic data, and might be less manipulated; second, the technical progress for firms is indeed slower than that of the whole economy; third, if the statistical data is not distorted and technical level is identical between firms and the whole economy, it is possible that inputs in firm-level data (micro data) is adjusted by quality; fourth, it is also possible that most studies of

firms' TFP use state-owned firms and their TFP growth rates could be lower due to misallocation (Hsieh and Klenow, 2009).

(6) Unlike the insignificant negative coefficients found in the full sample, TFPGs decline in sector-specific subsample after quality-adjustment, which can be explained by that quality adjustment captures some embodied technical progress and thus lowers the estimated TFPG.

(6) The impact of the number of inputs on TFPGs is also statistically significant. If more inputs are added in the model, TFPG decreases by 0.003 to 0.039, though the results are not as robust as in the full sample.

(7) The influence of the price used to measure output and input on TFPG is uncertain. TFPG estimates using nominal value are lower in region-specific studies, while higher in nation-level and aggregate-economy samples. Further research is needed to look into this effect.

(8) Similar to the full sample regression, TFPG grows with a diminishing rates.

In addition, in the previous regressions we made a strong assumption that the TFPG in each year for period-observations is identical. Now we separate out all single-year observations and conduct the econometric exercises. The results are reported in column 5 of Table 6. Compared with the results from the full sample, the main differences are related to the estimated coefficients for regional dummies. Together with East China, TFPGs in Central and West China are also significantly higher than the nation level.

Moreover, most studies are more interested in TFPGs at the national level and for the aggregate-economy, as they are heavily hinged with policy implications. In order to shed some light on this, we also separately conduct econometric exercises on these subsamples. The corresponding results are reported in Table 6 from column 6 to 8. However, we find that these results are quite similar to those in the first 5 columns, which implies that our main conclusions are quite robust.

5.3 Subsample After 1978

According to the results in the previous section, we find that the TFPG after 1978 is quite different from that before 1978 (Table 1 and Figure 1). Since China's economy performed impressively after the reform in 1978, it has significant policy implications to separate out the observations after 1978.

We conducted an LR test to check if there is a structural difference between the samples before and after 1978. The result rejects the null hypothesis of no difference. After sorting out all observations after 1978, we lead new regressions and the results are reported in Table 7. Since no substantial difference is found between these results and those of the full samples in Table 5, we will not repeat the above discussions here. In addition, it also confirms that our main results are quite robust.

[Insert Table 7]

6. Conclusion

This paper collected 5308 observations of total factor productivity growth rates (TFPG) for China from 150 primary studies and used a meta-analysis to analyze the impacts of a number of related factors on the heterogeneities of TFPG in the primary studies. Our results show that both factual factors and methodological factors can cause heterogeneities in TFPG in China. The sensitive analyses also indicate that the main results are quite robust with respect to different models and subsamples.

First, we find that the TFPG before the 1978 economic reform is quite close to zero, and hence most technical progress takes place after 1978. In particular, we find that the average TFPG for the aggregate economy at the national level is about 2.0%, which barely contribute to about 20% of economic growth in China.

Second, the TFPGs are quite heterogeneous between regions and between sectors. Particularly, the TFPGs in East China are higher than those in West and Central China, which might help explain the increasing regional inequality in China. The TFPG in manufacturing sector is significantly higher than other sectors, and ironically, the TFPGs in all sectors are generally higher than that of the aggregate economy, which are obviously contradictory to our common wisdom and more studies are needed for identifying the reasons.

Third, some methodological factors can significantly affect the TFPGs. Particularly, peer-review process and paper language can significantly influence the estimation of TFPGs. The TFPGs with peer-review process and written in English language respectively are higher than those without peer-review process and written in Chinese language. The number of inputs included in econometric models of primary studies also affects the results, and specifically, more inputs often lead to less TFPGs. While the following methodological factors, such as TFP estimation approaches, data type, quality adjustment and price generally have no significant impact on TFPGs.

. We uncover some potential problems in the current literature of empirical TFPG studies for China and find some factors that cause heterogeneities among previous studies, which is helpful to clarify some misunderstandings regarding the TFPG in China. Future studies should pay attention to these factors in order to make the research more convincing.

In addition, the measurement of capital input is also vital for TFPG studies, but we can't take a deeper look at how capital measurement affects TFPGs due to data limitations. This issue should be taken up by future research.

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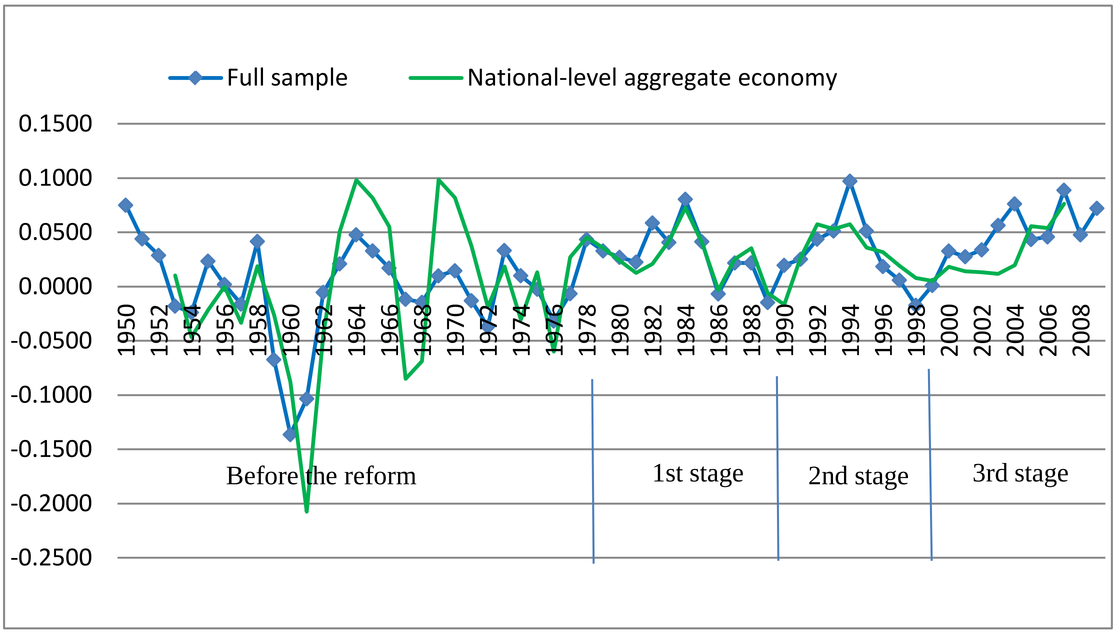

Notes: 1. Only single-year TFPGs are included. The total number of observations is 3292.

