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Article

State-Owned Enterprises, Productivity Loss and Misallocation of Resources in Indonesia amidst the Commodity Boom Era: Evidence from Firm-Level Data

Fajar Hadi Pratama[1*]

Corresponding author: fajar.pratama@bappenas.go.id

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Abstract

The recent evolution of total factor productivity (TFP) difference across countries has risen significantly, creating a considerable divergence in income per person as a measurement of living standards. However, Indonesia experienced a declining trend in TFP levels persistently. As a lower middle-income country, Indonesia is ambitious to be a high-income country by design, named Indonesia Vision 2045. This study mainly examines the presence of resource misallocation by channel. Higher revenue productivity (TFPR) dispersion leads to inefficiency of allocating resources and causes productivity loss. Secondly, it also examines the source of resource misallocation by observing the relationship between productivity loss and the proxy of policy distortion variables. Furthermore, this study aims to contribute to the misallocation and growth literature by analyzing firm-level data from 2004, 2005, 2012, and 2013. This study assesses the impact of the commodity boom period that spanned between 2002 and 2012–2013, two pivotal events that significantly altered Indonesia's economic landscape. The TFPR and output productivity (TFPQ) are the dependent variables using large and medium manufacturing annual surveys from the Indonesian Central Bureau of Statistics (BPS). This study discovers that TFPR varied across firms within industries, indicating resource misallocation. Furthermore, equalizing TFPR across sectors would increase aggregate TFP by 122%–133%. Productivity loss relates significantly to ownership, with the elasticity being 1% higher in state-owned enterprises (SOE), equating to a 57.7% increase in the TFPR dispersion. These findings have an important implication for the government policy aligning with the target above. Indonesia should reform SOE to be more productive and profitable while creating a fair playing field. This study also complements by analyzing other policy distortion factors, namely the firm's location and investment type.

Keywords: TFP; productivity loss; resources misallocation; TFRP dispersion; SOE.

[1] Directorate of Trade, Investment, and International Economic Cooperation, Ministry of National Development Planning/Bappenas, Jalan Taman Suropati No. 2, Menteng, Jakarta, Indonesia.

1. Introduction

Adam Smith (1759) once stated, "Mercy to the guilty is cruelty to the innocent" in his monumental legacy, The Theory of Moral Sentiments. This statement implies taking sides with those who should be punished; instead, being forgiven is a form of injustice for the innocent. Adhering to these moral values, this study intends to dissect the link between resource allocation and productivity to achieve a standard of living for people on a par with developed countries in the world.

One of the essential components of economic growth is productivity improvement. Understanding the sources of economic growth is crucial in promoting economic development through various policies. The key driver of economic growth consists of physical and human capital accumulation and total factor productivity (TFP). Jones (2020) states that the evidence indicates that productivity growth accounts for most of the cross-country differences in income per capita growth. The cause of differences has been explained by resource misallocation, which means the industry's capital and labor are less productive than they should be and affect lowering TFP. Chang-Tai Hsieh and Pete Klenow (2009) suggest that fully equalizing revenue productivity (TFPR) across firms in each industry by giving full liberalization or removing the distortions entirely for three different years would accelerate the aggregate efficient TFP by 86%–115% in China, 100%–128% in India, and 30%–43% in the United States.

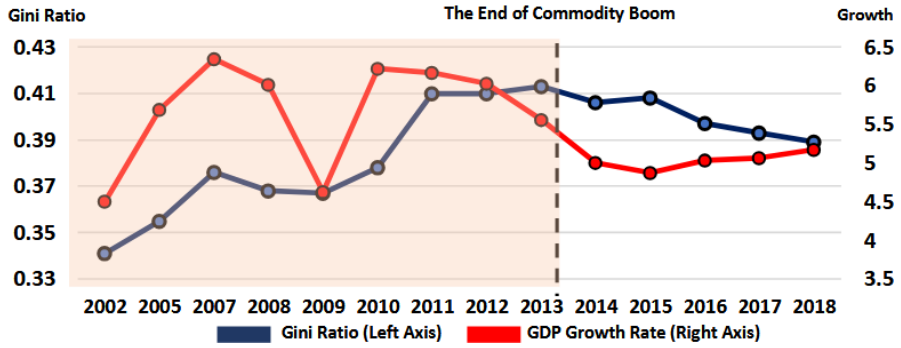
The economic development in Indonesia experienced a slower recovery after the Asian Financial Crisis (AFC) of 1997/1998, given that average economic growth was persistently lower than before the AFC. The explanation of its causes is not clear up to now. One of the proposed explanations is a lower growth of productivity (TFP) corresponding to the rise of the misallocation of resources. Many productive firms suffer from deteriorated credit growth and face difficulty expanding their business due to capital limitations. As a country that follows a welfare state characterised by operating state-owned enterprises (SOE) operation to counter the effect of decreasing productivity growth after AFC, the government of Indonesia wants to evaluate the performance of the SOE's optimisation by ratifying SOE's Act 2003 as an implementation of the mandate from The Constitution of the Republic of Indonesia of 1945, article 33 (2) that states production sectors that are vital to the state and that affect the livelihood of a considerable part of the population are to be controlled by the state. This paper wants to know how efficient SOEs are and evaluates the progress of manufacturing development in general, which is critical to retaining its status as one of the newly industrialized countries (Boddin, 2016).

We rely on rich firm-level data available for four years: 2004, 2005, 2012, and 2013, since this period is vital for manufacturing development, such as the first reform in the SOE Act, including the crucial period of post-recovery AFC, the global financial crisis, and the commodity boom starting from 2002 to around 2012–2013, which was a crucial period for the resource-dependent economy of Indonesia.

The years selected for this study—2004, 2005, 2012, and 2013—represent critical junctures in Indonesia's economic history and are therefore essential for understanding the evolution of resource misallocation and productivity dynamics. The Global Financial Crisis (GFC), which occurred between 2007 and 2009, had a profound impact on Indonesia's economy, despite the country's relative resilience (RBA, 2023). The crisis, which was triggered by a collapse in the global financial system, particularly in the US housing market,

led to a dramatic downturn in global demand and disruptions in trade and investment. For Indonesia, the GFC resulted in a slowdown in manufacturing output and resource exports, making it a vital period to examine how firms in Indonesia adjusted to such shocks. The economic performance data from 2004 and 2005 serve as a crucial baseline to assess the pre-crisis conditions, providing insights into how firms and industries were performing before the global downturn, thereby allowing a clear comparison to the post-crisis period.

Furthermore, the end of the commodity boom around 2012 marked a pivotal transition in Indonesia's resource-dependent economy. From 2002 to 2012, Indonesia experienced significant economic growth driven by high global commodity prices, which boosted revenues from exports of oil, coal, and natural gas. However, as commodity prices began to fall after 2012, Indonesia faced a structural shift that forced the economy to diversify and move away from its heavy reliance on resource extraction. The period following 2012, particularly in 2012 and 2013, provides valuable data on how the country adjusted to these external shocks, with the manufacturing sector struggling to recover and the mining sector facing slowdowns. This shift had significant socio-economic implications, including an increase in income inequality. As Indonesia's economy grew rapidly during the commodity boom, the benefits of this growth were not evenly distributed, leading to a widening of income inequality, reflected in the rising Gini ratio—from 0.38 in 2010 to 0.41 in 2012 (Kacaribu et al., 2019).



Figur 1. Indonesia GDP Growth Rate and Gini Ratio 2002-2018

Source: LPEM FEB UI (2019)

By analyzing these years, this study investigates how the decline in commodity prices led to economic shifts and whether resource misallocation persisted or worsened in the face of this new economic reality. Thus, these timeframes provide essential context for examining Indonesia's ongoing productivity challenges, particularly in sectors like manufacturing and state-owned enterprises (SOEs), that were heavily reliant on the resource boom. This study has empirical findings that the TFP dispersion amongst manufacturing industries in Indonesia is wider and fluctuates over time. It reflected the dispersion of TFPQ and TFPR. The ratio of 75th to 25th percentiles of TFPQ in the latest year dropped from 1.33 in 2004 to 1.31 in 2013, and the 90th minus the 10th percentiles of TFPQ increased from 2.59 in 2004 to 2.63 in 2013. On the other hand, the dispersion of TFPR becomes wider, both the ratio of 75th to 25th percentiles from 0.36 in 2004 to 0.45 in 2013 and 90th minus the 10th percentiles from 0.77 in 2004 to 0.99 in 2013. These findings indicated that resource misallocation in Indonesia might worsen over time.

