

Manufacturing

by Robert Siregar

Submission date: 24-Jul-2022 08:03PM (UTC+0700)

Submission ID: 1874411490

File name: Manufacturing.pdf (388.32K)

Word count: 3603

Character count: 21366

Peer-reviewed academic journal

Innovative Issues and Approaches in Social Sciences

IIASS – VOL. 14 (2021)

Innovative Issues and Approaches in Social Sciences

IIASS is a double blind peer review academic journal published 3 times yearly (January, May, September) covering different social sciences: political science, sociology, economy, public administration, law, management, communication science, psychology and education.

IIASS has started as a SIdip – Slovenian Association for Innovative Political Science journal and is being published by ERUDIO Center for Higher Education.

Typeset

This journal was typeset in 11 pt. Arial, Italic, Bold, and Bold Italic; the headlines were typeset in 14 pt. Arial, Bold

Abstracting and Indexing services

COBISS, International Political Science Abstracts, CSA Worldwide Political Science Abstracts, CSA Sociological Abstracts, PAIS International, DOAJ, Google scholar.

Publication Data:

ERUDIO Education Center

Innovative issues and approaches in social sciences, 2021, vol. 14

ISSN 1855-0541

Additional information: www.iiass.com

1 MANUFACTURING AS AN ENGINE OF GROWTH: THE CASE OF EAST ASIAN COUNTRIES BASED ON LITERATURE STUDIES

Khairunnisah Lubis¹, Ardhy Dinata Sitepu², Robert Tua Siregar³, Anggiat Sinurat⁴, Rudi Salam Sinaga⁵

Abstract

This paper aims to answer why manufacturing is an engine of growth from an economist's perspective. This paper uses descriptive qualitative methods. Data collection using literature studies. This paper will confirm Robert Kaldor's theory of economic growth in East Asian Countries. The results support that the successful implementation of manufacturing in developing countries is due to the total factor productivity (TFP) which causes changes in efficiency and changes in technology.

Keywords: Economic growth, Manufacturing, East Asia Countries

Introduction

Manufacturing is the process of converting raw materials, components, or parts into finished goods that meet a customer's expectations or specifications. Manufacturing commonly employs a man-machine setup with division of labor in a large-scale production"

¹ Khairunnisah Lubis is lecturer at Universitas Medan Area, Kolam Street, No. 1 Medan Estate, Medan City, 20223, Indonesia, Correspondence Author: email: klubis240891@gmail.com, khairunnisah@staff.uma.ac.id.

² Ardhy Dinata Sitepu is masters at Erasmus University College. Nieuwemarkt 1A, 3011HP Rotterdam Netherlands, email: ardhy Sitepu@gmail.com.

³ Robert Tua Siregar is lecturer at Sekolah Tinggi Ilmu Ekonomi Sultan Agung, Surabaya Street, No. 19, Pematangsiantar City, 21118, Indonesia, email: tuasir@gmail.com.

⁴ Anggiat Sinurat is lecturer at Universitas Simalungun, Sisingamangaraja Street, No.1, Pematangsiantar City, 21141 Indonesia, email: angginoer@gmail.com.

⁵ Rudi Salam Sinaga is lecturer at Universitas Medan Area, Kolam Street, No. 1 Medan Estate, Medan City, 20223, Indonesia, email: rudisalam@staff.uma.ac.id.

¹ (Business Dictionary 2017). Manufacturing is regarded as the most important engine of economic growth as it is viewed as the way to reach modernization and skilled job creation, as well as spillover effects to other sectors development (Tybout 2000). But, since the contribution of the manufacturing sector has declined in developed countries, many argue that the manufacturing sector has less importance to increase economic growth (McCausland 2012).

