# Factors Affecting the Production Value of Large and Medium Manufacturing Industries in West Java Province from 2017 to 2020

Sekar Ayu Wandira[1], Andika Pambudi[2], Hari Nugroho[3], Rico Ricardo[4]

Department of Economics, Pertamina University, Jl. Teuku Nyak Arief, Jakarta 12220[1,2,3,4]
sekarwndr@gmail.com[1], andika.pambudi@universitaspertamina.ac.id[2],
harinugroho.dr@gmail.com[3], rico.ricardo@universitaspertamina.ac.id[4]

**Abstract.** Industrialization plays an important role in driving national economic growth, with West Java as a province that holds a dominant role in this sector. However, the contribution of West Java's manufacturing industry has declined. This study analyzes thefactors affecting manufacturing production in 27 districts/cities in West Java from 2017 to2020, using panel data regression methods. The results show that capital, raw materials, and labor have a significant and positive impact on manufacturing production, while laborwages have a significant but negative effect. Inflation does not have a significant impact on production. Based on these findings, it is recommended that the government implementregulations related to raw materials by strengthening bilateral cooperation with supplier countries to minimize the impact of exchange rate fluctuations that could disrupt raw material imports.

**Keywords:** Production Value; Panel Data; Manufacturing Industry; West Java; ProductionFactors.

## 1 Introduction

The manufacturing sector plays an important role in Indonesia's national economic growth. Since 1985, Indonesia's economy has undergone significant changes, shifting from the agricultural sector to the manufacturing sector, indicating a structural transformation in economic development [1]. This economic development is closely related to economic growth,where both support each other [2].

The manufacturing industry is a key indicator of economic growth due to its significant contributions, including in GDP/GDP formation, employment, contribution to non-oil and gas exports, and its strong linkages with other sectors [3][4]. In 2021, the manufacturing sector contributed 19.24% to GDP, with the role largely supported by provinces across Indonesia. Figure 1 shows the ten provinces with the highest contribution from the manufacturing industry.

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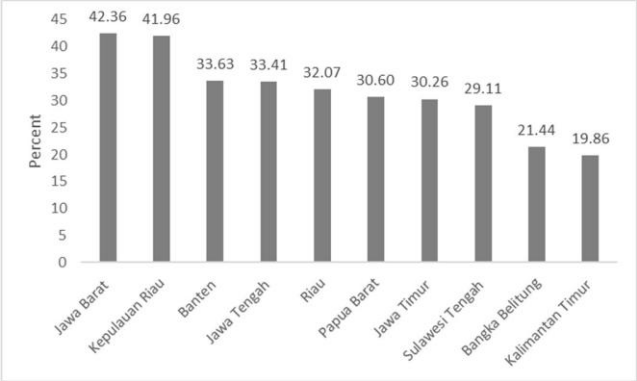


**Fig. 1.** Contribution of Manufacturing Industry's Value Added to GDP by Province in 2021

West Java is a major manufacturing province in Indonesia, contributing IDR 638 billion to theGRDP in 2021 [5]. Its geographical advantages, such as access to the Java Sea, Indian Ocean, as well as its proximity to Jakarta, facilitate the distribution of manufactured products throughland, sea, and air infrastructure, including Tanjung Priok Port [6]. In addition, West Java has 50out of 154 industrial estates in Indonesia, which represents 32.47% of the total national industrial estates. In 2014, approximately 54% of manufacturing companies were located in West Java, making it a national industrial center [7].

Although West Java plays an important role in the manufacturing industry, its contribution hasdecreased from 43.01% in 2015 to 41.19% in 2020, reflecting a decline of 2.11% in five years. This decline could affect the national economy, given the importance of the manufacturing sector as a key driver of sustainable development [8].

Changes in the industrial sector can be measured through various indicators, one of which is production [9]. Efficient production can be achieved when factors of production such as capital,raw materials, and labor are easily available. A shortage of any of these factors can have a significant impact on industrial output. In addition, labor wage is also an important external factor that affects the motivation and performance of labor, or from the firm's side, it is considered as the cost incurred to pay labor [16]. Inflation is also considered as a factor that affects industrial output.

