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The Dynamics of Industrialization in Middle-Income Countries: A Case Study of the Manufacturing Industry Sector

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ABSTRAK

Industrialisasi merupakan proses modernisasi ekonomi yang mencakup seluruh sektor ekonomi yang mempunyai kaitan satu sama lain dengan industri manufaktur. Tingkat industrialisasi yang rendah di negara berpendapatan menengah yang terlihat dari kurangnya penguasaan teknologi dan peningkatan industri yang membuat terjebak dalam perangkat teknologi berpendapatan menengah yang tentu akan membuat negara berpendapatan menengah mengalami deindustrialisasi prematur sehingga negara-negara berpendapatan menengah memiliki keterbatasan yang signifikan dalam hal kontribusi mereka terhadap perdagangan dan investasi global. Tujuan dari penelitian ini adalah untuk mengetahui pengaruh keterbukaan perdagangan, tenaga kerja dan investasi asing langsung secara parsial maupun simultan terhadap industri manufaktur di negara berpendapatan menengah tahun 2005-2022. Variabel independen yang digunakan adalah nilai tambah industri manufaktur sedangkan variabel dependennya adalah keterbukaan perdagangan, tenaga kerja dan investasi asing langsung, data yang digunakan dari tahun 2005-2022 yang bersumber dari world bank dan metode yang digunakan adalah regresi data panel dengan model yang terpilih adalah Fixed Effect Model (FEM). Hasil penelitian secara parsial menunjukkan bahwa keterbukaan perdagangan, tenaga kerja, dan investasi asing langsung berpengaruh signifikan terhadap nilai tambah industri manufaktur, kemudian keterbukaan perdagangan, tenaga kerja, dan investasi asing langsung secara simultan berpengaruh signifikan terhadap nilai tambah industri manufaktur di Negara Berpendapatan Menengah tahun 2005-2022.

ABSTRACT

Industrialization is a process of economic modernization that includes all economic sectors related to the manufacturing industry. The low level of industrialization in middle-income countries is evident from the lack of technological mastery and industrial upgrades that make them trapped in middle-income technological devices, which will certainly make middle-income countries experience premature deindustrialization so that middle-income countries have significant limitations in terms of their contribution to trade and global investment. The purpose of this study is to determine the effect of trade openness, labor, and foreign direct investment partially and simultaneously on the manufacturing value added in middle-income countries in 2005-2022. The independent variable used is the manufacturing value added while the dependent variable is trade openness, labor and foreign direct investment, the data used from 2005-2022 sourced from the world bank and the method used is panel data

regression with the selected model is Fixed Effect Model (FEM). The results of the study partially show that trade openness, Labor, foreign direct Investment have a significant effect on the manufacturing value added then trade openness, labor, and foreign direct investment simultaneously have a significant effect on the manufacturing value added in middle-income countries in 2005-2022.