Figure 1, Average TFPG from 1950 to 2009

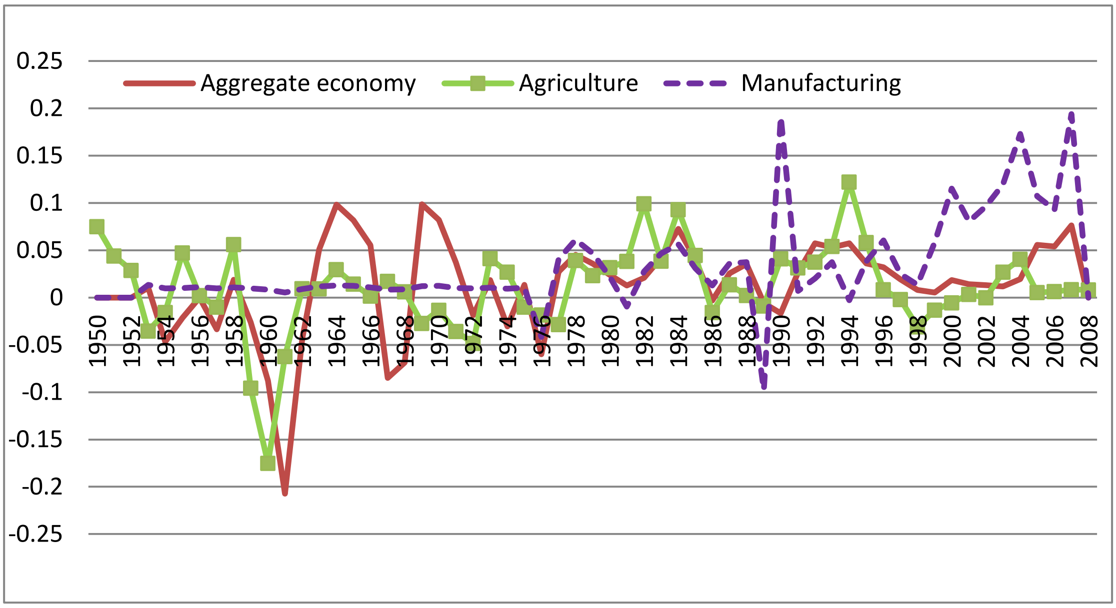

Figure 2, National-Level TFPGs by Sectors

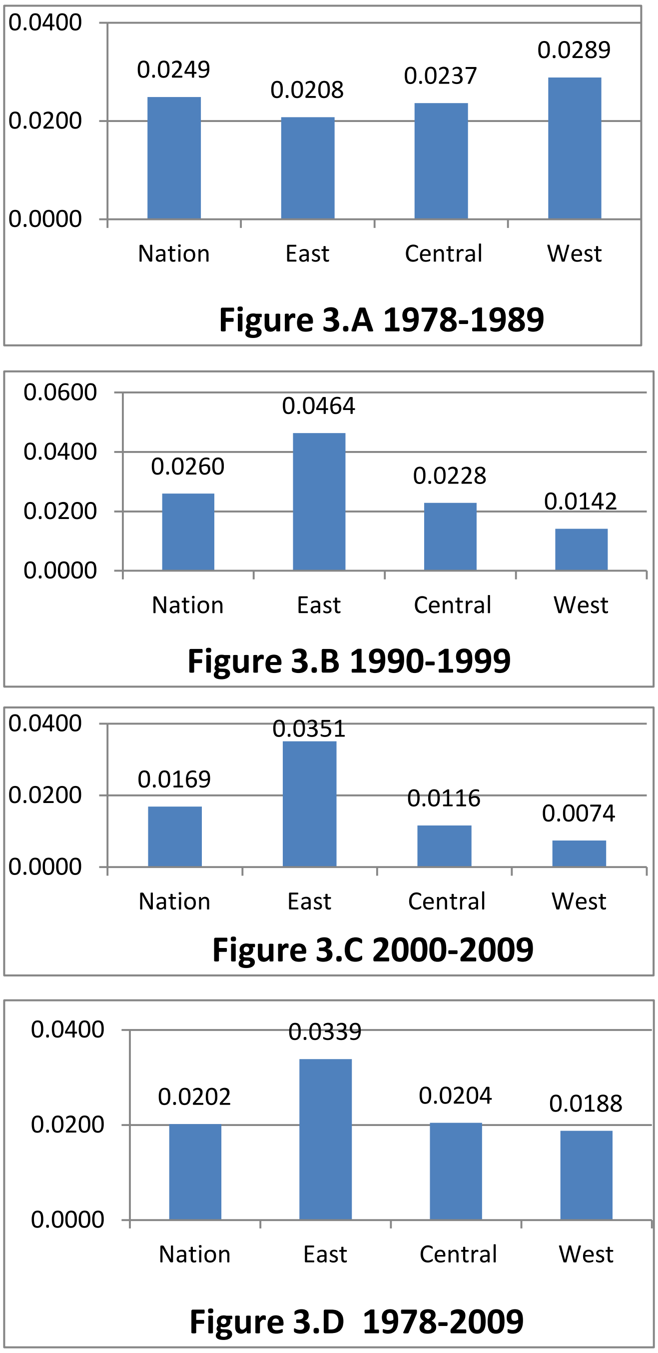

Figure 3, TFPGs of the Aggregate Economy for Different Regions

Table 1 TFPG in Different Periods

Period	Observations	Mean	Std. Dev.	Min	Max
1950-1954	35	-0.0149	0.0704	-0.2470	0.1234
1955-1959	80	-0.0032	0.0812	-0.2670	0.1997
1960-1964	86	-0.0313	0.1098	-0.3346	0.1740
1965-1969	90	0.0068	0.0592	-0.1139	0.1769
1970-1974	90	0.0016	0.0536	-0.0980	0.2058
1975-1979	147	0.0167	0.0512	-0.1160	0.2020
1980-1984	301	0.0479	0.0715	-0.0791	0.9430
1985-1989	349	0.0122	0.0534	-0.5229	0.2708
1990-1994	430	0.0550	0.0986	-0.1867	0.9603
1995-1999	678	0.0127	0.0716	-0.2560	0.7670
2000-2004	825	0.0436	0.0931	-0.3990	0.9760
2005-2009	181	0.0456	0.0821	-0.3330	0.4320
1950-1977	437	-0.0080	0.0748	-0.3346	0.2058
1978-2009	2855	0.0345	0.0828	-0.5229	0.9760
1950-2009	3292	0.0288	0.0830	-0.5229	0.9760

Note: Only single-year TFPGs are included.