Resource misallocation creates a barrier to the productive firms accessing sufficient resources for expanding their business, which lowers their TFP; otherwise, they could grow higher. Naturally, the less productive firm will face difficulties continuing their business and choose to either renew their contract or exit from the industry. It will be valuable findings to improve the TFP corresponding to high potential TFP gains if the distortions could be completely removed. To know how much potential TFP gains from removing distortions by equalizing TFPR within industries, this study presents the result of 122%–133%. Then, if it equalises by using TFP gain relative to US efficiency in 1997, the TFP gains reached 55% - 63%. This result is relatively higher compared to China and India based on Hsieh and Klenow's (2009) study.

Based on the background, as mentioned earlier, several issues or questions could be observed, such as (1) How much TFP gains could increase if distortions are removed by equalising TFPR within industries and relative to TFP gains of the U.S.?; (2) Why did the productivity gap in Indonesia remains broader amongst high and low-productive firms by relating the type of ownership between state-owned enterprises (SOEs), local state-owned enterprises (LSOEs), private-owned firm (POFs), and foreign-owned firms (FOFs)?; and (3) What other factors determine policy distortions that lead to resources misallocation?.

This study aims to contribute to the misallocation and growth literature for developing and newly industrialized countries in understanding TFP differences and to promote resource misallocation issues to internalize in Indonesian industrial and investment policy. The remaining sections of this study are organized as follows. Section 2 provides the literature review of the Indonesian economy, and the study of economic development mainly explains the concept of resource misallocation. Section 3 presents the methodology for misallocation accounting, the data, and parameter choices to measure hypothetical productivity gains. Section 4 reports the empirical findings and analysis for the hypothetical potential gains and observes why productivity dispersion remains wider in Indonesian manufacturing. Finally, section 5 provides conclusions and policy implications.

2. The Indonesian Economy, Productivity Loss, and Misallocation of Resources in Indonesia

Chapter two will review the literature relating to economic development in Indonesia, a study on economic growth, and a study of productivity to assist the development and guidance of the research.

2.1 The Indonesian Economy in Brief

Economic growth in Indonesia before the Asian Financial Crisis (AFC) of 1997/1998 reached more than 5%, and after the AFC, it only grew around 5%. It made Indonesia suffer from stagnation and could not attain the same level of growth path as before AFC. This situation was below expectations due to Indonesia's ambition to become a high-income country. Felipe J. et al. (2012) explained that the transitions from an upper-middle to a high income in Hong Kong, the Republic of Korea, and Taipei needed to grow faster and sustainably for an extended period. Compared with this, Indonesia's economic growth is far from ideal to catch up the gap, even reaching an upper-middle country in 2019.

Indonesia needs to grow higher to increase its standard of living. Using gross domestic product per capita measurement, the progress of lifting living standards in Indonesia experienced slower than peers. In contrast, Indonesia transformed their economy a long time ago, marked for the first time in 1967, by changing its economic direction from

state-driven to market-driven after allowing foreign direct investment to come to Indonesia. Nowadays, Indonesia suffers from MIT after more than 30 years, and almost all Indonesian economists believe that productivity plays a key role for Indonesia to grow faster and sustainably to converge the gap with the developed countries for a couple of decades ahead.

The difference in productivity needs to be investigated further with the causes of misallocation because there are few references compared to technology diffusion and human capital development in Indonesia. Since government plays an essential role in decision-making both nationally and regionally, especially in the allocation of resources, the SOE's role as a government representative in business is crucial in understanding whether productivity loss is due to policy distortion or other variables such as foreign investment facilities and the location of companies that are usually given lots of incentives and subsidies to promote investment. Therefore, the study of misallocation becomes crucial to enhancing government policies, primarily industrial and investment policies.

2.2 Indonesia's Economy and Large-Medium Industries

2.2.1 Economic development in Indonesia

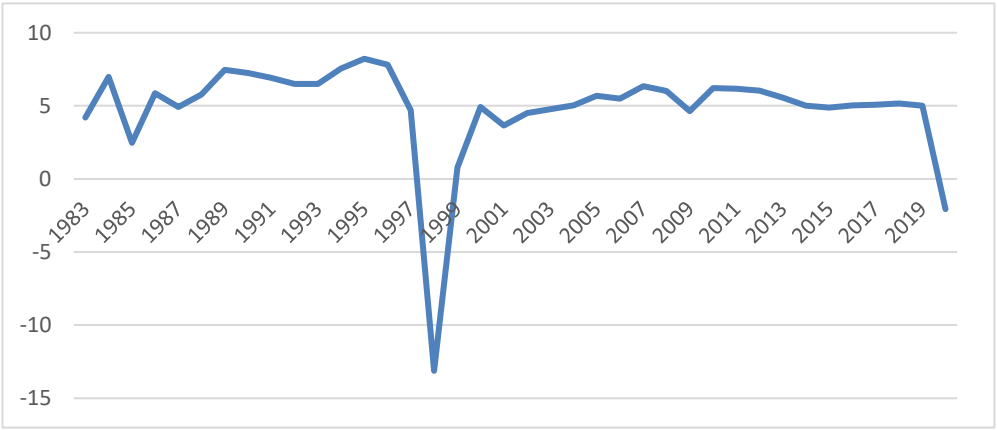


Figure 2. Indonesia GDP Growth (annual %), 1983 – 2020

Source: World Development Indicator, World Bank

Macroeconomic performance in Indonesia since AFC 1997/1998 had no adequate growth acceleration to recover back to the economic growth path before AFC (Hofman, 2004). This event affected the economic transformation from rapid growth to stagnation. Macroeconomic performance could be decomposed further by observing the economy into two different structure sides, expenditure structure and production structure, to see how the economy of Indonesia evolved over time.

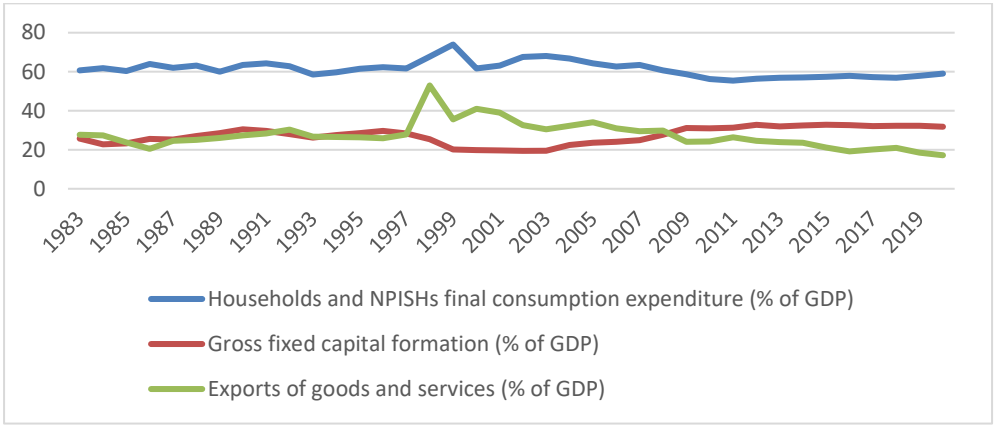


Figure 3. Indonesia Expenditure Share of GDP (%), 1983 – 2020

Source: World Development Indicator, World Bank

The structure of the Indonesian economy could be explained based on the expenditure base. It indicates that Indonesia's economy relied strongly on its domestic consumption or internal economic activities. Indonesia's key driver for growth changed at least by dividing it into three periods. The first period spanned when Indonesia was driven by domestic household consumption from 1983 - 1997; the second period was predominantly export-driven from 1998 - 2007 and the third, redirected into investment-driven in 2008 – until now. The trend of investment-driven did not run well. Investment remained stagnant even though export share continually decreased, and the share of household consumption returned to gain close to 60%.

To boost the economy, reaching higher by relying on consumption was sustainable because it depends on people's purchasing power corresponding to lower-middle income. A different situation was when the economy is driven by export or investment to bring money from abroad utilising external funds to enhance internal economic activities. Japan and South Korea are the best examples of how the economic transformation evolved to reach high-income countries by relying on an export-driven economy. Japan experienced an economic miracle starting from the beginning of the 1950s to the early 1970s due to the effect of the outbreak of the Korean War, in which world trade increased by 34% (Takada, 1999), and South Korea boosted export-led industrialisation in during 1962-1989 (Harvie et al., 2003).