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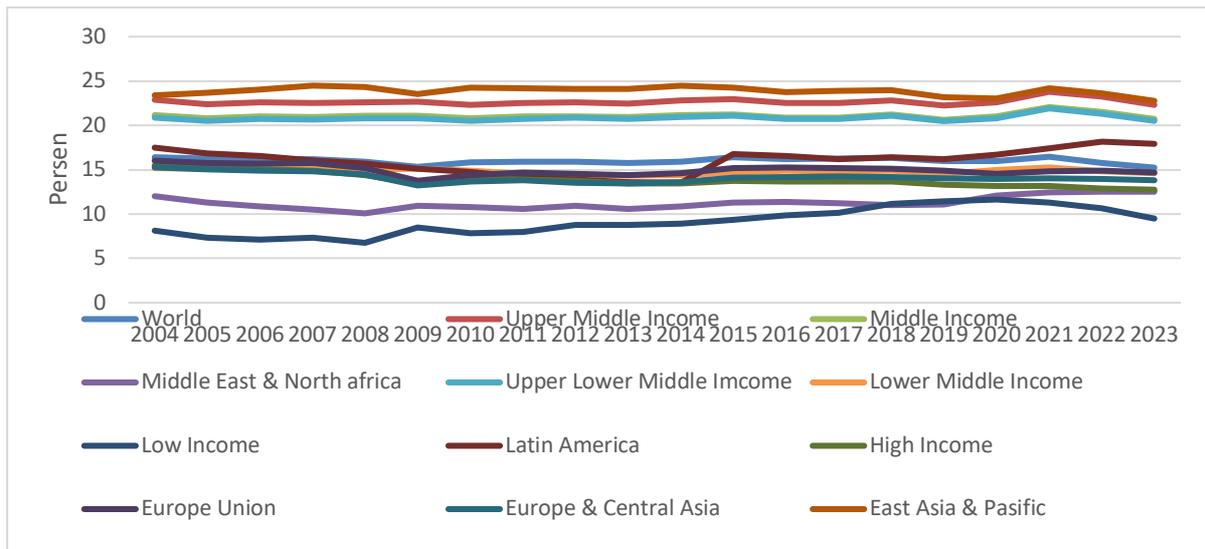
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1. INTRODUCTION

Industrialization activities are related to the development process. The industrialization process is a process that aims to improve the welfare of society in terms of higher living standards and conditions. In industrialization activities, the industrial sector is made the main focus of development and is expected to play an important role as a leading sector [1]. With a low level of industrialization, middle-income countries tend to rely heavily on the export of primary goods. This dependence causes these countries to rely on natural resources to drive growth with limited added value and little connection to other economic sectors, thereby increasing their vulnerability to external shocks [2].

Limitations in industrial and technological development hinder sustainable development, which affects industrial progress. This is due to the technology trap faced by middle-income countries, which is closely related to the concept of premature deindustrialization. This technology trap refers to specific structures and institutions that do not support the enhancement of value-added in domestic industries as well as the sustainable development of industry and technology [3]. In several middle-income countries, the manufacturing sector has already begun to decline or is on a shrinking path at income levels far lower than those at which advanced economies started experiencing industrial decline. Middle-income countries are transitioning into service-based economies without undergoing a strong industrialization process. This phenomenon is known as premature deindustrialization. Premature deindustrialization is one of the key factors that causes many middle-income countries to become trapped in a state of slow growth and prevents them from catching up with advanced economies [4].



Source: World Bank, Processed Data 2025.

Figure 1. Contribution of Manufacturing to GDP by Region in 2004–2023.

Based on Figure 1, it can be seen that the contribution of manufacturing to GDP in various regions, and overall in all of these regions, has remained stagnant. For example, the highest contribution is in the East Asia & Pacific region, where in 2004 it was 23.40%. In 2023, it became 22.75%. This indicates that over two decades, the contribution of manufacturing to GDP in the East Asia & Pacific region decreased by 0.7 percent. Then, in the upper-middle income region, it was 22.89% in 2004 and experienced stagnation until it became 22.29% in 2023. This means that over two decades, the contribution of manufacturing to GDP in middle-income countries experienced stagnation. Furthermore, in the lower-middle-income region, over the past two decades, there has also been stagnation and a decline in the contribution of manufacturing to GDP, as shown by the figure of 15.17% in 2004 and 14.62% in 2023. This means that over 20 years, the contribution of manufacturing to GDP in the lower-middle-income region has decreased.

According to the World Bank in 2024, there are 108 countries categorized as middle-income countries with a per capita GDP ranging from USD 1,136 to USD 13,845. In addition, middle-income countries are home to six billion people, and two out of every three people living in extreme poverty are found in these countries. Low-income countries also contribute 40% to the global GDP and are responsible for 60% of carbon emissions. Middle-income countries also face several greater challenges than high-income countries, such as rapidly aging populations, increasing protectionism in high-income countries, and the growing need for energy transition [5].