Table 2 TFPGs in Different Sectors, Regions and Approaches

Category	Observations	Mean	Std.Dev.	Min	Max
East China	1145	0.0418	0.0763	-0.3500	0.9430
Central China	964	0.0264	0.0790	-0.3990	0.7670
West China	950	0.0283	0.0835	-0.5185	0.9760
Whole Nation	2249	0.0215	0.0616	-0.5229	0.9603
Agriculture	2357	0.0203	0.0714	-0.5185	0.9430
Manufacturing	583	0.0759	0.1213	-0.5229	0.9760
Service	88	0.0538	0.0551	-0.0350	0.2848
Aggregate-economy	2281	0.0227	0.0500	-0.3346	0.4320
SRM	1769	0.0276	0.0588	-0.5229	0.9603
DEA	2634	0.0328	0.0819	-0.3990	0.9760
SFA	593	0.0164	0.0719	-0.5185	0.5800
AINA	250	0.0089	0.0593	-0.1776	0.1889
Others	62	0.0249	0.0509	-0.0594	0.2130
Full sample	5308	0.0280	0.0728	-0.5229	0.9760

Table 3 Summary of Primary Studies

Journal/Paper	Region	Sector	Data	Method	Price	Inputs	Observations*
English 47	Nation 130	Aggregate 69	Panel data 80	AINA 8	Constant 126	Capital and labor 86	Single-year 3292
Chinese 103	East 48	Agriculture 41	Time series 70	SRM 72	Current 17	More inputs 64	Period 2016
	Central 40	Manufacturing 38		DEA 55			
	West 38	Service 6		SFA 14			
Published 136		Non-agriculture 1	Micro-data 141				
Unpublished 14			Micro-data 9	Others 4	Unknown 7	Quality-adjusted 23	

Notes: 1. The numbers denote the numbers of primary studies.

2. There are more primary studies than papers because some papers have more than one study.

3. In the last column, Single-year refers to the TFPG estimated for each year, while Period refers to the TFPG reported for a period.

Table 4 Definition of variables

Variables	Definition
Published	Dummy for published studies with peer-review process.
English	Dummy for primary studies written in English language.
Region	Dummy for region-level studies.
East	Dummy for East China, including Hebei, Beijing, Tianjin, Guangdong, Jiangsu, Liaoning, Shandong, Shanghai, Zhejiang, Fujian and Hainan.
Central	Dummy for Central China, including Anhui, Henan, Heilongjiang, Jilin, Hubei, Hunan, Jiangxi, Inner Mongolia and Shanxi.
West	Dummy for West China, including Guangxi, Guizhou, Yunnan, Sichuan, Chongqing, Tibet, Ningxia, Qinghai, Gansu, Shaanxi and Xinjiang.
Sector	Dummy for sector-specific economy study.
Agriculture	Dummy for primary sector, including plantation, forestry, animal husbandry, fishery and services in support of these industries.
Manufacturing	Dummy for secondary sector, including mining and quarrying, manufacturing, production and supply of electricity, water and gas, and construction.
Service	Dummy for tertiary sector, refers to all other economic activities not included in agriculture or manufacturing.
SRM	Solow Residual Method used in primary studies.
DEA	Data Envelopment Analysis used in primary studies.
SFA	Stochastic Frontier Analysis used in primary studies.
AINA	Arithmetic Index Number Approach used in primary studies.
Others	Other approaches used in primary studies.
Micro data	Dummy for primary studies using micro data.
Quality-adjust	Dummy for primary studies adjusting the quality of inputs.
Inputs	Additional inputs except for labor and capital are included in primary studies.
Current price	Nominal value is used in primary studies.
Time	Year (1949 is set to be 1).
Time squared	Year Squared.
Reform	1= after 1978, 0= others.
Panel	Panel data is used in primary studies.
Scale	Restriction of constant return to scale is held in primary studies.
Reg-elasticity	Output elasticity with respect to input is estimated by regressing.
Dummies	Dummy variables are used in primary studies.

Table 5 Results based on the Full sample

Variables	OLS	WLS		
	Time square	Reform	Time	Time square
East	0.0221 (7.58)***	0.0174 (6.30)***	0.0181 (6.52)***	0.0179 (6.45)***
Central	0.0054 (1.75)*	-0.0001 (-0.04)	0.0008 (0.25)	0.0004 (0.14)
West	0.0087 (2.84)***	0.0029 (0.91)	0.0039 (1.24)	0.0035 (1.12)
Agriculture	0.0201 (4.96)***	0.0111 (3.34)***	0.0112 (3.34)***	0.0113 (3.37)***
Manufacturing	0.0601 (16.87)***	0.0332 (11.34)***	0.0303 (10.17)***	0.0314 (10.44)***
Service	0.0299 (3.90)***	0.0290 (5.02)***	0.0243 (4.15)***	0.0262 (4.45)***
SRM	0.0045 (0.84)	0.0014 (0.30)	0.0053 (1.16)	0.0036 (0.77)
DEA	-0.0049 (-0.90)	-0.0020 (-0.45)	-0.0005 (-0.11)	-0.0017 (-0.35)
SFA	-0.0132 (-2.18)**	0.0011 (0.21)	0.0020 (0.36)	0.0006 (0.10)
Others	0.0005 (0.05)	0.0084 (0.97)	0.0110 (1.26)	0.0096 (1.09)
Published	0.0193 (6.32)***	0.0107 (3.27)***	0.0116 (3.52)***	0.0111 (3.37)***
English	0.0068 (2.57)***	0.0070 (2.84)***	0.0075 (3.01)***	0.0071 (2.86)***
Micro data	-0.0245 (-3.13)***	-0.0091 (-1.64)	-0.0061 (-1.11)	-0.0071 (-1.24)
Quality adjust	0.0004 (0.12)	-0.0011 (-0.39)	-0.0016 (-0.55)	-0.0016 (-0.57)
Inputs	-0.0178 (-4.77)***	-0.0143 (-4.83)***	-0.0152 (-5.11)***	-0.0151 (-5.07)***
Current price	-0.0111 (-3.20)***	-0.0022 (-0.72)	0.0001 (0.03)	-0.0008 (-0.26)
Time/Reform	0.0028 (6.64)***	0.0375 (11.18)***	0.0009 (9.07)***	0.0019 (4.86)***
Time squared	-0.00003 (-4.82)***			-0.00001 (-2.66)***
Intercept	-0.0666 (-7.38)***	-0.0225 (-3.79)***	-0.0299 (-4.63)***	-0.0435 (-5.28)***
R^2	0.0987	0.0745	0.0671	0.0684
Adjusted R^2	0.0957	0.0715	0.0641	0.0652
F	32.19***	25.05***	22.39***	21.57***
Observations	5308	5308	5308	5308