Some studies show the positive link between manufacturing and economic growth. For instance, Fagerberg and Verspagen (1999) find that manufacturing is the engine of growth particularly in developing countries both in East Asia and Latin America, but adversely it has no significant contribution in the developed countries. He also examines the impact of manufacturing and service to growth in different periods and countries. From his research, manufacturing structure shifted from mass production manufacturing to advanced industrialization since 1973 through the invasion of sophisticated technology. Further, Szirmai (2011) argues that manufacturing has been important for enhancing growth in developing countries in the past 50 years. Although manufacturing has been an important engine of growth in most developing countries, the contribution of manufacturing in developed countries shows the opposite trend where the service sector becomes more important and the share of the service sector to GDP much bigger than manufacturing. On the other hand, Timmer and de Vries (2009) find that manufacturing contributes to growth at the early stage, while in the next stage market services contribute mostly to aggregate growth. He found that market services are the important sector to accelerate labor productivity in Asia such as Hong-Kong, India, Singapore, and Taiwan.

The role of manufacturing in economic growth has been the subject of debate among several economists. The relationship between manufacturing and growth mostly refers to Robert Kaldor's (1966) postulates. Kaldor (1966) identifies several properties as an engine of growth such as dynamic economies of scale; strong linkage between manufacturing and other sectors; strong characteristic of learning by doing; innovation and technological progress and the significance of manufacturing to balance of payment (Tregenna 2011).

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This essay inquires the reasons why manufacturing becomes the engine of growth from the economist perspective. As a limitation, this essay will reflect on the empirical evidence from South East Asian countries where manufacturing successfully enhances economic growth. By exploiting the empirical evidence, we find that the successful implementation of manufacturing in several successful developing countries is due to total factor productivity (TFP) which accounts for efficiency change and technological change. This essay will be organized into three sections. Section I is a brief introduction of the topic. Section II is the substantive part which explains about the theoretical model of economic growth from Robert Kaldor, followed by the empirical evidence from East Asian countries. Finally, section III is the summary of the finding.

Literature Review

One of the first economists who were comprehensively concerned on the causal relation between manufacturing and economic growth was the Cambridge-based economist, Nicholas Kaldor (1908-1986). He argues in many of his writings that it is impossible to understand growth and development without analyzing sectoral approaches which divided increasing return activities into two sectors, manufacturing and landed based activities such as agriculture and mining. He proposes three laws and subsidiary propositions in his public lecture (1966) entitled "Causes of the Slow Rate of Growth of the United Nations" which was published as Strategic Factors of Economic Development (Thirlwall 2013).

More precisely, Kaldor's first law argued that the growth of GDP and the growth of the manufacturing sector positively correlated. The growth in manufacturing output leads to increased productivity in manufacturing as the reduction in cost of production and in prices. The hypothesis of this is that the technology in manufacturing is much better than agriculture and services which allow manufacturing to expand economies of scale (Thirlwall 2013).

Manufacturing benefits from economies of scale higher than the service sector and agriculture. Through economies of scale, larger scale of production can be achieved at a lower cost, so that increases returns to scale. However, economies of scale are applicable only in manufacturing industries with large fixed costs of production where the cost must be expended even if the production drops to zero (Suranovic 2010). The Economies of scale can be

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achieved through the accumulation of capital as the result of transfer labor, technology, and learning by doing (Szirmai 2011).

The second law associates the manufacturing productivity growth with manufacturing output (Thirlwall 2013). Traditionally, Verdoorn's law has been estimated as a linear relationship between the exponential growth rate of labor productivity and manufacturing output (McCombie and Robert 2007). This initial growth reduces the unit labor cost and gives a mark-up pricing rule through the existence of return in industrial sectors. Kaldor distinguished the existence of return into two types, which are the static and dynamic of returns. The former according to economies of scale of processes of labor division and specialization in growing sectors (Timmer 2000), while the latter refers to increasing productivity in manufacturing due to learning-by-doing processes such as technological change and external economies in production (Libanio 2006).