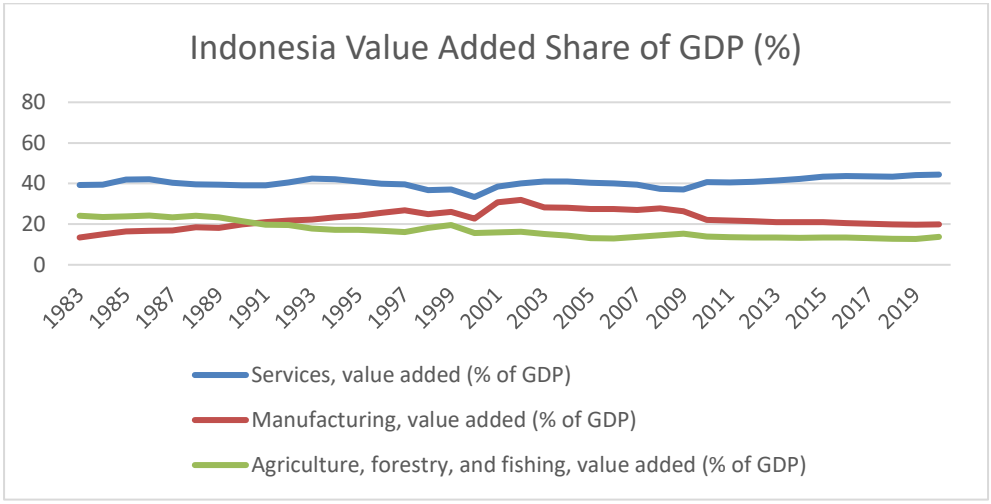


Figure 4. Indonesia Value Added Share of GDP (%), 1983 – 2020

Source: World Development Indicator, World Bank

Furthermore, the economy of Indonesia for a couple of decades has evolved from an agriculture- and service-based economy to an industry- and service-based economy, but the trend has recently changed. Thanks to rapid growth in the manufacturing sector, which was always above service and agriculture, from 1983 to 1996, it even recorded higher than total economic growth. It directly affected the manufacturing share, starting at the lowest of 13.43% in 1983 and rising to 20.96%. Verico (2021) mentioned it as the first Chenery and Syrquin phenomenon for Indonesia because, for the first time, Indonesia experienced the share of the manufacturing sector being higher than the share of the agriculture sector. The economic change with the gap between service and industry diverging started in 2010 when the service share persistently increased rather than the manufacturing sector slowing down and agriculture remained stable.

Since 1983 the share of service remained high, and Indonesia had an opportunity to shift service as a leading sector in late 1996 with the industry sector given the share of industry increased while at that time the share of service decreased. However, when the AFC hit the economy, the rising trend reversed otherwise. Thus the momentum for manufacturing to become a leading sector to overtake the service sector no longer happened. In addition, Indonesia and other ASEAN peer countries have confronted deindustrialization in the recent decade. As shown in table 1, Malaysia, Indonesia, Thailand, and the Philippines faced a decline in their manufacturing share after successfully experiencing the first Chenery and Syrquin phenomenon in the late 1980s.

The story behind the tremendous acceleration of industrial sector growth from 1983 to 1996 is that Indonesia ratified Industrial Act No. 5, 1984. Hill, H. (1997) observed that from the mid-1980s, Indonesia already exported its first manufactured product to the world market with the trademark "Made in Indonesia." At the beginning of modern industrial development in Indonesia, the government had a significant role in aligning with huge state-owned heavy industry to the abundance of the state budget because of the surplus of oil exports in the previous years.

Table 1. Share by Industry 1983-2019

Country	1983-1996			1997-2006			2007-2019			2020		
	agr	mfg	serv	agr	mfg	serv	agr	mfg	serv	agr	mfg	serv
Indonesia	21.15	19.51	40.46	15.74	27.44	38.77	13.59	22.29	41.39	13.70	19.88	44.40
Malaysia	16.81	23.31	45.52	9.63	29.30	46.86	9.12	23.00	49.71	8.21	22.31	54.78
Vietnam	36.05	16.62	37.59	23.02	18.88	40.10	17.57	15.24	40.17	14.85	16.70	41.63
Singapore	0.47	23.61	62.16	0.08	24.72	63.30	0.04	19.57	69.26	0.03	20.54	70.95
Philippines	22.56	24.36	43.01	14.35	24.19	51.68	12.17	20.83	56.60	10.18	17.67	61.42
Thailand	13.45	25.33	54.25	9.13	28.53	53.63	9.72	28.27	53.24	8.64	25.23	58.25
UK	1.26	15.99	67.76	0.82	12.55	67.21	0.63	9.29	70.26	0.57	8.39	72.79
US	N/A	N/A	N/A	1.15	14.23	73.51	1.06	11.69	76.19	N/A	N/A	N/A

Source: World Development Indicator, World Bank

The progress of lifting living standards in Indonesia experienced slower progress than Singapore, the only high-income country in ASEAN, or Malaysia and Thailand. However, it remained better than Vietnam and the Philippines. Felipe J. et al. (2012) observed the pattern of the country becoming high-income based on empirical studies that the UK rose to a high-income country in 1973 and the US in 1962. They consecutively needed 32 and 21 years to achieve it from upper-middle income. He also discovered the empirical finding that the Netherlands was the first country to become a lower-middle-income country in 1827, and it spent almost 128 years, until 1955, before moving to a high-income country.

2.2.2 'Middle-Income Trap'

Indonesia suffered from a relatively low growth rate to close the gap with developed countries. By using the definition of Spence (2011, 100), as countries in the $5,000-$10,000 per capita income range, Indonesia preliminarily experienced a rise in labor wages followed by decreasing industry sector share for a couple of years, especially in the labor-intensive sector, and compounded by low productivity and innovation. This concern, as Kohli, H. S., et al. (2011) explained, is that such countries could not make a timely transition from resources-driven growth to productivity-driven growth to become globally less competitive, heading Indonesia into the so-called 'Middle-Income Trap' challenge.

One of the causes of the slower growth rate comes from the industrial development in Indonesia, which experienced stagnation and even suffering after the AFC. Since then, Indonesia has pointed out that the manufacturing growth has been below its total economic growth on average, with manufacturing growth of 10.93% from 1983 – 1996 10,93% with GDP growth of 6.31% and manufacturing growth of 3,64% and GDP growth of 3,98% annually. Indonesia had become the middle income, as mentioned by Felipe J. et al. (2012) taken 25 years until 2010. However, he stated that to avoid the MIT, Indonesia was required to grow 15% the average per capita income rate annually during the 2011–2013 period. Therefore, given this evidence, Indonesia has officially suffered the MIT since 2013.

Basri and Putra (2016) explained that rapid and sustainable economic development is the keyword for escaping the low- and middle-income trap by strengthening the industrial sector. The fact shows on the other side which industrial sector remains slow. Furthermore, they state that accelerating high yet sustainable economic growth has become increasingly unrealistic for Indonesia, as the progress of its capital stock and TFP could not catch up with frontier technology countries. It can only do so by boosting the industry sector as the leading sector.

Understanding the sources of economic growth is crucial in promoting economic development through various policies. Bappenas (2017) calculated that Indonesia can exit MIT in 2036 with a predicted GDP per capita of around USD 13,045. This Indonesian Vision 2045 projection has a prerequisite to achieving its vision. Indonesia has to encourage manufacturing growth to attain at least 6% annually, supported by digital technology growth that will boost information technology service growth by at least 7% annually. The agriculture sector will continue to grow by 2-3% to preserve the food resiliency and sustainable environment as the net-zero emission commitment. Unfortunately, this scenario did not consider the effect of the COVID-19 pandemic since this outbreak was unpredictable.

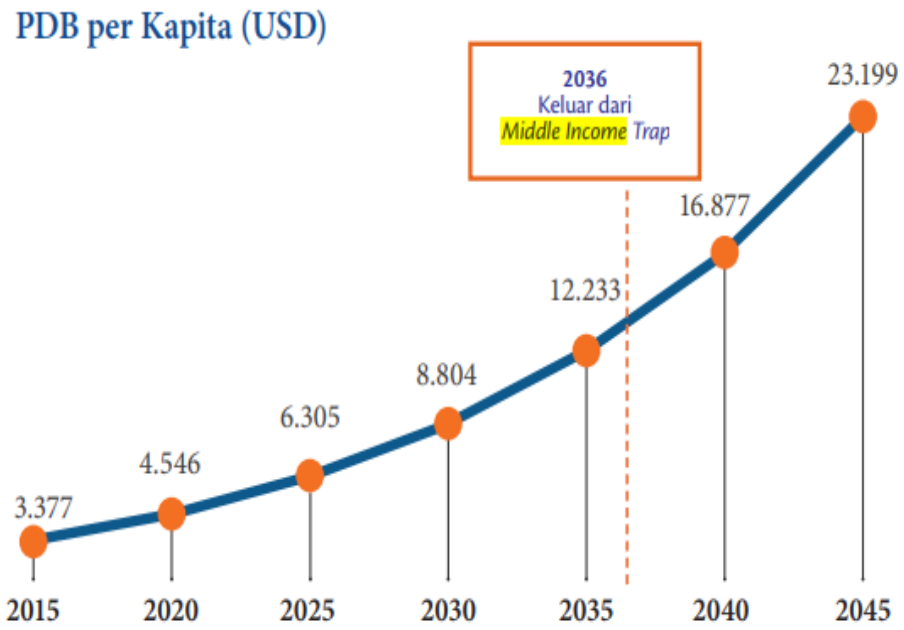


Figure 5. GDP per Capita Projection (current US$), 2015 – 2045

Source: Bappenas

2.3 The Study of Economic Development and The Evidence from Developed and Developing Countries

2.3.1 The differences in TFP amongst countries

Reviewing the economic development literature can start firstly by questioning what determines the wealth of nations. The crucial evidence from income data, usually gross domestic product (GDP), across countries worldwide helps economists investigate economic development progress in a country. Jones (2020) stated that one of the most essential facts of economic growth is that sustained increases in living standards are an undoubted new phenomenon. Moreover, he said that the living standards around the world probably differed by no more than a factor 2 or 3 before the year 1700. The standard of living has diverged sharply in the past three centuries, and a phenomenon is named the Great Divergence.