This research focuses on Large and Medium Enterprises to observe the contribution of overallproduction value. Large and medium-sized enterprises were chosen due to their significant role in contributing to production value and providing extensive employment, despite the smaller number of units compared to small and medium-sized enterprises [11]. This shows that Large and Medium Enterprises tend to be capital-intensive, with an emphasis on production efficiency and cost control to achieve optimal

production results, while Small and Medium Enterprises aremore labor-intensive and have a social orientation [11]. Table 1 shows the development of Large and Medium Enterprises.

**Table 1.** Development of Large and Medium Industries in West Java Province, 2017-2020.

| Years | Business Entity | Labor Force (Individuals) | Production Value (Thousand Rupiah) |
|---|---|---|---|
| 2017 | 10,099 | 2,268,064 | 1,918,739,865,091 |
| 2018 | 9,470 | 2,156,783 | 2,239,060,790,860 |
| 2019 | 8,724 | 2,104,482 | 2,397,515,911,405 |
| 2020 | 8,215 | 2,104,482 | 2,397,515,911,405 |

Labor is an important element in the production process, because without labor, other factors ofproduction cannot function [12]. However, the relationship between labor and production valueyields different views. According to [13] and [14], both found that labor has a positive and significant impact on manufacturing production. In contrast, [15] found that labor has a negative impact, which indicates that an increase in labor can reduce production value.

Capital is an important factor in the production process. In the large and medium manufacturing industries in West Java, there was a significant decline in capital from 2017 to 2018, although it remained stable until 2020. This decline is thought to affect production value, as capital is a key element in starting the production process. Several studies show different results regardingthe relationship between capital and production. Studies [14], [16], and [17] found that capitalhas a positive and significant effect on production, while study [18] found no effect of capital on production.

Raw materials are an important factor in manufacturing production, because without raw materials, the production process cannot take place. In West Java, raw material costs increasedfrom IDR 642.66 billion in 2017 to IDR 989.25 billion in 2020. Raw materials play a crucial role in industries that convert semi-finished goods into finished products, thus affecting the value of production. Previous studies, such as [16] and [14], showed a positive effect of raw materials on production, while [19] found a negative effect.


**Fig. 2.** Development of Capital, Raw Materials, and Wages for Large and Medium Industries in WestJava, 2017-2020

In contrast to the decline in labor, wages in the Large and Medium Manufacturing Industry (IBS) in West Java experienced fluctuations between 2017 and 2020. Wages increased by 5.58%, from 110.79 billion rupiah in 2017 to 116.97 billion rupiah in 2018, then decreased to 112.34 billion rupiah in 2019, and remained stable in 2020. Previous research shows different results regarding the impact of wages on the manufacturing industry. Research by [16] found apositive impact, while [20] found no significant impact. Phenomena such as slowing production, decreasing capital, and increasing raw material costs are affected by inflation, which can reducecompetitiveness and affect productivity. However, [21] found that inflation does not always have a significant impact on the manufacturing industry.

These factors are thought to affect the production of the manufacturing industry. However, there are differences in findings between the value of production and the factors that allegedly influence it. Based on the results of previous studies, some factors were found to be influential,while others were not. Therefore, the purpose of this study is to analyze whether these factors affect the production value of large and medium manufacturing industries in West Java Provincein 2017-2020.

## 2 Literature Review

### 2.1 Manufacturing Industry

The manufacturing industry involves the process of transforming raw materials into finished orsemi finished products that have added value. Industry can be defined as a company that produces goods or services with high economic value, aims to generate income and provide products for consumers [22].

## 2.2 Production

Production is the process of converting inputs into outputs within a production unit or company. According to [23], production utilizes various inputs to produce outputs that reflect the value of production. This process involves using factors of production to add value to goods or services [24]. A production function, such as the Cobb-Douglas function, describes the relationship between inputs (capital and labor) and output [24]. The inputs used are related to opportunity cost, which is the maximum value that can be obtained from the use of alternatives [25]. Production costs are the costs that producers incur to produce a product, and these costs tend to increase with the amount of output produced [26]; [27].

## 2.3 Production Capital

Working capital refers to liquid assets required for a company's daily operations [28]. In large and medium manufacturing industries in West Java, capital includes land, buildings, machinery, vehicles, and other equipment. Capital is very important in the production process because it allows companies to produce goods or outputs [29]; [22].

