

科学研究費助成事業 研究成果報告書

平成 28 年 6 月 23 日現在

機関番号：37503

研究種目：基盤研究(C) (一般)

研究期間：2013～2015

課題番号：25380273

研究課題名(和文) Estimating and Identifying Sources of Productivity Growth and Their Factor Determinants for the Japanese Economy

研究課題名(英文) Estimating and Identifying Sources of Productivity Growth and Their Factor Determinants for the Japanese Economy

研究代表者

キム サンホ (KIM, Sangho)

立命館アジア太平洋大学・国際経営学部・教授

研究者番号：20635461

交付決定額(研究期間全体)：(直接経費) 3,400,000円

研究成果の概要(和文)：本研究では、日本の製造業における全要素生産性とその要因決定要素を推定し、特定するための理論モデルを開発した。この研究では、生産性成長を技術進歩とその他の要因に分解させる3つの異なる回帰モデルを提供した。研究の実証結果は、日本経済の生産性向上を促進するための多様な政策や提案を提供している。研究成果は、ワーキングペーパーの他、3本の論文として国際査読誌で発表し、また12の国際会議で口頭発表を行った。

研究成果の概要(英文)：This research has developed theoretical models to estimate and identify total factor productivity and its factor determinants for the Japanese manufacturing industry. The research provides three different regression models that decompose productivity growth into technical progress and many other factors. Empirical results of the research provide various policy suggestions required to boost productivity growth for the Japanese economy. From the research, three papers are published in internationally refereed journal, along with one working paper. Working papers of the research had been presented at twelve international conferences.

研究分野：Economic Growth

キーワード：TFP Technical Change Returns to Scale Markup Embodied Tech. Change Tech. Efficiency Change Allocative Eff. Change Scale Efficiency Change

1 . 研究開始当初の背景

The Japanese economy has tried to recover its competitiveness, deteriorated significantly due to the great appreciation of the Japanese yen after the global economic depression, originating from the US mortgage and ensuing Euro debt crises. The Japanese government is pursuing structural reform to boost private investment, along with expansionary monetary and fiscal policy to stimulate the economy.

In this regard, this research decomposes total factor productivity (TFP) changes into efficiency changes and technology innovation to estimate and identify sources of productivity growth of the Japanese economy both at the national and industrial level. Moreover, the study investigates determinant factors for sources of TFP growth in the Japanese economy at the firm level, which consist of technical progress, technical efficiency changes, allocative efficiency changes and scale efficiency changes. By doing this, the study can recommend policies that are effective in improving the overall productivity of the Japanese economy.

2 . 研究の目的

This research utilizes industrial panel data for the Japanese manufacturing industry to decompose the Solow residual into scale economies, markup effects, and technical change. Secondly, the research is to estimate the sources of productivity growth by simultaneously considering embodied technical progress, spillover effects, and openness after controlling for returns to scale, imperfect competition, and capacity utilization. Thirdly, this research decomposes TFP growth into technical progress, technical efficiency change, allocative efficiency change and scale efficiency change, to estimate and identify factor determinants of these sources of productivity growth for Japanese industrial firms.

This research aims to suggest policy implications required to improve the productivity of industrial sectors of the Japanese economy by estimating and identifying determinant factors TFP growth.

3 . 研究の方法

This research developed three theoretical models and applied them to Japanese manufacturing data for empirical analysis. First, a model was developed to decompose TFP growth as measured by the Solow residual into technical change, scale economies, markup effects, and capacity utilization. This model was applied to

the Japan Industrial Productivity Database. Secondly, a model was designed to include both embodied and disembodied technical progress without restrictive assumptions of perfect competition, constant returns to scale, and full employment. This model was employed to estimate factor determinants of productivity growth for the Japanese manufacturing sector. Thirdly, a model is adopted to decompose TFP growth into technical progress (TP), technical efficiency change (TEC), allocative efficiency change (AEC), and scale efficiency change (SEC). This model was applied to Japanese industrial firm data to identify factor determinants of decomposed productivity growth.

4 . 研究成果

Empirical findings of this study are as follows:

1) The measured Solow residual significantly overestimates the total factor productivity growth of the total Japanese manufacturing sector. The results show that the economic growth during 1970-85 was driven mostly by scale economies resulting from large investments that enabled industries to exploit booming foreign demand, rather than by pure technological progress. The results also indicate that productivity growth started to decline in 1985 when manufacturers tried to contest eroding price competitiveness with economies of scale, which is much earlier than implied by the original Solow residual. Furthermore, sectoral estimation suggests that productivity grew much faster in the high-growth sector than in the low-growth sector, suggesting that international competition caused the high-growth sector to be more efficient than the low-growth sector through the sample years.

This study suggests that the economic growth driven by capital investment to utilize scale economies is subject to decreasing returns if not accompanied by technical progress. Specifically, the study indicates that lacking innovation caused slowdown of the Japanese manufacturing industry despite that the industry had heavily invested to weather severe economic challenges to maintain its productivity growth, especially after the Plaza Accord in 1985. The study also shows that the economy can benefit from enhanced competition as lowered markup boosts productivity growth. Thus, opening the market and promoting its competition will enhance the competitiveness of the economy.

2) Embodied technological progress is a significant component of productivity growth for the Japanese manufacturing industry, especially for the durable manufacturing sector. This suggests the recent decline in productivity growth, which is generally considered as one of the main

reasons for the sluggish Japanese economy, is related to both a decrease in human capital and the vintage of physical capital. Thus, the Japanese government should enhance its investment in human resources and new frontier-technology embodied machinery to raise the competitiveness of the manufacturing sector.