Furthermore, Jones (2020) explained that the phrase economic growth had been used commonly to refer to an increase in living standards. However, "growth" also has a more accurate definition, related to the exact rate of change in per capita GDP. This catch-up behavior is an essential concept in studying economic growth known as convergence. Using the Cobb-Douglas production function exhibits constant returns to scale; consequently, to allocate resources, the production function combines workers and machines to produce output, and it can assign any number of human and physical capital. Furthermore, Jones (2020) stated that output per person tends to be higher when the TFP is higher and the amount of capital per person is higher. However, having more capital per person does not increase per capita GDP because of diminishing returns. So, the TFP differences should be an alternative answer to this question.

Countries can be rich either because they utilize a high capital per person or use their human and physical capital efficiently, producing high total factor productivity (TFP). Jones (2020) observed that as a rough calculation in 2017, the differences in capital per person might explain about one-quarter of the difference in income between the richest and poorest countries, while differences in TFP explain the remaining three-quarters of the differences in per capita GDP. Understanding why TFP differs across countries is a critical question at the frontier of current economic research, Jones (2020, 97). There is a puzzle in economic development about the differences in TFP across countries that remain divergent and large even after adjusting the factors of production both in quantity and quality. The difference in producing output per worker causes the variation in income per capita, in which poorer countries consistently produce output much less than more prosperous countries. The mainstream researcher proposes two significant explanations for this cause: frontier technologies and best practices for producing output are slow to diffuse from high-income to low-income countries. However, the other idea in recent literature focuses on resource misallocation as the cause of productivity loss to complement the previous study. For example, low-income countries have a problem allocating their production factor efficiently.

Table 2. Selected GDP performance, 1983-2019 (average, annual %)

Country	GDP growth (annual %)	GDP per capita growth (annual %)
Indonesia	4.84	3.27
India	5.79	4.04
China	9.42	8.47
Singapore	5.80	3.69
Malaysia	5.43	3.22
Vietnam	6.37	4.93
Thailand	4.79	3.83
Philippines	3.56	1.45
United States	2.67	1.73
United Kingdom	2.03	1.55

Source: World Development Indicator, World Bank

Then, if we break down the causes of differences in TFP, we will find that human capital, technology, and misallocation as part of institutions have an essential role. The latest possible cause can be explained by the government policy determining how efficiently they

allocate their people and resources to achieve their national goal. The extent of institutional reason has become the center of attention after a seminal paper from Hsieh and Klenow (2009) published their study on the misallocation of resources impacting production loss. Misallocation means the production factors, capital and labor, are utilized less productively than they should be, so it is lower total factor productivity. This study successfully observed the firm-level data from China, India, and the US to explain the difference in productivity levels. The United States has become the benchmarking country for TFP because of its leading advanced technology and high level of human capital.

The empirical data from selected developing and developed countries could explain the difference between economic growth and TFP. Table 3. shows the GDP performance of Indonesia, Thailand, and the Philippines, placed in the bottom three compared to other recently progressive developing countries. On the contrary, India, China, Vietnam, and Malaysia recorded relatively high GDP growth above 5% and GDP per capita. While developed countries such as the UK and US remained stable at a slower pace, surprisingly, Singapore could grow faster. Jones (2020) stated that the evidence indicates that productivity growth accounts for most of the cross-country differences in income per capita growth. Regarding that statement, the latest study stated that with the The level of investment and labor was not much different; a country had different economic growth determined by the different productivity levels. Given the empirical evidence that since the industrial revolution, the phase of capitalist development that started in 1820 was the crucial period for accelerating productivity growth (Maddison, 1977), this situation was incredibly challenging for Indonesia.

Table 3. Selected TFP level at current PPPs (USA=1), 1983 and 2019

Country	1983	2019
China	0.353	0.400
Indonesia	0.606	0.445
India	0.313	0.438
Malaysia	0.539	0.575
Singapore	0.816	0.691
Vietnam	-	-
Thailand	0.475	0.455
United Kingdom	0.962	0.768
United States	1.000	1.000
Philippines	0.554	0.507

Source: Penn World Table, version 10.0

Table 4. shows the TFP level's evolution in purchasing power parity. Surprisingly, Indonesia experienced a sharp decline in TFP level compared to other countries. Reminding that productivity is part of economic growth computed by GDP, the lower TFP level reflects the lower economic growth. The fact is, Indonesia was the seventh-largest economy in the world based on output-side real GDP at current PPPs (in mil. 2017US$) in 2011, based on the Penn World Table (PWT) 10.0 (Feenstra, Inklaar, and Timmer 2015). Indonesia experienced slower progress by only growing 4.2-fold during 36 years. To avoid falling behind China and India, Indonesia must at the very least be growing more rapidly.

2.3.2 Study of Resources Misallocation and The Potential Policy Distortion

The evidence and the empirical data indicate that productivity growth accounts for most of the cross-country differences in income per capita growth, even though there is no significant difference in the level of investment and labour. Howitt (2000) and Klenow and Rodrıguez-Clare (2005) examined the endogenous growth relating to the differences in cross-country income per capita by showing the significant TFP differences in the world, possibly due to the slow progress of technology diffusion from advanced economies to other economies that usually less-developed. Then, Restuccia and Rogerson (2008) attempted a different approach in observing the misallocation of resources across the firm that substantially impacts aggregate TFP rather than focusing on a representative firm's efficiency. Furthermore, the more comprehensive study of productivity held by The McKinsey Global Institute (1998) in Brazil argued that the retail sector has low productivity because labor market regulation makes labor costs less competitive than informal retailers. This study indicates that the role of institutions and government is critical in regulating the market. Hence, it can deteriorate resource allocation, eventually causing productivity losses.

Hsieh and Klenow (2009) observed the one mechanism affecting bad institutions causing resource misallocation. The result recommends that it may be crucial in describing the development gap in TFP differences. A seminal paper from Hsieh and Klenow (2009) observes manufacturing firm-level data from India, China, and the US using an indirect approach to measuring static misallocation (Restrucci et al., 2017). They found that aggregate TFP losses from misallocation are significant by quantifying them through factor productivity dispersions. Moreover, from their research, the exciting fact is that in China, state-owned plants exhibited 41% lower TFPR, as if they received subsidies to continue operating despite 14% lower TFPQ. Perhaps surprisingly, collectively owned (part private and part local government) firms have 11% higher TFPR. On average, foreign-owned firms had 23% higher TFPQ but 13% lower TFPR. On the contrary, exporting firms showed better productivity with 46% higher TFPQ but 14% lower TFPR. The critical findings in Hsieh and Klenow (2009) regarding the policy distortion of ownership led this study to compare with the Indonesia dataset.

This research refers to those non-market factors induced by rules, regulations, and institutions. It will cause productivity dispersion in the marginal revenue product of capital (MRPK) proportional to the revenue-capital ratio as policy distortions. Regulation takes the critical analysis as one of the categories of distortion explaining the causes of misallocation; for example, regulating the SOE can be attributed to regulating market activity. Wu, G. L. (2018) designed the research to identify the effects on average MRPK dispersion across firm ownership. This study discovered that foreign-owned firms receive a similar level of preferential treatment as state-owned firms that usually receive low-interest-rate credits from the state-owned banking system and facilitate more accessibility to the capital market.

Indonesia ratified the State-Owned Enterprises Act 2003 and Government Act 2014. This regulation gives authority to the government in allocating not only the state budget and state capital investment but also for giving subsidies, compensation, relaxing taxes, working capital bailouts, and appointing the board of directors and commissioner. All those authorities will lead to potential sources of misallocation due to the enforcement of SOE, which can potentially regulate the market activity that proves to be a critical source contributing to productivity losses (Song et al., 2011; Hnatkovska et al., 2012).