## 2.4 Production Raw Materials

Raw materials are the main cost purchased and processed during the production process [30]. The source of raw materials can come from local purchase, import, or own processing [15]. The availability of raw materials, both in terms of quantity and quality, is very important, because the lack of raw materials can stop the production process [31]. Raw materials are also important components that make up and complete the finished product [32].

## 2.5 Production Labor

Labor is the main production factor in the production process [33]. Its existence is very important, because without labor, other production factors cannot function optimally [34]. Increasing market demand often encourages companies to hire more workers to increase production capacity [35].

## 2.6 Production Labor Wages

Wages are compensation given to labor, either in the form of money or goods, in return for services rendered [36]. Wages affect production because an increase in costs can lead to an increase in the selling price of goods, which in turn can reduce demand and lower production levels [37]; [35].

## 2.7 Inflation

Inflation, defined as a sustained rise in prices, affects production value by increasing production costs and decreasing consumer purchasing power. High inflation often reduces

production value due to higher costs and lower demand [38];[39]. Conversely, low inflation can lower production costs and increase purchasing power, which in turn increases production value through reducedcosts and increased demand [40].

# 3 Methodology and Data

## 3.1 Data Description

This study uses secondary data obtained from the West Java Central Bureau of Statistics website. The data used is panel data, which combines time series and cross-sectional data, to analyze differences between districts/cities in West Java over a certain period. The observed variables include capital, raw materials, labor, wages, and inflation. Data were collected from 18 districts and 9 cities in West Java for the period 2017-2020. Detailed information about thedata can be seen in Table 2, which is sourced from the Indonesian Large and Medium IndustryStatistics.

**Table 2.** The type and source of data used in the study.

| Variable | Unit | Source |
|---|---|---|
| Production Value | Thousand Rupiah | Statistics Indonesia |
| Production Capital | Thousand Rupiah | Statistics Indonesia |
| Production Raw Materials | Thousand Rupiah | Statistics Indonesia |
| Production Labor | Thousand Rupiah | Statistics Indonesia |
| Production Labor Wages | Thousand Rupiah | Statistics Indonesia |
| Inflation | % | Statistics Indonesia |

## 3.2 Analysis Methods

This study uses the panel data method to analyze the impact of the factors used on the manufacturing industry. The model equation in this study is as follows:

$$LnY = \beta 0 + \beta 1(LnK)_{\mathrm{it}} + \beta 2(L)_{\mathrm{it}} + \beta 3(LnBB)_{\mathrm{it}} + \beta 4(LnU)_{\mathrm{it}} + \beta 5(I)_{\mathrm{it}} + \varepsilon_{\mathrm{it}} \quad (1)$$

In the model, the constant (intercept) is denoted as $\beta 0$, while $\beta 1$ through $\beta 5$ represent the slopecoefficients. The natural logarithm is indicated by Ln, and the term it signifies that the model integrates both cross-section (i) and time series (t) data. The error term is represented by ε. The variable Y stands for the production value or output of manufacturing production, K denotes production capital, L represents production labor, BB indicates production raw materials, and U refers to production labor wages.

# 5 Analysis and Discussion

## 5.1 Goodness-of-Fit Test

The first step in determining the best model is to conduct a fit test. According to Widarjono (2005), the testing stages include Pooled Least Squares (PLS), Fixed Effects Model (FEM), and Random Effects Model (REM). The model fit test results are presented in Table 3:

**Table 3.** Model Goodness-of-Fit Test Results

| Goodness-of-Fit Test | Chi-Square Probability | Best Model |
|---|---|---|
| Chow Test | 0.0000 | Fixed Effects Model (FEM) |
| Hausman Test | 0.1085 | Random Effects Model (REM) |
| Lagrange Multiplier (LM) Test | 0.0000 | Random Effects Model (REM) |

## 5.2 Classical Assumption Test

After selecting the best estimation model through the model fit test, a classical assumption test is conducted to ensure the model meets the Best Linear Unbiased Estimator (BLUE) criteria, including the absence of autocorrelation, multicollinearity, or heteroscedasticity. The Random Effects Model (REM), identified as the best model, meets these criteria as it uses Generalized Least Squares (GLS). Autocorrelation is not tested on panel data, as noted by [41]. The multicollinearity test, which was conducted to check for problems, showed no problems, with correlation values between independent variables below 0.8, in accordance with [42]. The results of the multicollinearity test can be seen in Table 4.