However, the impact of the investments on IT and R&D capital is likely to be underestimated at the industry-level due to their external economies, resulting in underinvestment versus the optimal level. In this regard, the government should encourage investments in these capitals to enhance productivity growth by providing incentives. Also, the importance of IT capital should be emphasized as its transmission mechanism on productivity growth is multifaceted through direct effects, vintage effects and external effects. This provides some explanation as to why IT is estimated to have had a strong influence on TFP growth for the Japanese economy in previous literature. To address the externality, the government should consider providing tax breaks to boost R&D and IT investment, to maintain them at the optimum level.

The existence of significantly positive markup implies that competitive pressure on firms can boost technical progress. Thus, the Japanese government should reduce entry barriers for manufacturing firms by lowering actual fees, business days to obtain permits, and the number of procedures.

3) Empirical results show that TP and TEC are two key components that contribute to TFP growth. Almost all the industries have positive TP that outweighs deteriorating TEC to register overall increases in TFP, and most industries enjoy efficiency gain in both SEC and AEC even though those gains are much smaller than TEC and TP. Regarding TFP determinants, the results indicate that quality of employees, imports and outsourcing have significantly positive influence on TE, and that foreign ownership enhances TP while both exports and imports deteriorate it. Firm size has a significantly negative influence on SEC for almost every industry. Thus, the results suggest that reversing the trend of deteriorating TEC is a major issue in enhancing productivity growth. For this, investment in human capital should be stimulated and outsourcing should be extended.

5 . 主な発表論文等

(研究代表者、研究分担者及び連携研究者には下線)

[雑誌論文] (計 3 件)

1) Sangho Kim, “Factor Determinants of Total Factor Productivity Growth for the Japanese

Manufacturing Industry,” *Contemporary Economic Policy*, vol. 34, pp. 572-586, 2016, refereed

2) Sangho Kim and Keunjae Lee, “Returns to Scale, Markup and Total Factor Productivity for the Japanese Manufacturing Industry,” *Korea and the World Economy*, vol. 16, pp. 195-222, 2015, refereed.

3) Sangho Kim, “Estimating Productivity Growth in the Korean Economy without Restrictive Assumptions,” *Contemporary Economic Policy* Vol. 32, pp. 520-532, 2014, refereed.

[学会発表] (計 12 件)

1) Sangho Kim, “Factor Determinants of Decomposed Total Factor Productivity Growth: Evidence from Japanese Manufacturing Firms (English language),” The 4th International Conference on Business and Social Sciences, March 30, 2016, Kyoto Research Park, Japan.

2) Sangho Kim, “Factor Determinants of Decomposed Total Factor Productivity Growth: Evidence from Japanese Manufacturing Firms (Korean language),” The Korean Economic Association's Allied Economic Conference, February 17, 2016, Seoul National University, Seoul, Korea.

3) Sangho Kim, “What Drives Total Factor Productivity Growth for Japanese Manufacturing Industry? (English language)” The Japanese Applied Economic Association's Spring Conference, June 13, 2015, Kyushu Sangyo University, Fukuoka, Japan.

4) Sangho Kim, “What Drives Total Factor Productivity Growth for Japanese Manufacturing Industry? (English language)” The Japanese Economic Association's Spring Conference, May 23, 2015, Niigata University, Niigata, Japan.

5) Sangho Kim, “What Drives Total Factor Productivity Growth for Japanese Manufacturing Industry? (English language)” 2015 Annual Meeting of The Korean Association of Applied Economics, April 3, 2015, Sogang University, Seoul, Korea.

6) Sangho Kim, “What Drives Total Factor Productivity Growth for Japanese Manufacturing Industry? (English language)” The 79th International Atlantic Economic Society Conference, March 13, 2015, Milan Marriot Hotel, Milan, Italy.

7) Sangho Kim, “What Drives Total Factor

Productivity Growth for Japanese Manufacturing Industry? (Korean language)” The Korean Economic Association's Allied Economic Conference, February 24, 2015, Yonsei University, Seoul, Korea.

8) Sangho Kim, “Returns to Scale, Total Factor Productivity Growth for Japanese Manufacturing Industry (Korean language),” The Korean Economic Association's International Conference, August 12, 2014, Yonsei University, Seoul, Korea.

9) Sangho Kim, “Returns to Scale, Total Factor Productivity Growth for Japanese Manufacturing Industry (English language),” The Japan Applied Economic Association's Spring Conference, June 21, 2014, Tokushima University, Tokushima, Japan.

10) Sangho Kim, "Estimating Productivity Growth in the Korean Economy without Restrictive Assumptions (English language)," 世界金融危機の理論・実証・政策, November 30, 2013, Hosei University, Tokyo, Japan.

11) Sangho Kim, “Returns to scale, Markup, and total factor productivity for the Japanese Manufacturing Industry (English language),” November 21, 2013, IBSSS The Global Symposium on Social Sciences, Kafuu Resort Fuchaku Condo Hotel, Okinawa, Japan.

12) Sangho Kim, "Estimating Productivity Growth in the Korean Economy without Restrictive Assumptions (Korean language)," Econometrics Seminar, August 27, 2013, Korea University, Seoul, Korea.

〔図書〕(計 0 件)

〔産業財産権〕
出願状況(計 0 件)

名称：
発明者：
権利者：
種類：
番号：
出願年月日：
国内外の別：

取得状況(計 0 件)

名称：
発明者：
権利者：
種類：
番号：
取得年月日：

国内外の別：

〔その他〕
ホームページ等

6 . 研究組織
(1) 研究代表者
金相鎬 (KIM Sangho)
立命館アジア太平洋大学・国際経営学部・教授
研究者番号：20635461