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估算及其对经济增长的贡献研究

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摘　要

改革开放 30 年来，中国的增量改革取得了举世瞩目的成就。世界银行分析报告指出，中国经济的增长速度之快以及持续时间之长在世界主流经济上是史无前例的。然而，1997 年的亚洲金融危机，使经济学家开始从效率角度重新审视中国的经济增长。前苏联（包括金融危机前的东亚）的经验表明，经济增长的关键不在于实现了一段时间的高增长，而在于实现的是什么样的高增长，增长能否持续。许多学者指出，中国经济的增长方式带有鲜明的"粗放式"特征，全要素生产率的贡献太低，不足以支撑经济的持续增长，中国经济的增长主要是依靠投入推动的。那么，中国的经济增长是否以及在多大程度上是"粗放式"的增长？全要素生产率贡献了多少？全要素生产率是否存在恶化趋势？为此，本书对全要素生产率的研究方法进行梳理和总结，在此基础上，对全要素生产率及其对我国经济增长的贡献进行实证研究，以找出我国的经济增长中，究竟有多少是由资本和劳动投入推动的，有多少是由技术进步导致的，试着对上述问题做出回答。

首先，本书对全要素生产率计算中的两个重要的要素投入，即固定资本和劳动投入进行估计，在此基础上，对全要素生产率及其对经济增长的贡献进行实证研究。鉴于既有研究在固定资本存量估计中存在的主

观性假设问题，本书利用投入产出表，推导了一个计算固定资本存量的公式，并利用该公式重新估算了我国整体经济和工业行业的固定资本存量。而既有研究中一般采用历年从业人数作为劳动投入指标，由于没有考虑劳动质量改善对劳动投入的贡献，从而减小了劳动投入对经济增长的贡献，导致全要素生产率的估计结果偏高。为此，本书利用 Tornqvist 指数编制了反映劳动质量改善的劳动投入指数，并利用已估计的固定资本存量，运用索罗余值法重新计算了我国的 TFP 及其对经济增长的贡献。

其次，根据内生增长理论，考察了引入人力资本变量后我国全要素生产率的变化情况。通过对人力资本计量方法的评述，本书选择投资成本法估算了教育投资形成的人力资本，并进一步利用永续盘存法估计了我国的人力资本存量。在此基础上，建立自回归分布滞后模型，对全要素生产率和人力资本对我国经济增长的贡献进行实证研究。

最后，分别利用制造业和省际面板数据，采用数据包络分析法对不同行业和区域全要素生产率的变化情况进行实证研究，以找出各行业和区域全要素生产率的变化规律，并对变化的原因进行解释。通过将全要素生产率分解为技术进步与技术效率，把握各行业和区域全要素生产率变化的深层次原因。

本书的主要结论有：

（1）对固定资本存量估计的结果表明，从总体趋势来看，我国的资本产出比在上升，资本的生产率在下降，表明我国正在经历一个资本深化的过程。进一步对工业行业固定资本存量的研究表明，20 世纪 90 年代中后期，我国主要工业行业均出现了资本深化过程，但 1998 年之后，不存在资本深化现象。

（2）劳动投入指数的分析结果表明，劳动质量的改善是目前我国劳动投入增长的重要源泉，而且随着时间的推进，劳动质量改善在劳动投入增长中的贡献呈上升趋势。通过对要素投入贡献的分析发现，1990－2007年间，资本投入对经济增长的贡献率超过60%，表明现阶段我国的经济增长仍属于资本推动型。从不同时期来看，劳动投入的贡献率稳步提高，但提升速度缓慢，而全要素生产率对经济增长的贡献呈逐年下降趋势。

（3）对引入人力资本变量后的全要素生产率进行估计，结果表明，人力资本仅次于物质资本，成为我国经济增长的第二大推动力量。而由于人力资本的引入，充分分解了"索洛余值"，使全要素生产率对经济增长的贡献显著减小。对模型结果的进一步分析表明，人力资本的投入产出效益大大高于物质资本，而且人力资本投资效应具有一定的滞后性。因此，现阶段我国应进一步加大对人力资本的投资力度。

（4）运用 DEA 法对区域全要素生产率进行测算的结果表明，1993－2008年间 TFP 以年均2.5%的速度增长，对经济增长的贡献率达到25.07%，这个增长率和贡献率还是比较令人满意的。通过对 TFP 的分解发现，其增长主要得益于技术进步以年均3.5%的速率增长，而技术效率则以年均0.9%的速率抵消技术进步的贡献。从区域层次看，东部地区的 TFP 增长率在各个时期均是最高的。不同地区 TFP 的分解结果表明，东部地区的技术效率增长最快，西部地区的技术效率次之，而中部地区的技术效率增长最慢，技术效率增长的差异是导致中西部地区 TFP 增长落后的主要原因。

（5）运用 DEA 法对制造业全要素生产率进行测算的结果表明，我国制造业 TFP 变化大体经历了3个阶段：1991－1993年的较快增长、

1993 - 1998 年的下降以及 1998 年后的快速增长，总体上呈现出先升后降、再快速回升的态势。通过对 TFP 变动的进一步分解发现，其增长主要来源于技术进步的推动作用，而技术效率则以每年 1.4% 的速度抵消技术进步的贡献。通过对制造业行业 TFP 的进一步分解，我们得出更有意义的结论。具体地说，国有或垄断程度高的行业在技术进步方面表现突出，但其技术效率的退化程度令人吃惊；竞争较为激烈，同时拥有一定技术门槛的行业技术效率改善明显，但技术进步表现不佳；进入门槛越低，竞争越激烈的行业，技术进步表现越差。