**Table 4.** Multicollinearity Test

| | LOG(BB) | L | LOG(K) | LOG(U) | I |
|---|---|---|---|---|---|
| LOG(BB) | 1.0000 | | | | |
| L | 0.6303 | 1.0000 | | | |
| LOG(K) | 0.6897 | 0.4854 | 1.0000 | | |
| LOG(U) | 0.6643 | 0.6751 | 0.5261 | 1.0000 | |

| | | | | | |
|---|---|---|---|---|---|
| I | 0.0392 | 0.1358 | -0.0624 | 0.0425 | 1.000 |

### 5.3 Model Determination After Classical Assumptions

The model fit test identified the Random Effects Model as the best model. The classical assumption tests showed no problems with multicollinearity, while heteroscedasticity and autocorrelation were addressed using Generalized Least Squares (GLS). The resulting model, which meets the BLUE assumptions, is presented in Table 5 .

**Table 5.** Random Effects Model

| Variable | Coefficient | Probability |
|---|---|---|
| LOG(BB) | 0.9672799 | 0.000*** |
| L | 0.2253715 | 0.001** |
| LOG(K) | 0.0356837 | 0.023** |
| LOG(U) | -0.1367834 | 0.033** |
| I | 0.0397174 | 0.488 |
| Constant | | 3.462689 |
| Prob>F | | 0.0000 |
| R-Square | | 0.9675 |

**Note:**
**(***  = Significant at the 1% level (Prob < 0.001)
**(**  = Significant at the 5% level (Prob < 0.050)

The simultaneous significance test estimation results show that the probability value (Prob > F)is 0.0000 at a significant level of 1%, which means that globally there is at least one independent variable that affects the dependent variable in the model. This result is supported by the partialtest (t-test), which shows that four independent variables have a significant effect on the dependent variable. The probability of each variable is as follows: 0.000 for raw materials (LOG BB) with a 1% significant level, 0.001 for labor (L), 0.023 for capital (LOG K), and 0.033 for wages (LOG UP) with a 5% significant level. Furthermore, the estimation results show that the$R^2$ value is 0.9675, which means that the independent variables in this model can explain 96.75% of the variability in the dependent variable, while the remaining 3.25% is explained by other variables outside the model. This model with a high $R^2$ value is due to the selection of variablesbased on the production function, which includes the main supporting factors of production

### 5.4 The Impact of Capital on the Production Value of Large and Medium Manufacturing Industries in West Java Province

Based on the estimation results, capital has a positive and significant effect on production valuein the large and medium manufacturing industries in West Java. The data shows a drastic declinein capital, from IDR 338 billion in 2017 to IDR 177.79 billion in 2018, and relatively stable ataround IDR 177 billion from 2019 to 2020. Although the value of production increased, its growth slowed down, which is thought to be related

to the decline in capital.

The relationship between capital and manufacturing production is significant, especially in capital intensive large and medium-sized industries. A decrease in capital directly impacts thevalue of production. The estimation results confirm that capital has a positive and significant effect on production, consistent with the findings of [37] and [43], which show that higher capital increases production, while lower capital decreases production. This is in line with the production function theory, which states that output depends on capital and labor, with greaterlabor resulting in greater output.

### 5.5 The Impact of Labor on the Production Value of Large and Medium ManufacturingIndustries in West Java Province

Labor has a positive and significant impact on the manufacturing industry. In West Java Province, the number of workers decreased from 2,268,064 people in 2017 to 2,104,482 peoplein 2019-2020, which contributed to the slowdown in production value growth. Research by [44]shows that an increase in the number of workers is associated with an increase in production value, in accordance with the production function theory which states that output will increasealong with an increase in inputs, including labor. In addition, [37] noted that the availability ofadequate labor can speed up the production process and increase the turnover of goods and services in the market.

### 5.6 The Impact of Raw Materials on the Production Value of Large and MediumManufacturing Industries in West Java Province

The regression results show that raw materials have a positive and significant relationship withlarge and medium manufacturing industries in West Java, with a coefficient of 0.972, which isthe highest value among other factors. This confirms that raw materials are a key factor in manufacturing production in West Java, in line with findings from [45] and [23] which highlight the importance of raw materials in the production process. In addition, [29] noted that raw materials affect production costs, which encourages firms to minimize costs through imports.