Capital expenditure from SOEs takes a significant proportion of state revenue and the economy. The Financial State Report (audited) 2015–2019 revealed that SOE's contribution to the state budget increased over time in 2019. The share of its contribution was more than 20.0% of total state revenue. On the other hand, the government of Indonesia continuously injected SOEs with state capital investment in developing public infrastructure. Although the amount of its investment decreases over time. Moreover, Indonesia had 263 manufacturing SOEs in 2013, rising from 239 in 2004. Meanwhile, the number of LSOEs remains fluctuating, with manufacturing firms decreasing to 134 in 2013 from 525 in 2004.

Policy distortion could also happen by providing so many incentives and subsidies to attract investment in particular areas, such as industrial estates appointed by the government; for example, Calligaris S. (2015) observed that misallocation is higher for firms located in southern Italy. The tax and customs facilities include a reduction in corporate income tax, usually as the type of incentive. There is also exemption from value-added tax on the import and delivery of machinery and factory equipment and exemption from import duty on the import of machinery and goods and materials.

Another possible source of policy distortion is investment status, which has exceptional attention to attracting foreign direct investment in developing countries. Kong, Q. et al. (2021) mentioned in their paper that "[…] resource misallocation, as an essential characteristic of China's "progressive reform," has become a significant factor restricting high-quality outward foreign direct investment (OFDI)."

3. Result and Analysis

Chapter three will discuss the framework and research approach to build a crystal-clear understanding of the methodology and data analysis and to prove whether to reject or fail to reject the hypotheses.

3.1. The National Drinking Water Policy in Indonesia

The research approach will focus on the indirect approach and static effects of misallocation by using the Hsieh and Klenow (HK) framework in 2009. This study will focus on the *indirect* approach because the study does not explicitly identify the causes of misallocation, which the direct approach usually does (Restuccia D. et al., 2017). It also measures the static effects of misallocation. It means not examining the misallocation generated by specific time-series patterns so that it will focus on differences in resource misallocation across industries at a point in time. Using pooled data and looking for cross-section data across years to the extent of misallocation is correlated with various observables. This research would also focus on specific data from 2004, 2005, 2012, and 2013, due to its relevance to the commodity boom that spanned between 2002 and 2012–2013. The years 2004 and 2005 serve as a baseline for the impact of post-AFC, reflecting Indonesia's economic conditions in the early period of the commodity boom. These years allow for comparing pre- and post-crisis productivity and misallocation. On the other hand, 2012 and 2013 capture the period following the commodity boom, when global prices for natural resources began to decline, prompting Indonesia to shift towards economic diversification.

Furthermore, this research calculates productivity loss and potential gain with reallocated labor and capital by equalizing marginal products across firms to the extent observed in the US, benchmarking to US efficiency as an undistorted comparative country.

This study also uses descriptive statistics to describe the percentile of dispersion of TFPQ and TFPR and shows the distribution of TFPR and TFPQ as a two-way plot chart. For robustness, the study excludes sectors with fewer than five firms and trims TFPR and TFPQ data from 2% to 12% to reduce the influence of outliers. Additionally, the elasticity of substitution within industries (σ) is examined to understand how resource allocation responds to changes in relative prices.

3.1.1 Cobb-Douglas Production Technology

This research uses the standard model of monopolistic competition consisting of heterogeneous firms that produce differentiated products to observe the effect of resource misallocation on aggregate TFP. This study follows Hsieh and Klenow framework that exploits the Cobb-Douglas production function to simplify the heterogeneity of capital across firms. It assumes that capital-to-labor ratios are equal for all producers in an efficient allocation. This firm combines the output Y_s of S manufacturing industries.

$$Y = \prod_{s=1}^{S} \quad Y_S^{\theta_s}, \; where \; \sum_{s=1}^{S} \quad \theta_S = 1 \tag{1}$$

where θ_S Is the value-added share of sector s.

The cost minimization implies $P_s Y_s = \theta_s PY$, where P_s refers to the price of industry output Y_s and $P \equiv \prod_{s=1}^{S} \quad (P_s/\theta_s)^{\theta_s}$ represents the price of the final good. $P_{si}Y_{si}$ are the firms value-added.

Sector's output firm Y_s is an aggregate of the individual firm's output Y_s By using Constant Elasticity of Substitution (CES) Technology, that is $Y_s = \left(\sum_{i=1}^{M_s} \quad Y_{si}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$ where Y_{si} is the differentiated product by the firm I in sector s, and σ is the elasticity of substitution across firms within the sectors. Each Individual firm produces output by using a Cobb-Douglas function of firm TFP, Capital, and labour, $Y_{si} = A_{si} K_{si}^{\alpha_s} L_{si}^{1-\alpha_s}$, where A_{si} stands for firm-specific productivity; L_{si} is the firm's labour; and K_{si} is the firm's capital.

3.1.2 Decision-making at the firm level for maximising their profit

Profits of each firm are given by

$$\pi_{si} \; = \left(1 - \tau_{Y_{si}}\right) P_{si} Y_{si} - \omega L_{si} - \left(1 + \tau_{K_{si}}\right) R K_{si} \tag{2}$$

$$s.t. \, Y_{si} = Y_s \left(\frac{P_s}{P_{si}} \right)^{\sigma} \tag{3}$$

Where,

$P_{si}Y_{si}$: the firm's value-added;
ω_{si}, R : the unit cost of labour and capital, respectively;
$\tau_{Y_{si}}$: the firm-specific output distortions; and
$\tau_{K_{si}}$: the firm-specific capital distortions.

The capital-labour ratio as the first-order condition is given by

$$\frac{K_{si}}{L_{si}} = \frac{\alpha_s}{\alpha_s - 1} \cdot \frac{\omega}{R} \cdot \frac{1}{(1+\tau_{K_{si}})} \tag{4}$$

$$L_{si} \propto \frac{A_{si}^{\sigma-1}(1-\tau_{Y_{si}})^{\sigma}}{(1+\tau_{K_{si}})^{\alpha_s(\sigma-1)}} \tag{5}$$

$$Y_{si} \propto \frac{A_{si}^{\sigma}(1-\tau_{Y_{si}})^{\sigma}}{(1+\tau_{K_{si}})^{\alpha_s\sigma}} \tag{6}$$

The distortions and productivity for each firm define as follows:

$$1 + \tau_{K_{si}} = \frac{\alpha_s}{1-\alpha_s} \cdot \frac{\omega L_{si}}{R K_{si}} \tag{7}$$

$$1 + \tau_{Y_{si}} = \frac{\sigma}{\sigma-1} \cdot \frac{\omega L_{si}}{(1-\alpha_s) P_{si} Y_{si}} \tag{8}$$

$$A_{si} = \kappa_s \frac{(P_{si}Y_{si})^{\frac{\sigma}{\sigma-1}}}{K_{si}^{\alpha_s} L_{si}^{1-\alpha_s}} \tag{9}$$

$\tau_{Y_{si}}$ is the capital wedge. If the wedge equals 1, there is no misallocation. Conversely, if the wedge is <1, the firm inefficiently uses too much capital. Hence, it misallocates inputs within the firm and also across firms.

3.1.3 Aggregate TFP accounting

Rather than firm TFP, the extent of resource allocation is driven by distortions that will result in differences in the marginal revenue products of labour (MRPL) and Capital (MRPK) across firms. Moreover, to specify the formula for industry productivity TFP_sAs Foster, Haltiwanger, and Syverson (2008) suggested, it is helpful to show that firm-specific distortions can be measured by its revenue productivity (TFPR).