Table 1. GDP Per Capita, Industrial Sector GDP Value, Country Category

Country	GDP Per Capita (USD)	Industrial Sector GDP Value (USD)	Category
China	12,175.19	6,812,380,000,000	Upper Middle Income
India	2,236.31	892,980,778,133	Lower Middle Income
Indonesia	4,892.62	551,425,109,945	Upper Middle Income
Brazil	9,258.05	483,927,141,907	Upper Middle Income

Turkey	12,105.65	317,333,949,910	Upper Middle Income
Vietnam	3,760.39	159,511,376,519	Lower Middle Income
Bangladesh	1,885.37	151,320,650,092	Lower Middle Income
Iran	5,667.52	146,651,973,884	Upper Middle Income
Philippines	3,745.65	123,190,848,242	Lower Middle Income
Pakistan	1,616.39	69,871,126,318	Lower Middle Income

Source: World Bank, Processed Data 2025.

Based on Table 1, it can be seen that there are 10 middle-income countries with the highest industrial sector GDP among middle-income countries. The country with the highest GDP is China, amounting to USD 12,175.19, with its industrial GDP ranked first at USD 6,812 billion. Meanwhile, the lowest industrial GDP is found in Pakistan, amounting to USD 69.871 billion. Furthermore, the data also shows that these countries are classified as middle-income countries, as indicated by the highest GDP of USD 12,175.19 in China and the lowest GDP of USD 1,616.39 in Pakistan, which are both still within the middle-income countries category.

Development in the industrial sector contributes significantly to stimulating economic growth and is capable of providing added value, particularly to raw materials, labor absorption, and the expansion of business opportunities in improving the welfare of society [6]. The manufacturing industry continues to maintain its advantage, especially in middle-income countries, because the manufacturing industry is the sector that most strongly supports investment and the accumulation of technology. The manufacturing industry is the sector that provides the most important contribution to human resource development in middle-income countries. Therefore, the manufacturing industry remains the basis of economic growth in low- and middle-income countries [7]. On the other hand, the manufacturing industry is the sector that accumulates the most physical capital, allowing it to gain greater benefits from economies of scale. Economies of scale are achieved by reducing fixed costs and increasing efficiency [8].

There are significant limitations in middle-income countries regarding global trade and investment. This is due to inadequate infrastructure and small domestic markets, resulting in limited access to foreign markets, which increases trade costs. In addition, limited access to technology becomes a barrier for companies in middle-income countries to enter global markets and participate in global supply chains [9].

A study conducted by Novitasari (2015) stated that trade openness has a significant negative effect on manufacturing value added [10]. Based on the research conducted by Khobai and Moyo (2020), the results show that trade openness has a significant positive effect on the manufacturing industry in both the long term and the short term [11]. One of the factors contributing to the increase in the labor force is population growth, as it is considered a positive factor in economic growth. This is because a larger population will enhance the capacity of the domestic market, while increasing the labor force will, in turn, increase labor's contribution to the economy [12]. The manufacturing industry plays a significant role in job creation because it is a labor-intensive sector. However, to gain advantages from economies of scale and price competition, capital is increased through technological development in the industry, which can lead to a reduction in employment, particularly among low-skilled workers [13]. According to a study conducted by Alfarizy and Ekananda (2024), the number of workers has a significant positive effect on manufacturing value added [14]. A study conducted by Gita Lestari (2021)

stated that labor, both in the short term and the long term, has a negative and insignificant effect on manufacturing value added [15].

The role of investment in the industrial sector can withstand the current economic instability. Investment in the manufacturing industry tends to increase every year because a high level of investment in the manufacturing sector will increase production capacity, which aligns with the increase in the value added of the manufacturing industry, as the manufacturing sector is capital-intensive [16]. This study uses foreign direct investment, which plays a role in economic growth because it can bring benefits in the form of capital, technology, and knowledge to the recipient country [17].