Fingleton and McCombie (1998) examine the linear relation of productivity growth and manufacturing output using the model below,

$$P_m = b_1 + b_{2qm} \text{ with } b_2 > 0$$

It means that one-percentage of output growth will cause five-percentage increase in productivity growth and adversely one-percentage in productivity growth causes a two-percentage increase in output growth. This Verdoorn's law argues that the increased return of scale derives from the technical change which endogenously induced by output growth.

The third law stated that productivity in the manufacturing sector positively linked to manufacturing output growth (Thirlwall 2013). There is a strong causal relation between the growth of manufacturing output and the growth of labor productivity outside of manufacturing sectors due to diminishing returns in non manufacturing sectors such as agriculture and service activities (Thirlwall 2013). Following the third law, McMillan et al (2011) argued that transfer of labor and other resources from less productive to more productive activities increase the economic growth as it enhances the structural change within countries. The allocative inefficiencies potentially would become the engine of growth in developing countries.

In several literatures, Kaldor's growth model is classified as endogenous growth model which being the pioneer of new growth

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theory. Taylor (2007) mentioned that Kaldor's basic assumption on growth shares similar properties with many endogenous growth models, especially those which propose human capital accumulation, learning by doing, and research and development (R&D). According to You (1994), Kaldor introduced endogenous technical change by introducing technical progress function, even though it was not less successful (Taylor 2007).

The traditional Kaldor's law tests the causal relationship between manufacturing labor productivity and manufacturing output growth. However, the current situation is considerably different because the growth rates are mostly explained by total factor productivity (TFP) which account for efficiency change and technological change, rather than accumulation of traditional factors of production Guo et al. (2012). Therefore, Guo et al. (2012) introduced the extended Kaldor's law into three extensions. The first proposes to pay attention to TFP, and the second introduces several rarely added which are still relevant theoretically to the Kaldorian framework. The third extension consists of spillover effects.

However, McCombie (1981) criticized Kaldor's third law as a misspecified identity. He argues the formulation of Kaldor's third law does not undermine the transmission of productivity. Kaldor's third law assumes that the level of manufacturing productivity is higher than the level of agricultural productivity, which means any shift from agriculture to manufacturing ideally followed by the increase of overall productivity of the economy regardless of the growth of productivity from other sectors. But, McCombie (1981) reveals that the higher productivity in manufacturing will not influence the increasing productivity in agriculture, in spite of no transfer of surplus labor from agriculture to the manufacturing sector. Siregar et al. (2020) The increase in the national economy comes from the response to economic growth in the regions.

Results and Discussion

In this empirical evidence, we focus on total factor productivity (TFP) which accounts for efficiency change and technological change. These empirical evidence show efficiency change and technological change are more significant enhancing growth than capital accumulation. Among East Asian countries, South Korea is the most reliable example which successfully transformed its economy from low productivity to high productivity, and improved the level of income

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from low-income to low-middle income level using sophisticated technology (Singh 2004).

The reliable research on the impact of technical progress on growth is the study of Ikemoto (1986). Ikemoto estimates the total factor production (TFP) for 1970-1980 among East Asian countries using Tornqvist index (price or quantity index). The finding indicates that productivity growth positively increases economic growth in all countries. New industrialized countries such as Taiwan and Korea enjoy the highest growth rate due to the increase of productivity growth, while on the other hand Hong Kong, Malaysia, Philippines, Singapore, and Thailand are much lower. The gap between the first group which enjoys the highest growth rate and the lower one is due to the difference in technical progress and efficiency. Ikemoto indicates that technological use is inefficient in Hong Kong, Malaysia, and Singapore, while Philippines and Thailand do not utilize it due to the backlog of technological innovation.

There are several reasons why the growth rate is different among cross-country experiences. First, inventing products and processes is not crucial for technological development in successful industrialization, but the important factor is acquiring the capabilities to achieve efficient production and investment. Second, some countries overemphasize technological use which increases the cost in poor productivity. Third, the acquisition of technology is not merely derived from experiences, but also evaluation and monitoring, then lead to innovation. The last reason is determining the economic environment which is important to determining the country's productivity related to available resources (Dahlman and Westphal 1981).