关键词：全要素生产率；固定资本存量；劳动投入指数；人力资本存量；数据包络分析法

Abstract

Reform and opening up for 30 years, the incremental reform has made remarkable achievement in China. The analysis report of World Bank indicates, it is unprecedented in the mainstream economic history that Chinese economic growth rate and the duration. However, since the Asian financial crisis in 1997, economists began to re – examine Chinese economic growth from efficiency angle. Former Soviet Union's (including the East Asian before financial crisis) experience shows that the key to economic growth is not achieved the highly growth in a period, but rather to achieve what kind of high growth, the sustainability of growth. Many scholars have pointed out that Chinese growth with a distinctive "extensive" feature, the contribution of total factor productivity is low, and Chinese economic growth mainly relies on input – driven. So, Whether Chinese growth and to what extent is the extensive growth? What's TFP contribution to the economy growth? Whether there is deterioration trend in total factor productivity? Therefore, based on collating and summarizing the research methods of total factor productivity, the article has an empirical research to total factor productivity and its contribution to economic growth in China. To find out how much is driven by capital and labor inputs,

how much is caused by the technological progress in Chinese economic growth, and try to answer above questions.

First, we estimate two important elements of inputs in calculating total factor productivity, namely fixed capital stock and labor inputs. On this basis, we calculate the total factor productivity and its contribution to economic growth in empirical research. In view of the subjective assumptions on fixed capital stock estimates in the existing research, in this paper, we deduce a formula to calculate capital stock by input – output table, and use the formula to re – estimate the fixed capital stock in Chinese overall economic and industrial sectors. While the existing studies generally use the number of employees over the years as the labor input index, which without considering the quality of the work to improve the contribution of labor input, thereby, reducing the labor input contribution to economic growth, lead to estimation of total factor productivity high. Therefore, we compile the labor input index that reflect the labor quality improvement by using of Tornqvist Index, and using the fixed capital stock that has estimated, we re – estimate chinese total factor productivity and its contribution to economic growth by Solow Residual Method.

Secondly, according to the endogenous growth theory, we investigate TFP's changes after the introduction of human capital variables. Through the review of human capital measurement methods, we choose the invest – cost method to estimate the human capital by educational investment formation, and further apply the perpetual inventory method to estimate the stock of human capital in China. On this basis, through the establishment of autoregressive distributed lag model, we have an empirical research on total factor productivi-

ty and human capital to economic growth.

Lastly, utilizing the manufacturing sector and provincial panel data, we have an empirical study on the changes of total factor productivity in different sectors and regions by data envelopment analysis method, to identify industry and regional variation of total factor productivity, and explain the reasons for the change. By further decompose into technological progress and technical efficiency to total factor productivity, to grasp the deep – rooted reasons of TFP change in different regions and industries.

The main conclusions of this book are as follows：

（1）By the estimation of fixed capital stock shows Chinese capital – output ratio on the rise from the overall trend, declining in capital productivity shows that our country is going through a process of capital deepening. Further, by analyzing the capital stock of industrial sectors, we draw a conclusion, since the mid – 90s, Chinese major industrial sectors have emerged in the process of capital deepening, but after the 1998, there was no capital deepening phenomenon.

（2）By the analysis of the labor input index shows that the improvement of labor quality is an important source of labor input growth in China, and as time goes on, labor quality improvement to the contribution of labor input is growing. By analyzing the contribution of factor inputs from 1990 to 2007 year, we find the capital input contribute to economic growth more than 60%, which indicate Chinese economic growth at this stage is still to rely on capital – driven. From a different period of time, the contribution of labor input steadily improved, but slow, while the contribution of total factor productivity declined

year by year.

（3）By estimating total factor productivity after the introduction of human capital variables, the results show that human capital is second only to physical capital, and has become the second largest economic growth driving force, and since the introduction of human capital, fully decompose the "Solow residual value", so TFP's contribution to economic growth decreased significantly. Further analysis to the model results show that the input and output efficiency of human capital is much higher than physical capital, human capital investment effect has a certain lag, therefore, China should further increase investment in human capital at the present stage.

（4）Based on provincial panel data, this paper applies Data Envelope Analysis Method to calculate TFP, the results shows, the yearly TFP growth rate is about 2. 5% and accounting for 25. 07% of economic growth during 1993 − 2008. The growth rate and contribution rate is relatively very satisfied. By further decomposition of TFP shows the growth driven by technological progress at an average annual growth rate of 3. 5%, while the technical efficiency at an average annual rate of 0. 9% offset the contribution of technological progress. From a regional perspective, the TFP growth rate of eastern region is the highest in each period. Further decomposition of TFP in different regions found technical efficiency in eastern region is fastest, while the central region has the slowest growth in technical efficiency, technical efficiency growth differences is the main reason that lead to TFP growth in central and western regions behind.

（5）Based on manufacturing panel data, this paper applies Data Envelope Analysis Method to calculate TFP, the results shows, the TFP change in

Chinese manufacturing industry has undergone three stages: the faster growth in 1991 – 1993 year, decline from 1993 to 1998 year and the rapid growth after 1998 year. Generally shows a first and then decreased, and then quickly picked up momentum. By further decomposition of TFP shows the growth mainly stems from technical progress, while technical efficiency at an average annual rate of 1.4% offset the contribution of technical progress. By the decomposition of industry TFP, we obtained more meaningful conclusion. Generally, the state – owned or monopoly industry has high technical progress, however, technical efficiency declined significantly; the industry with some competition and a certain technical threshold has improved technical efficiency obviously and technical progress has been a slowly growth; the industry with low technical threshold and competition, the technological progress is the worst.

Key words: Total Factor Productivity; Fixed Capital Stock; Labor Input Index; Human Capital Stock; Data Envelope Analysis Method

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