Based on a study conducted by Santi Nurwahyuni (2023), which examined the effect of foreign direct investment on the manufacturing industry in Indonesia, the results revealed that foreign direct investment has no effect on the manufacturing industry [18]. According to a study conducted by Gita Lestari (2021), foreign direct investment in the industrial sector, both in the short term and the long term, has a negative and significant effect on manufacturing value added [15].

2. METHOD

2.1 Source and Type of Research

The type of research used was descriptive quantitative, and the data source was secondary data. The secondary data was obtained from institutions relevant to this research. This study used three independent variables, namely trade openness, labor, and foreign direct investment, and one dependent variable, namely manufacturing value added, with data sourced from the World Bank. The data used is panel data that combines time series (2005-2022) and cross-section (10 country in middle-income country).

2.2 Operational Definitions

Table 1. Variable, Data, Symbol, Unit, Source

Variable	Data	Symbol	Unit	Source
Manufacturing Value Added	Manufacturing value added in USD	IM	USD	World Bank
Trade Openness	percentage of exports and imports to GDP	KP	%	World Bank
Labor	Percentage of industrial Labor to total labor	TK	%	World Bank
Foreign Direct Investment	Net inflows of foreign direct Investment (FDI) in USD	IV	USD	World Bank

2.3 Data Analysis Method

Panel data are obtained by observing a group of individuals over a certain period of time, which is often referred to as cross-sectional units. Specifically, this estimation approach uses the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM), and applies the Chow test, Hausman test, and Lagrange Multiplier (LM) test to determine the best model for understanding the relationship between the dependent and independent variables. In this study, these tests were used to identify the most appropriate model for analyzing the panel data [19]. The independent variables used in this study are trade openness, labor, and foreign direct investment, while the dependent variable is manufacturing value added. This study employed a multiple logarithmic model, which is a logarithmic model applied to both the independent and dependent variables, as logarithms offer various advantages such as reducing the scale of measured variables and making adjustments to address normality and heteroskedasticity issues. Therefore, this model is referred to as

a logarithmic model [20]. Thus, in this case, the general form of the model in the econometric equation can be formulated as follows:

$$\text{LogIM}_{it} = \beta_0 + \beta_1\text{KP}_{it} + \beta_2\text{TK}_{it} + \beta_3\text{LogIV}_{it} + \varepsilon_{it}$$

Explanation:

IM	= Manufacturing Value Added	(Percentage)
KP	= Trade Openness	(Percentage)
TK	= Labor	(Percentage)
IV	= Foreign Direct Investment	(Percentage)
ε	= Error term	
β_0	= Constant	

3. RESULTS AND DISCUSSION

3.1 Model Selection Test

Table 1. Results of Model Selection Test

Model Selection Test	Prob. > F	Selected Model
Chow Test	0.0000	Fixed Effect
Hausman Test	0.0001	Fixed Effect

Source: Stata Output, Processed Data 2025

In Table 1, the results of the Chow test show a P-value of 0.0000, which is smaller than α (0.05). Therefore, the decision to be made is to reject H_0 and accept H_a , indicating that the selected model in this test is the Fixed Effect Model (FEM). Subsequently, the next test to be conducted is the Hausman test. Based on the Hausman test, the P-value is 0.0001, which is smaller than α (0.05). Thus, the decision is to reject H_0 and accept H_a , meaning that the selected model in the Hausman test is also the Fixed Effect Model (FEM). Therefore, based on the tests conducted above, it can be concluded that the best model chosen is the Fixed Effect Model (FEM).

3.2 Selected Model Regression: Fixed Effect Model

Table 2. Fixed Effect Model Regression Results

LogIM	Coeff.	t	Prob > t
Cons	19.69402	32.24	0.000
KP	-0.008723	-4.30	0.000
TK	0.1603322	16.94	0.000
LogIV	0.0823916	2.66	0.009

Source: Stata Output, Processed Data 2025.