The use of plant-specific deflators yields TFPQ physical productivity. The use of industry deflator yields TFPR, revenue productivity, which defines as follows:

$$TFPQ_{si} \triangleq A_{si} = \frac{Y_{si}}{K_{si}^{\alpha_s}(\omega L_{si})^{1-\alpha_2}} \tag{10}$$

$$TFPR_{si} \triangleq P_{si}A_{si} = \frac{P_{si}Y_{si}}{K_{si}^{\alpha_s}(\omega L_{si})^{1-\alpha_2}} \tag{11}$$

The aggregate productivity of the sector (s), TFP_s, is given as follows:

$$TFP_s = \left[\sum_{i=1}^{M_s} \left(A_{si} \cdot \frac{\underline{TFPR_s}}{\underline{TFPR_{si}}}\right)^{\sigma-1}\right]^{\frac{1}{\sigma-1}} \tag{12}$$

3.1.4 Misallocation accounting

The fact is that if there is no distortion, we will have $\tau_{K_{si}} = \tau_{Y_{si}} = 0$ and $TFPR_{si} = \underline{TFPR_s}$, then industry TFP would be $\underline{A_s} = \left(\sum_{i=1}^{M_s} A_{si}^{\sigma-1}\right)^{\frac{1}{\sigma-1}}$. Now, the actual and efficient productivity as a whole has been calculated. This equation is central to figuring out the potential TFP gain if the resource is reallocated efficiently. For each industry, it calculates the ratio of actual TFP to this efficient level of TFP and then aggregates this ratio across sectors using the Cobb-Douglas aggregator

$$\frac{Y}{Y_{efficient}} = \prod_{s=1}^{S} \left[\sum_{i=1}^{M_s} \left(\frac{A_{si}}{A_s} \cdot \frac{\underline{TFPR_s}}{\underline{TFPR_{si}}}\right)^{\sigma-1}\right]^{\theta_s/(\sigma-1)} \tag{13}$$

Hsieh and Klenow's framework exploit all manufacturing sectors. Assume that each sector has a constant share of added value (as in a Cobb-Douglas utility function), then

$$\frac{TFP_{all}^{*}}{TFP_{all}} = \left(\frac{TFP_1^{*}}{TFP_1}\right)^{\theta_1} x \left(\frac{TFP_2^{*}}{TFP_2}\right)^{\theta_2} x \dots x \left(\frac{TFP_S^{*}}{TFP_S}\right)^{\theta_S} \quad (14)$$

Where TFP_s is a hypothetical level of TFP in sector s, TFP_s^* that measure if allocated all factors efficiently between firms s, and θ_s is the value-added share of sector s.

The calculation of TFP gain is as follows.

$$TFPgain_s = 100\ x\ \left(\frac{TFP_s}{TFP_s^{*}} - 1\right) \quad (15)$$

3.1.5 Policy distortion approach

There are three different approaches to policy distortion to evaluate the government that are (1) ownership divided into SOE, LSOE, POF, and FOF; (2) investment company status that are categorised into FDI, DDI, and non-facilities; and (3) location of company where the firm locates at inside or outside the industrial estate.

To discover those relations, this study examines by using weighted least squares (WLS) with value-added industry shares as weight and pooling cross-section across time. This study uses WLS to respond to heteroskedasticity because WLS is more efficient than OLS. Wooldridge, J. M. (2015) stated that heteroskedasticity is essential because the variance estimators are biased without the homoscedasticity assumption, which is no longer valid for constructing confidence intervals and t statistics. Heteroscedasticity is mainly due to the presence of outliers in TFPR and TFPQ. Therefore, using WLS, this study will have heteroskedasticity-robust standard errors to produce valid t-statistics for statistical inference.

3.2. Data Analysis Method

This study assumes that firms potentially have different output, capital distortions and a single final good (Y) produced by a representative firm in a perfectly competitive final output market. It uses the monopolistic competition model with the heterogeneous firm. Moreover, it relies on the choice of parameters from a previous study by Hsieh and Klenow (2009) by exploiting the rental price of capital, the real interest rate is 5%, and the depreciation rate. Furthermore, the elasticity of substitution for value-added (α) is 3, which corresponds to a markup of 50% and the capital share (α_s) and labour share (1-α_s) adopted from United States manufacturing firms because assuming that the US shares represent a minimal distortion operation and utilising the resources efficiently. All these parameters were summarised as follows.

The first data collection will be evaluated and summarised in Microsoft Excel before further analysing Hsieh and Klenow (HK) framework and regression. The HK framework will be computed in STATA 16.0 for Microsoft as it fits with the writer's knowledge concerning sophisticated econometrics program skills. This study will observe the firm-level data, which contains information about ownership, investment sources, and company location. The detailed data is taken from the manufacturing of large and medium-sized firms with at least employed 20 workers, as the dataset reported from an annual manufacturing survey by the Indonesian Central Bureau of Statistics (BPS).

Table 4. Choice of parameters

Parameters	Parameterisation
The rental price of capital, of which	R = 0.10
The real interest rate	0.05
The depreciation rate	0.05
The between-firm elasticity of substitution for value-added	$\sigma = 3$
The actual capital and labour shares	Compiled from the U.S.

Source: Hsieh and Klenow (2009), Bach, T. N. (2019).

Table 5. Summary statistics

Year	2004	2005	2012	2013
ln(TFPQ)	7.9	7.9	8.3	8.4
SD	1.2	1.2	1.3	1.2
Min	4.8	5.0	4.3	2.3
Max	13.9	13.8	14.3	15.7
ln(TFPR)	0.4	0.4	0.4	0.4
SD	0.4	0.4	0.5	0.5
Min	- 0.7	- 1.0	- 2.6	- 3.5
Max	2.7	2.5	4.6	6.8
Fixed capital (mil. IDR)	9	12	26	103
SD	81	168	674	6,580
Min	-	-	-	-
Max	4,720	15,200	67,800	916,000
Revenue (mil. IDR)	37	41	107	113
SD	246	251	689	748
Min	0	0	0	0
Max	17,000	15,900	43,800	44,500
Labour Compensation (mil. IDR)	2	3	6	6
SD	10	11	27	23
Min	0	0	0	0
Max	667	686	1,320	1,210
N (BPS)	20685	20729	23592	23698
N (Study)	17406	18403	22471	22493
Sample Ratio (%)	84.1	88.8	95.2	94.9

Source: BPS, Author's calculation

Table 5 reports basic summary statistics for the main variables used in the analysis. This table represents averages, standard deviations (SD), and minimum and maximum values of the variables of interest. The last row indicates the ratios of valid sample observations over the total number of firms surveyed.

3.3. Empirical Findings and Analysis

Chapter four will examine the framework and research approach with a real dataset in Indonesia using a proven methodology to figure out the new findings that can contribute to misallocation and growth literature.

3.1. Introduction of Data Evaluation and Analysis

As economic growth commonly becomes a living standard measurement, the lower TFP can hamper economic growth on a low growth path, causing difficulties in lifting the standard of living. Emphasising that resource misallocation can influence low aggregate TFP, thus making the TFP gap wider within the sector. This study uses microdata on the manufacturing sector to examine resource misallocation underlying micro foundations analysis. The first analysis examines productivity across sectors. It develops aggregate TFP potential gain by equalising TFPR across firms and TFPR relative to 1997 U.S. gains in Hsieh and Klenow's (2009) previous study.

The subsequent analysis determines the factor that causes resource misallocation, mainly because of policy distortions influenced by ownership, investment status, and company location. This analysis uses the econometric tools to describe the relationship between those three factors, with productivity loss defined as the deviation of log TFPQ or/and log TFPR from the industry mean.

3.2. Productivity Loss and Potential Gain

Productivity loss appears in the presence of TFPR dispersion. It reflects that firms face capital and output distortion that causes the rise of marginal products of capital and labor. Therefore, it shows the presence of resource misallocation in labor and capital. On the contrary, productivity gain happens when marginal products are equalized, meaning firms could reallocate labor and capital efficiently.

Table 6. Dispersionof *log log (TFPQ/TFPQ)*

Indonesia	2004	2005	2012	2013
SD	1.00	1.00	1.01	1.05
75 - 25	1.33	1.31	1.31	1.31
90 - 10	2.59	2.62	2.62	2.63
N	17,406	18,403	22,471	22,493

Source: BPS, Author's calculation

Table 6 shows that the pattern of TFPQ dispersion was broader in standard deviation and the 90th minus the 10th percentiles; otherwise, the ratio of 75th to 25th Percentiles of TFPQ became narrower, but not that much. This reflects higher physical productivity and may also reflect higher demand, quality, and variety of the firm's product. Furthermore, the 90th minus the 10th percentiles in Indonesia that reached 2.59 in 2004 lay between India and China by 3.11 in 1994 and 2.44 in 2005 consecutively.

Table 7. Dispersion of *log log* (*TFPR/TFPR*)

Indonesia	2004	2005	2012	2013
SD	0.33	0.35	0.41	0.50
75 - 25	0.36	0.35	0.42	0.45
90 - 10	0.77	0.81	0.94	0.99

Source: BPS, Author's calculation

Table 7. provides TFPR dispersion[2] statistics to analyse the presence of resource misallocation. Hypothesis 1 mentioned there should be no difference among TFPR if there were no capital and output distortions among firms. The ratio of 75th to 25th percentiles, the 90th to 10th percentiles, and the standard deviation of TFPR dispersion in Indonesia escalated. The rise of TFPR dispersion indicates that resource misallocation in Indonesia has worsened. Thus, this will deteriorate the aggregate TFP.