Notes: 1. The first column uses OLS models, and the last three use WLS with the squared root of the sample size as weight.

2. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

3. We take the whole nation and the aggregate economy as the control region and the control sector, respectively. Therefore, the benchmark group is the nation-level aggregate-economy TFPG using constant price and macro-data without quality adjustment, and it is estimated by arithmetic index number approach with only two inputs. Moreover, it is written in Chinese and has not been published.

4. If price information is not available in the primary study, we assume a constant price.

Table 6 Results based on subsamples

Variables	Nation-level	Region	Aggregate-economy	Sectors	Single year	Nation-single year	Nation-aggregate	Nation-aggregate-single year
East			0.0148 (4.80)***	0.0204 (4.51)***	0.0268 (5.88)***			
Central		-0.0174 (-5.62)***	0.0008 (0.22)	0.0004 (0.08)	0.0102 (1.76)*			
West		-0.0132 (-4.22)***	-0.0028 (-0.78)	0.0069 (1.39)	0.0166 (2.75)***			
Agriculture	0.0077 (1.54)	0.04443 (7.90)***			0.0168 (3.42)***	0.0117 (1.85)*		
Manufacturing	0.0092 (2.13)**	0.0757 (15.19)***		0.0110 (2.41)**	0.0350 (8.02)***	0.0186 (3.29)***		
Service	0.0273 (3.12)***	0.0328 (3.95)***		0.0034 (0.45)	0.0716 (5.86)***	0.0967 (5.92)***		
SRM	0.0004 (0.07)	0.0312 (4.73)***	0.0141 (1.96)**	-0.0040 (-0.70)	0.0009 (0.16)	0.0024 (0.40)	-0.0106 (-1.05)	-0.0009 (-0.06)
DEA	0.0015 (0.25)	0.0120 (2.12)**	0.0021 (0.29)	-0.0012 (-0.20)	0.0017 (0.29)	-0.0005 (-0.08)	-0.0040 (-0.39)	0.0073 (0.50)
SFA	0.0176 (2.34)**		0.0157 (1.47)	-0.0025 (-0.36)	0.0022 (0.29)	0.0186 (2.00)**		
Others	0.0110 (1.04)	-0.0273 (-1.19)		0.0387 (2.32)**	0.0184 (1.55)	0.0178 (1.41)	-0.0192 (-1.52)	-0.0115 (-0.64)
Published	-0.0031 (-0.48)	0.0118 (3.08)***	0.0009 (0.23)	0.0237 (4.44)***	0.0355 (6.46)***	0.0158 (1.81)*	0.0162 (1.72)*	0.0234 (1.83)*
English	0.0081 (2.19)**	0.0110 (3.09)***	0.0146 (5.14)***	0.0099 (2.41)**	0.0171 (4.16)***	0.0155 (3.35)***	0.0173 (3.78)***	0.0335 (4.61)***
Micro data	0.0010 (0.14)	-0.0127 (-1.06)	-0.0273 (-3.19)***	-0.0043 (-0.55)	-0.0126 (-1.39)	-0.0071 (-0.65)	-0.0268 (-2.60)***	
Quality adjust	0.0004 (0.09)	-0.0016 (-0.36)	0.0040 (1.29)	-0.0150 (-2.87)***	-0.0037 (-0.66)	-0.0035 (-0.50)	0.0090 (2.20)**	0.0083 (1.26)
Inputs	-0.0105 (-2.44)**	-0.0393 (-8.23)***	-0.0025 (-0.69)	-0.0254 (-5.69)***	-0.0273 (-5.95)***	-0.0177 (-2.77)***	-0.0088 (-1.72)*	-0.0153 (-1.71)*
Current price	0.0091 (2.04)**	-0.0189 (-3.81)***	0.0110 (2.19)**	-0.0026 (-0.65)	-0.0072 (-1.64)	0.0014 (0.25)	0.0118 (2.04)**	0.0095 (1.35)
Time	0.0021 (4.29)***	0.0036 (2.12)**	0.0035 (7.16)***	0.0012 (2.02)**	0.0024 (4.60)***	0.0026 (4.51)***	0.0040 (6.63)***	0.0044 (5.92)***
Time squared	-0.00002 (-2.38)**	-0.00004 (-2.20)**	-0.00004 (-5.94)***	-0.0000 (-0.02)	-0.00002 (-2.91)***	-0.00002 (-2.84)***	-0.00005 (-5.59)***	-0.0001 (-5.11)***
Intercept	-0.0321 (-2.87)***	-0.0776 (-2.20)**	-0.0627 (-5.23)***	-0.0286 (-2.27)**	-0.0719 (-6.18)***	-0.0581 (-4.30)***	-0.0649 (-3.74)***	-0.0883 (-3.70)***
R^2	0.0637	0.1146	0.0705	0.0898	0.0903	0.0766	0.0695	0.0770
Adjusted R^2	0.0574	0.1100	0.0648	0.0846	0.0853	0.0693	0.0605	0.0667
F	10.12***	24.61***	12.28***	17.46***	18.06***	10.37***	7.70***	7.48***
Observation	2249	3059	2281	3027	3292	1890	1145	908

Notes: 1. *, ** and *** respectively denote the significant levels at the 10%, 5% and 1%.