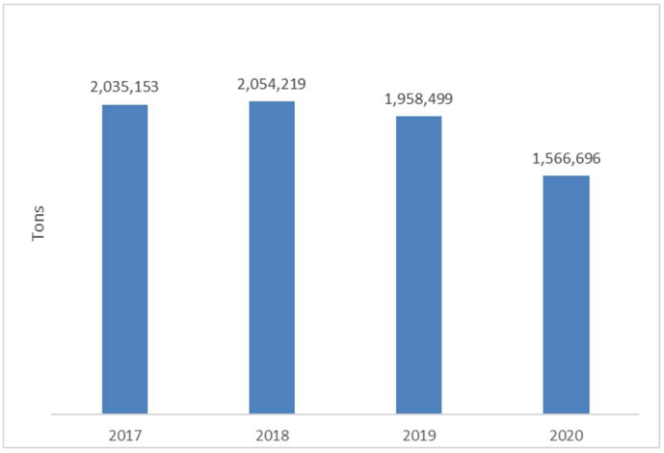


**Fig. 3.** Import Volume by Industry Sector for 2017-2020

Although the volume of imports decreased from 2,035,135 tons in 2017 to 1,566,696 tons in 2020, the value of raw material imports actually increased, from 642.66 billion rupiah in 2018 to 989.25 billion rupiah in 2020. This shows that companies are increasingly using more expensive domestic raw materials to meet production needs. The availability of raw materials directly affects the production process [46] and revenue from sales [47]

### 5.7 The Effect of Labor Wages on the Production Value of Large and Medium Manufacturing Industries in West Java Province

Labor wages have a significant, albeit negative, relationship with production value. The impact of wages on decreasing production value is in line with the phenomenon observed in large andmedium manufacturing industries in West Java between 2017 and 2020. During this period, wages increased from IDR 110.79 billion in 2017 to IDR 112.34 billion in 2020. An increase inwages may reduce the value of production as it increases the total production costs of the firm.When production costs rise, firms may be forced to increase product prices to cover the additional costs.

The effect of wages on the decline in production value is in line with the production cost theory,which states that an increase in input costs, such as labor wages, will increase production costs.If production costs increase, maintaining the same level of production without raising product prices becomes difficult. This price increase may reduce product demand, which in turn resultsin a decrease in production volume. This is supported by previous studies, including [48] and [49], which show that excessively high wage increases can burden employers and reduce the production capacity of firms, thereby contributing to a decline in production value

### 5.8 The Effect of Inflation on the Production Value of Large and Medium ManufacturingIndustries in West Java Province

In this study, inflation shows an insignificant relationship with the manufacturing industry, which means that inflation does not affect the production value of the manufacturing sector. The insignificant relationship between inflation and production value indicates that the phenomenon that occurs in the manufacturing industry in West Java is not influenced by inflation, or does not reflect the actual conditions. This insignificant positive relationship between production value and inflation contradicts the existing theory, which states that inflation should reduce prices, thus reducing production value. This finding is in line with previous research by [21], which shows that inflation has no significant impact on manufacturing industry production

## 6 Conclusions

Panel data analysis using a random effects model (REM) shows that capital (K), raw materials(BB), and labor (L) have a positive and significant effect on the production value of the manufacturing sector in West Java, while wage labor (U) has a negative but significant effect.The positive effects of capital and labor support their roles as key inputs that increase output and efficiency, in line with the production function theory. Raw materials also play an important role as inputs that support the production process.

Recommendations to improve production value in West Java include:

1. Capital: The large and medium manufacturing industries are capital-intensive, requiring investment to increase production scale and efficiency. In West Java, between 2017 and 2020, Pangandaran Regency has investment potential due to the stagnant number of companies and the lowest capital value, around 2 billion rupiah. This additional investment can increase production capacity, expand the market, and lower per-unit costs through economies of scale efficiency
2. Labor can be improved through increased investment, one of which is periodic training aimed at developing skills and productivity. This training includes Standard Operating Procedures (SOPs), machine operation, quality control, and the introduction of new production technologies.
3. In the raw material variable, it is known that the majority of raw materials in West Java and nationally are obtained through imports, which is related to the exchange rate. A suggestion for the government or policy makers is to form bilateral cooperation with rawmaterial supplying countries, in order to minimize the impact of exchange rate fluctuationsin the trade. This will help avoid raw material costs that are vulnerable to changes in exchange rates.

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