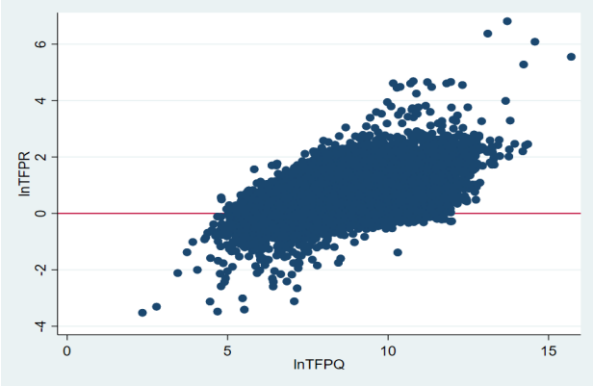


Figure 6. TFPR and TFPQ

Source: BPS, Author's calculation

For further analysis, as shown above, more productive firms face higher distortions than other comparable firms within a narrowly defined industry. The observation clearly shows a positive and statistically significant relationship between revenue productivity (TFPR) and physical productivity (TFPQ). The correlation between TFPR and TFPQ is shown by 0.51 and a p-value lower than 0.01. It verifies that more productive firms (i.e., those with larger TFPQ) face more considerable distortions that prevent them from growing (resulting in higher TFPR than average). Hence, capital and output distortion consume more resources than allocated to expand production. Based on findings in wider TFPR dispersion and a significant positive correlation between TFPR and TFPQ, this study has substantial evidence to infer that productivity loss in Indonesia was getting worse over ten years.

[2] TFPR dispersion, represent by log TFPR/TFPR or ln TFPR/TFPR means ln (TFPR) minus ln TFPR to show the deviation of firm's TFPR from the industry mean. The higher TFRP dispersion reflects the higher gap between firm's TFPR and industry's TFPR potentially arises misallocation and reduces aggregate TFP.

Table 8. TFP Gains from Equalising TFPR within Industries

Indonesia	2004	2005	2012	2013
%	132.5	128.3	122.0	133.2
China	1998	2001	2005	
%	115.1	95.8	86.6	
India	1987	1991	1994	
%	100.4	102.1	127.5	
United States	1977	1987	1997	
%	36.1	30.7	42.9	

Source: BPS, Author's calculation. China, India, and US data are based on Hsieh and Klenow's (2009) study.

Table 8. provides percent TFP gains in Indonesia from fully equalizing TFPR across plants in each industry by removing all distortions to get equalized marginal product across firms in each industry/sector. Full liberalization, by this calculation, would increase aggregate manufacturing TFP by 122%–133% in Indonesia. It is much bigger than China, India, and the US.

Table 9. TFP Gains from Equalising TFPR Relative to 1997 U.S. Gains

Indonesia	2004	2005	2012	2013
%	62.7	59.8	55.4	63.2
China	1998	2001	2005	
%	50.5	37	30.5	
India	1987	1991	1994	
%	40.2	41.4	59.2	

Source: BPS, Author's calculation. China and India data is based on Hsieh and Klenow's (2009) study.

For Indonesia, hypothetically, moving to "U.S. efficiency" might have boosted TFP by 63% in 2004, 60% in 2005, 55% in 2012, and 63% in 2013. Table 9 reports the percent TFP gains in Indonesia relative to those in the United States in 1997 because U.S. gains were most prominent in 1997, from Hsieh and Klenow (2009). Surprisingly, Indonesian allocative efficiency fluctuated compared to the 1997 U.S. benchmark and even deteriorated in the latest year. Thus, this evidence for worsening resource allocations might help explain why its lower TFP growth has even deteriorated.

3.3. The Relation between Productivity and Policy Distortions

3.3.1. Ownership (SOEs, LSOEs, FOFs, and POFs)

The type of ownership, especially in state-owned enterprises, might contribute to understanding the productivity loss influenced by the state and local government intervention.

Table 10. Ownership of Indonesian Firms

Indonesia	2004	2005	2012	2013
SOE	1.37	1.47	1.18	1.17
LSOE	3.02	2.34	0.71	0.60
POF	88.38	88.70	90.15	90.24
FOF	6.83	7.12	7.60	7.66
OTH	0.40	0.37	0.36	0.33
TOTAL	100.00	100.00	100.00	100.00

Source: BPS, Author's calculation. A number of firms in per cent.

Privately owned firms dominated in Indonesia. To get detailed information about the distribution of the firm's ownership, table 10. gives the percentage of the number of firms owned by the government, reduced from 1.37% in 2004 to 1.17% in 2013, and local state-owned enterprises decreased sharply from 3.02% in 2004 above the SOE to 0.60% in 2013. Lastly, the number of foreign-owned firms slowly but persistently increased by a percentage.

Table 11. TFP by Ownership

Indonesia	TFPR	TFPQ
SOE	0.014	-0.165***
	(0.027)	(0.064)
LSOE	0.026	-0.172***
	(0.026)	(0.063)
POF	-0.065***	-0.733***
	(0.024)	(0.056)
FOF	0.053**	0.109**
	(0.024)	(0.058)
Constant	-0.043*	0.098*
R Squared	0.007	0.054
N	80,771	80,771

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: BPS, Author's calculation

Based on this regression result, it can be inferred that there was a relationship between productivity loss and the type of firm ownership in Indonesia. State-owned enterprises exhibit 1.4% higher TFPR (revenue productivity) despite low efficiency, which reflects a TFPQ lower by 16.5% on average. In addition, surprisingly, closely similar to SOEs, local government firms have 2.6% higher TFPR despite low physical productivity of 17.2% on average. The firm that charges high markups should evince higher TFPR levels as SOE and LSOE face. In this case, how the government gives subsidies or incentives might not be adequate, as shown by the measurement of TFPR that still assigns markup. However, the physical productivity is lower than average.

Moreover, foreign-owned firms have 10.9% higher TFPQ and 5.3% higher TFPR on average. The latter could reflect better efficiency but still charge higher markups than SOEs

and LSOEs, which means that FOFs face policy distortions heavily compared to other ownership. Only privately owned firms have a lower 6.5% TFPR and a lower TFPQ of 7.3% on average. It indicates that POFs had lower profitability and were exposed to limited or unequal preferential treatment. Thus, they suffer lower efficiency than FOFs, even worse than SOEs and LSOEs.

Table 12. Regression of Sector TFPR Dispersion on SOE/LSOE in Indonesia

SOE and LSOE	2004	2005	2012	2013	ALL
State/Local Ownership Share	0.363	0.729*	0.813**	0.539	0.577***
	(0.233)	(0.392)	(0.358)	(0.394)	(0.161)
Constant	-0.021*	-0.017	-0.016	-0.077***	-0.028***
	(0.012)	(0.013)	(0.023)	(0.028)	(0.009)
R Square	0.003	0.005	0.012	0.005	0.006
N	763	700	423	396	2,285

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: BPS, Author's calculation

These unexpected results raise the question of how much of Indonesia's TFPR dispersion can be accounted for by state ownership. In table 16, this study examines its relationship across more than 300 up to 763 firms owned by central or/and local government four-digit manufacturing in Indonesia. Then, it regresses by using Ordinary Least Square (OLS), the industry variance of log TFPR on the industry share, between 0% and 100% of firms owned by the state. The relationship was positive and significant in 2012 and for the entire year pooled the dataset. The interpretation means that a one-percentage-point increase, or 1% higher, in the state/local-owned share equates to a 57.7%[3] increase in the TFPR dispersion in all datasets.

Table 13. The Industry Share by Ownership in Indonesia

Indonesia	2004	2005	2012	2013
SOE	4.83	3.73	4.69	4.74
LSOE	4.77	3.52	1.44	1.21
POF	60.83	56.47	63.29	63.99
FOF	28.76	35.59	29.76	29.11
OTH	0.80	0.68	0.74	0.89

Source: BPS, Author's calculation

Both state and local state-owned enterprises have a significantly higher relative TFPR dispersion in 2012 by 81.3%. Part of this may be due to an increase in industry share of SOEs by 4.69%, or an increase of 0.96 percentage points (pp).

[3] Increase the state/local-owned share by 1, which means a 1 percentage point (pp) or 1% higher increase in lnTFPRsi/TFPRs by 0.813. This means the TFPR dispersion is about 81.3%.

Table 14. Share of Gross Fixed Capital Formation by Institution

Institution	2012	2013	2014	2015	2016	2017	2018
Government Investment	9.25	10.70	9.24	11.31	10.19	10.43	8.56
SOE & LSOE Investment	5.89	5.70	4.84	4.65	5.53	7.46	7.09
Private Investment	84.86	83.60	85.91	84.04	84.29	82.11	84.35
Private NFC	66.74	64.79	67.46	65.82	66.84	63.95	65.80
Private FC	1.07	1.41	1.32	1.65	1.39	1.20	1.15
NPISH	0.99	1.14	1.07	1.15	1.21	1.45	1.55
Household	16.07	16.26	16.07	15.41	14.85	15.52	15.85
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: BPS

Referring to the table above, the progress of capital formation in SOE/LSOE should be considered, as it shows growth up to now. If it happens continuously, it will grab more market share in the manufacturing industry as it shows that resource misallocation potentially widens in the future.