2. We set East China as the control region in region subsamples and agriculture as the control industry in sectoral subsamples.

Table 7 Results after 1978

Variables	Full sample	Single year	Nation-level	Aggregate economy	Agriculture	Manufacturing	Service
East	0.0172 (6.30)***	0.0245 (5.35)***		0.0135 (4.90)***	0.0206 (4.87)***	0.0335 (2.26)**	0.0188 (1.00)
Central	-0.0004 (-0.12)	0.0077 (1.32)		-0.0004 (-0.13)	-0.0077 (-1.70)*	0.0381 (2.53)**	0.0009 (0.04)
West	0.0034 (1.08)	0.0135 (2.23)**		-0.0040 (-1.22)	-0.0025 (-0.56)	0.0618 (3.32)***	-0.0049 (-0.26)
Agriculture	0.0120 (3.59)***	0.0159 (3.19)***	0.0075 (1.44)				
Manufacturing	0.0314 (10.41)***	0.0336 (7.41)***	0.0091 (2.06)**				
Service	0.0243 (4.21)***	0.0634 (5.09)***	0.0264 (3.03)***				
SRM	0.0052 (0.84)	-0.0005 (-0.06)	0.0010 (0.13)	-0.0009 (-0.12)	-0.0034 (-0.54)	-0.0260 (-1.00)	-0.0465 (-2.31)**
DEA	0.0032 (0.51)	0.0080 (1.04)	0.0076 (1.01)	-0.0101 (-1.33)	-0.0067 (-1.05)	-0.0330 (-1.17)	
SFA	0.0083 (1.20)	0.0052 (0.58)	0.0208 (2.32)**		-0.0096 (-1.35)	0.0317 (1.06)	
Others	0.0125 (1.31)	0.0173 (1.34)	0.0130 (1.11)	-0.0155 (-1.61)	-0.0047 (-0.23)	0.0821 (1.73)*	
Published	0.0132 (3.91)***	0.0381 (6.40)***	-0.00005 (-0.01)	0.0006 (0.17)	0.0080 (1.46)	0.0731 (2.81)***	
English	0.0095 (3.62)***	0.0230 (4.95)***	0.0120 (2.92)***	0.0130 (4.85)***	0.0043 (1.11)	0.0553 (2.62)***	-0.0723 (-2.86)***
Micro data	-0.0089 (-1.64)	-0.0108 (-1.18)	-0.0011 (-0.15)	-0.0263 (-3.44)***	-0.0040 (-0.28)	-0.0565 (-2.86)***	
Quality adjust	-0.0044 (-1.47)	-0.0133 (-2.15)**	-0.0039 (-0.83)	0.0025 (0.83)	-0.0090 (-2.08)**	-0.0770 (-2.99)***	
Inputs	-0.0146 (-4.90)***	-0.0280 (-6.00)***	-0.0090 (-2.04)**	0.0002 (0.06)	0.0004 (0.46)	-0.0516 (-5.05)***	0.0545 (5.08)***
Current price	-0.0014 (-0.46)	-0.0079 (-1.68)*	0.0098 (1.98)**	0.0092 (1.92)*	0.0056 (1.37)	-0.0094 (-0.68)	
Time	-0.0076 (-4.75)***	-0.0056 (-2.45)**	-0.0073 (-3.04)***	-0.0004 (-0.27)	-0.0044 (-1.84)*	-0.0093 (-0.99)	-0.0059 (-0.56)
Time squared	0.0001 (4.90)***	0.0001 (2.46)**	0.0001 (3.11)***	0.0000 (0.19)	0.00004 (1.51)	0.0001 (1.27)	0.00004 (0.40)
Panel							
Constant scale							
Regress							
Dummy							
Intercept	0.1645 (4.73)***	0.1050 (2.12)**	0.1706 (3.34)***	0.0376 (1.05)	0.1338 (2.62)***	0.2499 (1.25)	0.1356 (0.53)
R^2	0.0531	0.0751	0.0383	0.0430	0.0514	0.1559	0.4232
Adjusted R^2	0.0495	0.0692	0.0300	0.0366	0.0443	0.1325	0.3647
F	14.85***	12.79***	4.63***	6.73***	7.27***	6.65***	7.24***
Observation	4787	2855	1761	2113	2031	556	88

Note: *, ** and *** respectively denote the significant level at the 10%, 5% and 1%.