Therefore, when manufacturing firms decide to adapt technology, they choose more than a method for making something to achieve expected cost, benefits, and engineering norms, but also the capabilities to require new experience with technology such as the capabilities to move on to new activities in the economy. Different technology allows manufacturing firms to afford the possibilities for adaptation and improvement or the possibilities to enhance company productivity. For instance, South Korea started to improve technology through long processes including study, training, and practice. Firms sent their operating personnel to work in foreign manufacturing

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companies before producing the products (Dahlman and Westphal 1981).

The recent study from Singh (2004) indicates that the process of technological progress was attained through fundamental changes across the sectors. Manufacturing is considered as the most dynamic sector, working on substantial technological changes, spearheads the process of transformation, and provides advanced technologies to other sectors. Thus, the advanced technology in the manufacturing sector attracts resources for more efficiency use. The significance of technological change was properly shown by South Korea's industrial sector performance where labor productivity growth increased almost double during the period 1980-1990 compared to the period 1970-1980. The main features of this improvement are due to the rising productivity growth driven by technological change and increased export demand over the world.

However, some literatures argue technological change does not significantly contribute to increased economic growth in East Asian countries. The empirical study of this claim was mainly from Young (1992) and Kim and Lau (1994). Both present the example from different countries in East Asia, and found that capital accumulation is the main source of growth.

Young (1992) examines the influence of the total factor productivity (TFP) enhancing economic growth from 118 countries. He estimated the growth of output per worker from a cross-country regression from 1970-1985. In his comparative study, Young uses the growth account accounting to estimate the influence of the total factor productivity (TFP) enhancing economic growth. It found that the annual contribution of total factor productivity which is attributed to technological change is not significant to enhance economic growth especially in Singapore. The average of total factor productivity in Singapore between 1974 and 1989 was approximately -6 percent of the total output growth, while capital accumulation accounted for 117 percent of the increase in output per worker. On the other hand, growth of total factor productivity had contributed to 30-50 percent of output growth with the overall 35 percent of output per worker in Hong Kong from 1971-1990.

From this finding, Young (1992) argues that Singapore centralized its economy with high savings and pushed itself too fast to technology,

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without fully considering the benefit of learning by doing in each stage which eventually increased the cost of production. He emphasized that the main source of economic growth in Singapore has been capital accumulation, and almost nothing with technological change.

Furthermore, Kim and Lau (1994) examine the impact of technological change to growth from the empirical study in several East Asian countries including Hong Kong, South Korea, Singapore, and Taiwan, and five OECD countries. Kim and Lau measure the level of technology of nine countries in their analysis. As the conclusion, they reached that technological level in four East Asian Countries was only 20 percent compared to the United States as the reference. This result had been declining from 25 percent in the 1950s.

Both of previous research strictly argue that technological change is not significant to increase economic growth, while Fagerberg (2000) has a slightly different view. He indicates that structural change in technology still matters, but it has a different pattern than before. In the beginning of the 20th century, technology is positively correlated to the growth of output, productivity, and employment. Fagerberg believes that employment in industries which use sophisticated technology like electricity and synthetic materials show the rapid improvement compared to traditional industries. It was implied that overall productivity growth derived from massive structural change.

Conclusion

The study examines the reasons why manufacturing is the key sector improving economic growth in successful developing countries. Kaldor's law provides a good first step to analyze the causal relation between manufacturing and economic growth. There is a linear relationship between labor productivity rate and manufacturing output which eventually induce economic growth.

The empirical evidence from several successful development countries in East Asian countries indicate that efficiency change and technological change significantly contribute to economic growth. However, the results from every country show that manufacturing is not always in line with economic growth due to inefficient technology and the backlog of technological change. Meanwhile, several research also found capital accumulation is the main source of

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growth. It assumes that technological change does not always match with certain countries.

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