3.3.2. Investment Company Status (FDI, DDI, and Non-facilities)

The higher TFPR may occur when foreign investors face unfavorable policies that could absorb their resources for expansion and inhibit production growth.

Table 15 TFP by Investment Status

Indonesia	TFPR	TFPQ
Domestic Direct Investment	0.051***	0.665***
	(0.004)	(0.009)
Foreign Direct Investment	0.118***	0.954***
	(0.005)	(0.012)
Constant	-0.116***	-0.758***
R Squared	0.008	0.115
N	80,771	80,771

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: BPS, Author's calculation

Based on this regression result, there was a relationship between productivity loss and investment status in Indonesia. DDI is estimated to have a 5.1% higher TFPR and 66.5% higher TFPQ, whereas FDI has a higher TFPR of 11.8% and TFPQ of 95.4% than non-facilities status. Based on this result, FDI signs are relatively higher in both TFPR and TFPQ. The higher TFPR in FDI reflects that it faces policy distortions more than DDI. It might reflect that foreign investment has a better technology or method to produce output efficiently while charging a high markup on average. On the contrary, domestic investment is less efficient and less charged for markup.

3.3.3. Location of Company (Inside or Outside Industrial Estate)

The industrial estate is built either by the government or privately to provide adequate supporting facilities such as close transportation access, a reliable energy supply, and many others to the tenant. The government usually offers tax deductions or incentives to attract new investors.

Table 16 TFP by Company Location

Indonesia	TFPR	TFPQ
Inside Industrial Estate	0.063***	0.490***
	(0.007)	(0.016)
Constant	-0.116***	-0.767***
R Squared	0.002	0.021
N	42,957	42,957

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: BPS, Author's calculation

Based on this regression result, there was a relationship between productivity loss and company location in Indonesia. Building a plant inside an industrial estate exhibits a 6.3% higher TFPR and a 49.0% higher TFPQ than outside an industrial estate on average. It is not consistent with the previous study that the firm located in an industrial estate, especially the export processing zone, will have lower TFPR on average due to preferential treatment or better access to credit (Hsieh and Klenow, 2009). Then, the higher TFPQ might reflect that the infrastructures or facilities inside the industrial estate could improve efficiency on average.

3.4. Robustness Test

This study provides several robustness checks on its baseline in table 12 calculations of hypothetical aggregate TFP gains from equalizing marginal products or removing all distortions in Indonesia. It starts with omitting the 4-digit sectors with fewer than five firm members. The result is less sensitive; roughly speaking, there are no changes with TFP gain. It is still the same as 133.2300% or falls only 0.0004% from 133.2304% in TFP gains. This result means that Indonesian data comply with the assumption that various firms have heterogeneous products and monopolistic competition frameworks. The practice of oligopoly might be limited to a particular sector or the general economy.

The baseline estimates in Table 13 generated by the dataset trimmed the 1% tails of TFPR and TFPQ compared to trimming 2% tails up to 12% of observations in 2013. The hypothetical TFP gains fall from 133.23% to 106.12%. Thus, measurement error in the remaining 1% tails could be substantial. Furthermore, to make the result robust to outliers by trimming 1% to 2%, TFP gains drop significantly from 133.23% to 114.05%, or are reduced by approximately 20% TFP gains.

This study has parameterized an elasticity of substitution within industries (σ) of 3, which is a conservatively low estimate. Estimated TFP gains are highly sensitive to this elasticity; for example, Indonesia's hypothetical TFP gain in 2013 jumped from 133.23% under $\sigma = 3$ to 193.00% with $\sigma = 5$. These are gains from fully equalizing TFPR levels. This result aligns with Hsieh and Klenow (2009) that the intuition is as follows: when σ is higher,

TFPR gaps are closed more slowly in the presence of resource misallocation from low to high TFPR, enabling more significant gains from equalizing TFPR levels.

4. Conclusion and Recommendation

Chapter five will discuss the conclusion and policy implication of the resource misallocation study. This chapter will be a substantial part for stakeholders to consider some of the key takeaways based on the findings and insights of this study and improve policymaking, specifically in allocating resources efficiently.

4.1. Conclusions

This paper has emphasised that resource misallocation reflected by TFPR dispersion could reduce aggregate TFP in Indonesia under Hsieh and Klenow's (2009) framework. This misallocation is driven by distortions in both capital and output, crucially explaining why Indonesia's aggregate TFP has remained persistently low and even declined over time.

Lower productivity prevents firms from expanding output, contributing to stagnation. Indonesia experiences might be similar to India as Banerjee and Duflo (2005) argued that misallocation of the resources plays a significant role in understanding the difference of TFP across countries, with gaps in marginal products of capital potentially driving low manufacturing TFP in India compared to the US.

Based on the analysis, it can be concluded that this study finds that moving to US efficiency would increase TFP by roughly 55% - 63% in Indonesia. Large dispersions in marginal revenue products among firms within the sector imply misallocation of resources in that industry. Examining the firm's characteristics that correlate with distortions, this study finds that firms with higher productivity face more enormous distortions, pointing to potential structural constraints and inefficient allocation of resources. The magnitude of the TFP gains depends on the improvements in allocative efficiency. An economy thus becomes more efficient when more productive firms are larger, more productive firms expand, and consequently, allocative efficiency improves.

To improve resource allocation efficiently, TFPR should be equal across firms within the industry, which typically vary across TFPQ that exhibit physical productivity depending on how productive the firms are. However, equalizing TFPR across firms within an industry is challenging. This research shows that the type of ownership plays a key role—SOEs and LSOEs are particularly prone to resource misallocation. Moreover, while foreign direct investment (FDI) generally contributes to efficiency, it still involves high markups. Location within industrial estates has also been shown to increase efficiency, emphasizing the role of infrastructure and policy in reducing misallocation.

The commodity boom period (2002 to 2012–2013) further complicated the landscape as it forced Indonesia to reassess its reliance on resource exports and refocus on diversification. The misallocation observed in the data years 2004, 2005, 2012, and 2013 underscores the urgent need for structural reforms to improve resource allocation, especially as Indonesia transitions away from a resource-dependent economy.

4.2. Policy Implication

Resource misallocation remains a significant challenge in developing countries, as limited competition allows inefficient firms to survive, hindering overall productivity growth.

Based on TFP gains, Indonesia has much room to catch up with India, China, and even the US. To close this gap, Indonesia urgently needed to do as follows. Firstly, Indonesia must focus on creating a more level playing field for all firms by removing distortions that favor certain industries or ownership types, fostering fair competition across the economy.

Secondly, the government needs to implement robust diagnostic and surveillance tools to monitor aggregate TFP and track the progress of economic growth. Such tools should be supported by comprehensive datasets covering different regions, sectors, and ownership types, which will allow policymakers to identify areas of inefficiency and resource misallocation more effectively.

Thirdly, the government, corporate partner, and mother company should provide assistance and solutions to the targeted sectors based explicitly on diagnostics and surveillance activity that suffer resources misallocation. Any distortion makes firms less productive to ensure no one is left behind. As Indonesia moves forward, the government should also consider adjusting its policy on incentives and subsidies. Once a sector or region has sufficiently developed, these preferential treatments should be phased out and redirected to areas that require further investment and growth. This flexible approach will ensure resources are allocated efficiently and that new, emerging sectors receive the support they need.

Lastly, with the end of the commodity boom and the need for economic diversification, Indonesia should prioritize fostering innovation and investment in manufacturing, technology, and services. Reducing the economy's dependence on fluctuating commodity prices will not only improve long-term productivity but also help create a more resilient and diversified economic base. In summary, improving resource allocation, addressing inefficiencies, and promoting economic diversification are key to boosting productivity in Indonesia. By focusing on these areas, the country can enhance its growth potential and ensure that the benefits of economic development are more broadly shared.

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Based on the results and discussion, the Provincial Government of DKI Jakarta should re-plan relocating people. Relocated residents should consider the needs, as well as the rights and aspirations of the residents, to achieve the desired results. Bronen (2021) states that human rights, social equality, and environmental justice are essential foundations of any relocated resident governance framework.

The Government of DKI Jakarta can hold discussions with the residents before moving them to a new location so that people stay put because they have to. The government can also disseminate rules to the residents before relocating to a new location. It is hoped

that when the relocating people live in Rental Public Housings rental public housing built by the government, they will not be rent overdue.

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