Appendix: List of primary studies

Author	Time paper	Journal	Region	Sector	Method	Data	Inputs	Price	Period	TFPG
Bai and Yin	2008	Chinese	East, west and central	Aggregate	SRM	Panel data	Labor and capital	Constant price	1979-2005	-0.1160, 0.4320
Bai and Zhang	2010	WP	China	Manufacturing	SRM	Panel data	Labor and capital	Constant price	1953-2005	-0.4702, 0.3452
Bosworth and Collins	2008	JEP	China	Aggregate, agriculture, Manufacturing and service	SRM	Time series	More	Constant price	1978-2004	0.0090, 0.0610
Brandt et al.	2011	JDE	China	Manufacturing	SRM	Panel data	Labor and capital	Constant price	1998-2007	0.0280
Bruemmer et al.	2006	JDE	East	Agriculture	SFA	Panel data	More	Constant price	1986-2000	0.0010, 0.1120
Cao and Birchenall	2011	WP	China	Agriculture	SRM	Time series	More	Constant price	1991-2009	0.0650
Cao and liu	2011	WP	China	Manufacturing	LVA	Panel data	Labor and capital	Constant price	1999-2007	-0.0260, 0.2130
Cao et al.	2009	RIW	China	Agriculture, Manufacturing and service	SRM	Time series	More	Constant price	1982-2000	-0.0350, 0.0500
Cao G.	2006	Chinese	China	Service	DEA	Panel data	More	Current price	2000-2003	0.0152, 0.2848
Cao J.	2007	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1980-2005	-0.0401, 0.0884
Chen H.	2009	Thesis	East, west and central	Aggregate	DEA	Panel data	Labor and capital	Unknown	1979-2004	-0.0703, 0.1461
Chen and Santos-Paulino	2010	WP	China	Manufacturing	SFA	Panel data	More	Constant price	1981-2006	0.0200, 0.0980
Chen et al.	2009	WP	China	Manufacturing	SFA	Panel data	Labor and capital	Constant price	1981-2006	0.0200, 0.1000
Chen et al.	2009	CER	China	Aggregate	DEA	Panel data	Labor and capital	Unknown	1997-2004	0.0369, 0.0578
Chen W.	2006	Chinese	China, east, central and west	Agriculture	DEA	Panel data	More	Constant price	1991-2003	-0.3185, 0.3433
Chow and Li	2002	EDCC	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1952-1978	0.0000, 0.0303
Chu et al.	2009	Chinese	China	Manufacturing	SRM	Time series	Labor and capital	Constant price	2002-2007	0.0237
Coelli and Rao	2005	AE	China	Agriculture	DEA	Panel data	More	Constant price	1980-2000	0.0600
Cui Z.	2005	Chinese	East	Aggregate	SRM	Time series	Labor and capital	Constant price	1979-2002	-0.0110, 0.2708
Dekle and Vandenbroucke	2010	RDE	China	Agriculture	SRM	Time series	More	Constant price	1978-2003	0.0060
Deng and Yu	2006	Chinese	East	Aggregate	DEA	Panel data	Labor and capital	Constant price	1981-2004	0.0030, 0.0490
Diao and Tao	2003	Chinese	China	Agriculture	SRM	Time series	More	Constant price	1980-2001	-0.0791, 0.0806
Ezaki and Sun	1999	AEJ	China, east, central and west	Aggregate	SRM	Time series	Labor and capital	Constant price	1981-1995	-0.1130, 0.1120
Fan and Zhang	2002	EDCC	China, east, central and west	Agriculture	SRM	Time series	More	Constant price	1953-1997	-0.1923, 0.1553
Fan S.	1991	AJAE	China	Agriculture	SFA	Panel data	More	Constant price	1965-1985	0.0074, 0.0213
Fan S.	1997	Food Policy	China	Agriculture	SRM	Time series	More	Constant price	1953-1995	-0.2297, 0.1650
Fan S.	1998	Chinese	China	Agriculture	AINA	Time series	More	Constant price	1953-1995	-0.1705, 0.1650
Fang et al.	2004	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1979-1999	-0.0591, 0.1412
Feng H.	1993	Chinese	China	Agriculture	AINA	Time series	More	Constant price	1950-1990	-0.1414, 0.1700
Fu and Floor	2004	WP	China	Manufacturing	DEA	Panel data	Labor and capital	Constant price	1991-1997	-0.2180, 0.2150
Fu and Gong	2009	AEP	China	Manufacturing	DEA	Panel data	More	Constant price	2001-2005	0.0111
Gao and Wang	2010	Chinese	China	Manufacturing	DEA	Panel data	Labor and capital	Constant price	2003-2007	0.0853
Gao J.	2003	Chinese	China	Manufacturing	AINA	Time series	More	Current price	1992-2000	-0.1437, 0.1320
Graham and Wada	2001	wp	East, west and central	Aggregate	SRM	Panel data	Labor and capital	Constant price	1978-1997	-0.0200, 0.2600
Gu and Meng	2002	Chinese	China	Agriculture	DEA	Panel data	More	Unknow	1981-1995	-0.0260, 0.1080

Guo and Jia	2005	Chinese	China	Aggregate	SRM, LVA, POA	Time series	Labor and capital	Constant price	1979-2004	-0.0599, 0.0613
Guo and Jia	2004	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1978-2002	-0.0012, 0.0034
Guo et al.	2005	Chinese	China, east, central and west	Aggregate	DEA	Panel data	Labor and capital	Constant price	1979-2003	-0.0161, 0.0378
Han and Zhai	2005	Chinese	East, west and central	Agriculture	DEA	Panel data	More	Current price	1982-2002	-0.0621, 0.9430
Hayami and Ruttan	1985	Book	China	Agriculture	AINA	Time series	More	Constant price	1953-1989	-0.1352, 0.1471
He et al.	2009	Chinese	East	Agriculture	DEA	Panel data	More	Constant price	1993-2005	-0.0410, 0.1520
He Y.	2007	Chinese	China, east, central and west	Aggregate	DEA	Panel data	Labor and capital	Constant price	1986-2003	-0.0430, 0.0790
Hong et al.	2005	Chinese	East	Agriculture	SRM	Time series	More	Constant price	1999-2003	0.0184
Hu and Liu	2007	Chinese	China	Aggregate	SRM	Time series	More	Constant price	1994-2004	-0.0103, 0.0039
Hu et al.	2008	Chinese	China, east, central and west	Aggregate	SRM	Time series	Labor and capital	Constant price	1978-2005	-0.0055, 0.0812
Huang and Zhou	2010	Chinese	China	Agriculture	SFA	Panel data	More	Unknow	1979-2008	0.0075, 0.0212
Islam et al.	2006	AEJ	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1979-2002	-0.0128, 0.1017
Jeanneney et al.	2006	WP	China, east, central and west	Aggregate	DEA	Panel data	Labor and capital	Constant price	1993-2001	0.0126, 0.0660
Jiang et al.	2005	Chinese	China, east, central and west	Agriculture	DEA	Panel data	More	Constant price	1978-2002	-0.0330, 0.0570
Jin et al.	2006	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1980-2003	-0.0946, 0.1139
Jin X.	2006	Chinese	China	Aggregate	DEA	Panel data	Labor and capital	Current price	1992-2003	-0.0950, 0.2380
Jin Z.	2003	Chinese	Central	Agriculture	LVA	Time series	Labor and capital	Constant price	1979-2000	0.0189
Kalirajan et al.	1996	AJAE	China, east, central and west	Agriculture	SFA	Panel data	More	Constant price	1970-1987	-0.5186, 0.4780
Kong et al.	1999	AEJ	China	Manufacturing	SFA	Panel data	Labor and capital	Constant price	1991-1994	-0.0730, 0.1240
Lambert and Parker	1998	JAE	China, east, central and west	Agriculture	DEA	Panel data	More	Current price	1970-1995	-0.0910, 0.2770
Li and Chen	2008	Chinese	China, east, central and west	Aggregate	DEA	Panel data	Labor and capital	Constant price	1978-2005	-0.0230, 0.0710
Li and Li	2008	Chinese	China	Manufacturing	SFA	Panel data	More	Constant price	1986-2005	0.0006, 0.0354
li and liu	2011	EM	China	Aggregate	SFA	Panel data	More	Constant price	1987-2006	-0.011, 0.0782
Li and Meng	2006	Chinese	China, east, central and west	Agriculture	DEA	Panel data	More	Constant price	1978-2004	-0.0120, 0.0590
Li and Zeng	2009	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1980-2007	-0.0467, 0.0967
Li et al.	1992	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1953-1990	-0.3346, 0.2058
Li et al.	2008	Chinese	China	Manufacturing	DEA	Panel data	Labor and capital	Constant price	1999-2003	0.0200, 0.1500
Li J.	1992	ESQ	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1953-1990	-0.3346, 0.2058
Li W.	1997	JPE	China	Manufacturing	SRM	Panel data	Labor and capital	Constant price	1981-1989	-0.0218, 0.1075
Liang Z.	2000	Chinese	China	Aggregate	LVA	Time series	More	Constant price	1978-1997	0.0127, 0.0196
Lin J. Y.	1992	AER	China	Agriculture	SRM	Panel data	More	Constant price	1978-19874	0.0003, 0.0029
Liu and Hu	2008	Chinese	China, east, central and west	Aggregate	SRM	Time series	Labor and capital	Constant price	1987-2005	0.0020, 0.0793
Liu and Liu	2000	Chinese	China	Manufacturing	AINA	Time series	Labor and capital	Current price	1976-1984	-0.0920, 0.1111
Liu and Wang	2003	RP	China	Manufacturing	SRM	Panel data	Labor and capital	Current price	1995	0.0879, 0.1278
Liu and Zhou	2008	Chinese	East	Manufacturing	DEA	Panel data	Labor and capital	Constant price	1997-2005	-0.0430, 0.2060
Liu and Zhou	2008	Chinese	East	Manufacturing	DEA	Panel data	Labor and capital	Constant price	2006	0.0620

Liu and Zhu	2007	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Current price	1985-2005	-0.2254, 0.0838
Liu et al.	2009	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1979-2007	0.0181, 0.0359
Liu et al.	2007	Chinese	China	Manufacturing	SFA	Panel data	More	Constant price	1996-2005	0.0900, 0.5800
Lu and Jin	2005	Chinese	China	Manufacturing	SRM	Panel data	Labor and capital	Current price	1990-2000	-0.0333, 0.0109
Ma J.	1989	Chinese	China, east, central and west	Manufacturing	SRM	Time series	Labor and capital	Current price	1984-1993	-0.0264, 0.0794
Mao and Koo	1997	CER	East, west and central	Agriculture	DEA	Panel data	More	Unknown	1979-1984	0.0045, 0.1132
McMillan et al.	1989	JPE	China	Agriculture	SRM	Time series	More	Constant price	1979-1984	0.0045, 0.1132
Mead R. W.	2003	ECP	China, west	Aggregate	SRM	Time series	More	Constant price	1984-1999	-0.0750, 0.1559
Meng and Gu	2001	Chinese	China, east, central and west	Agriculture	DEA	Panel data	More	Current price	1998	-0.0350, 0.1650
Meng and Li	2004	Chinese WP	China, east, central and west	Aggregate	DEA	Panel data	Labor and capital	Constant price	1952-1998	-0.0310, 0.0451
Ni and Wang	2005	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1979-2002	-0.0267, 0.1644
Ni H.	2008	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1953-2005	-0.0105, 0.0165
Nin et al.	2010	JPA	China	Agriculture	DEA	Panel data	More	Constant price	1962-2006	-0.1050, 0.1400
Nin-Pratt et al.	2010	JPA	China	Agriculture	DEA	Panel data	More	Unknown	1962-2006	-0.1050, 0.1400
Peng and Gou	2007	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1986-2004	-0.1504, 0.0921
Ren and Yuan	2006	Chinese	China	Manufacturing	DEA	Panel data	Labor and capital	Constant price	1997-2003	0.0280, 0.0860
Rong and Wang	2004	Chinese	China	Manufacturing	SRM	Time series	Labor and capital	Constant price	1986-2002	-0.2051, 0.1176
Shen and Zhao	2006	Chinese	East	Aggregate	SRM	Time series	Labor and capital	Constant price	1979-2003	-0.0630, 0.0972
Shen et al.	2007	Chinese	China	Manufacturing	DEA	Panel data	Labor and capital	Current price	1985-2003	-0.0150, 0.0550
Shen K.	1999	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1953-1997	-0.0003, 0.0585
Shen K.	1997	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Current price	1953-1994	-0.0873, 0.1070
Shen N.	2006	Chinese	China, east, central and west	Manufacturing	DEA	Panel data	Labor and capital	Current price	1985-2003	-0.0220, 0.0620
Shi and Liu	2006	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1979-2003	-0.0851, 0.0750
Sun and Ren	2005	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1981-2002	-0.0422, 0.0967
Sun and Nian	2011	Chinese	China, east, central and west	Service	DEA	Panel data	Labor and capital	Constant price	2005-2009	-0.0220, 0.1070
Tang A. M.	1986	Book	China	Agriculture	AINA	Time series	More	Constant price	1953-1989	-0.1686, 0.1742
Tong et al.	2009	WP	China, east, central and west	Agriculture	DEA, SFA	Panel data	More	Constant price	1994-2005	-0.2560, 0.5240
Tu Z.	2007	Chinese	China	Manufacturing	DEA	Panel data	Labor and capital	Constant price	1996-2004	-0.1170, 0.1760
Wang and Cheng	2005	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1979-2002	-0.0457, 0.0827
Wang and Ge	2007	Chinese	China, east, central and west	Agriculture	DEA	Panel data	More	Constant price	1982-2004	-0.0010, 0.0880
Wang and Gu	2005	Chinese	Central	Manufacturing	DEA	Panel data	More	Constant price	1994-2002	-0.1400, 0.1200
Wang and Liu	2006	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1953-2001	-0.2901, 0.1511
Wang and Yan	2004	Chinese WP	China, east, central and west	Aggregate	DEA	Panel data	Labor and capital	Constant price	1979-2001	-0.0503, 0.0720
Wang and Yao	2003	CER	China	Aggregate	SRM	Time series	More	Constant price	1953-1999	-0.0167, 0.0306
Wang and Zhou	2008	Chinese	China	Aggregate	DEA	Panel data	More	Constant price	1995-2005	-0.0170, 0.0480
Wang et al.	2005	Chinese	China	Aggregate	DEA	Panel data	Labor and capital	Constant price	1953-2002	-0.2670, 0.1980

Wang et al.	2009	Chinese	China	Aggregate	SRM	Time series	More	Constant price	1953-2007	0.0181, 0.0374
Wang et al.	2008	Chinese	China	Service	SRM,DEA	Panel data	Labor and capital	Constant price	1980-2005	-0.0278, 0.0720
Wang Q.	2009	Chinese	East	Aggregate	SRM	Time series	Labor and capital	Constant price	1980-2006	0.0880
Wen G. J.	1993	EDCC	China	Agriculture	AINA	Time series	More	Constant price	1953-1989	-0.1762, 0.1889
Wen H.	2005	Chinese	China, east, central and west	Aggregate	SRM	Time series	Labor and capital	Constant price	1989-2001	-0.0131, 0.0905
Wong L.	1986	Book	China	Agriculture	AINA	Time series	More	Constant price	1953-1989	-0.1651, 0.1792
Woo W. T.	1997	CE	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1979-1993	-0.0519, 0.0547
Wu and Wang	2002	Chinese	China	Aggregate	SRM	Time series	More	Constant price	1981-1998	0.0294, 0.0420
Wu et al.	2001	RDE	China, east, central and west	Agriculture	DEA	Panel data	More	Constant price	1980-1995	-0.0395, 0.0853
Wu S.	2007	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1952-2003	-0.0050, 0.0228
Wu Y.	2008	Chinese	China	Aggregate	SFA	Panel data	More	Constant price	1993-2004	0.0164, 0.0430
Xiao and Lin	2011	Chinese	China	Aggregate	DEA	Panel data	Labor and capital	Constant price	2003-2007	0.0110, 0.1250
Xiao and Wang	2006	Chinese	Central	Manufacturing	DEA	Panel data	More	Constant price	1999-2003	-0.1010, 0.7670
Xie et al.	2008	Chinese	China	Manufacturing	SRM	Panel data	More	Current price	1998-2005	0.1026
Xin and Qin	2009	WP	East, west and central	Agriculture	DEA	Panel data	More	Constant price	1988-2005	-0.0480, 0.0830
Xu and Du	2005	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1953-2003	0.0276, 0.0501
Xu and Wang	2008	Chinese	East	Aggregate	DEA	Panel data	Labor and capital	Constant price	1990-2005	0.0089, 0.0165
Yang and Wang	2008	Chinese	China, east, central and west	Manufacturing	DEA	Panel data	Labor and capital	Constant price	2000-2005	-0.3990, 0.9760
Yang T.	1994	Chinese	China	Manufacturing	SRM	Time series	Labor and capital	Current price	1981-1990	-0.5229, 0.9603
Ye Y.	2002	Chinese	China, east, central and west	Aggregate	SRM	Time series	Labor and capital	Constant price	1979-1998	0.0359, 0.0558
Young A.	2003	JPE	China	Non-agricultural sector	SRM	Time series	More	Constant price	1978-1998	0.0140
Zeng and Li	2008	Chinese	China, east, central and west	Agriculture	DEA	Panel data	More	Constant price	1981-2005	-0.0865, 0.1534
Zeng X.	2008	Chinese	China	Agriculture	DEA	Panel data	More	Constant price	1981-2005	-0.0380, 0.0830
Zhang and Gui	2008	Chinese	China, east, central and west	Aggregate	DEA	Panel data	Labor and capital	Constant price	1979-2005	-0.0424, 0.0886
Zhang and Shi	2003	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1953-1998	-0.2909, 0.1260
Zhang and Xu	2009	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1980-2005	-0.0376, 0.0849
Zhang et al.	2006	Chinese	China	Manufacturing	DEA	Panel data	More	Constant price	1999-2005	-0.0030, 0.0130
Zhang et al.	2009	Chinese	China	Manufacturing	SFA	Panel data	Labor and capital	Constant price	1981-2006	0.0200, 0.1000
Zhang Y.	2007	Chinese	China	Aggregate	DEA	Panel data	Labor and capital	Constant price	1981-2004	-0.0900, 0.1700
Zhang Z.	2008	Chinese	China, east, central and west	Service	DEA	Panel data	Labor and capital	Constant price	1994-2004	-0.0060, 0.2280
Zhao and Hu	2005	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1952-2003	-0.0028, 0.0256
Zhao and Zhang	2006	Chinese	China	Agriculture	SRM	Panel data	More	Constant price	1986-2003	0.0005, 0.0283
Zhao et al.	2005	Chinese	China, east, central and west	Aggregate	DEA	Panel data	Labor and capital	Constant price	1980-2003	-0.1730, 0.1510
Zhao H.	2004	Chinese	China	Agriculture	SRM	Time series	Labor and capital	Constant price	1980-2000	-0.0732, 0.4366
Zhao X.	2008	Chinese	China, east, central and west	Manufacturing	DEA	Panel data	More	Constant price	2002-2005	-0.0010, 0.0540
Zheng and Hu	2005	Chinese	China, east, central and west	Aggregate	DEA	Panel data	More	Constant price	1980-2000	-0.0204, 0.1091
Zheng et al.	1995	Chinese	East	Manufacturing	SFA	Panel data	More	Constant price	1991-1992	-0.1389, 0.1785

Zheng et al.	2008	Chinese	China	Aggregate	SRM	Time series	More	Constant price	1978-2005	0.0079, 0.0427
zheng et al.	2009	WD	China	Aggregate	SRM	Time series	Labor and capital	Unknown	1978-1995	0.0079, 0.0427
Zhi D.	1997	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Current price	1978-1994	-0.0280, 0.0957
Zhi D.	1995	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1978-1993	-0.0472, 0.0877
Zhu and Li	2005	Chinese	China	Manufacturing	SRM	Panel data	More	Constant price	1987-2002	-0.0566, 0.0317
Zhu W.	2008	Chinese	China	Aggregate	SRM	Time series	Labor and capital	Constant price	1984-2004	-0.1867, 0.1936

Notes: 1. Time-paper in the second column denotes the date of publication for published work and the date of finishing the paper as a working paper respectively.

2. There are two values in the TFPG Range column. The former is the minimum TFPG in the respective primary study and the latter is the maximum TFPG.