Based on the estimation results, the following equation model is formed:

$$\text{LogIM}_{it} = 19.69402 - 0.008723\text{KP}_{it} + 0.1603322\text{TK}_{it} + 0.0823916\text{LogIV}_{it} + \varepsilon_{it}$$

From the above equation, the following conclusions can be drawn:

1. The constant value is 19.69402, measured in percentage, which is then converted to antilog. The antilog value of the constant is 4.943334514, measured in USD. This means that when the variables of trade openness, labor, and foreign direct investment are equal to 0, the manufacturing value-added variable will be 4.943334514 USD.
2. The trade openness variable (KP) has a coefficient value of -0.008723. Based on the unit form of the trade openness variable, which is in percentage, the model indicates that for every 1% increase in trade openness, the manufacturing value added in middle-income countries will decrease by 0.008723%, assuming that other variables remain constant.

3. The labor variable (TK) has a coefficient value of 0.1603322. Based on the unit form of the labor variable, which is in percentage, the model indicates that for every 1% increase in labor in middle-income countries, the manufacturing value added in middle-income countries will increase by 0.1603322%, assuming that other variables remain constant.
4. The foreign direct investment (IV) variable has a coefficient value of 0.0823916. Based on the unit form of the foreign direct investment variable, which is in percentage, the model indicates that for every 1% increase in foreign direct investment in middle-income countries, the manufacturing value added will increase by 0.0823916%, assuming that other variables remain constant.

3.3 Classical Assumption Test

3.3.1 Normality Test

Table 3. Results of Normality Test

Variable	Obs	Adj. Chi-Sq(02)	Prob. > Chi-Sq
Residuals	180	2.07	0.3551

Based on Table 3, it can be seen that the residual variable has a probability value of 0.3551, which is above 0.05, meaning we fail to reject H_0 , indicating that the residuals are normally distributed.

3.3.2 Multicollinearity Detection

Table 4. Results of Multicollinearity Detection

Variable	VIF	Multicollinearity
KP	1.00	Low
TK	1.00	Low
LogIV	1.00	Low

Source: Stata Output, Processed Data 2025.

Based on Table 4, it can be seen that the trade openness variable has a value inflation factor (VIF) of 1.00, which is within the range of $1 < 5$, meaning that the trade openness variable has low multicollinearity. Similarly, the labor variable has a VIF of 1.00, which is also within the range of $1 < 5$, meaning that the labor variable has low multicollinearity. Furthermore, the foreign direct investment variable has a VIF of 1.00, which is within the range of $1 < 5$, meaning that the foreign direct investment variable has low multicollinearity.

3.3.3 Heteroskedasticity Test

Table 5. Results of Heteroscedasticity Test

Chi-Sq(1)	Prob > Chi_Sq	Conclusion
1.67	0.1957	Accept H_0

Source: Stata Output, Processed Data 2025.

Based on Table 5, it can be seen that the probability value is 0.1957, which is above 0.05, meaning that H_0 is accepted, indicating that there is no heteroscedasticity problem.

3.4 Statistical Test

3.4.1 t-Test

Table 6. Results of t-Test

Variable	t-count	t-table	Prob > t	Conclusion
KP	-4.30	-1.97353	0.000	Reject H ₀
TK	16.94	1.97353	0.000	Reject H ₀
LogIV	2.66	1.97353	0.009	Reject H ₀

Source: Stata Output, Processed Data 2025.

1. The results of the t-test show that the trade openness variable has a probability of $0.000 < 0.05$ and a calculated t-count of $-4.30 < t\text{-table } -1.97353$. This means that H₀ is rejected and H_a is accepted, indicating that the trade openness (KP) variable has a significant effect on manufacturing value added in middle-income countries during the period 2005–2022.
2. The results of the t-test show that the labor variable has a probability of $0.0000 < 0.05$ and a calculated t-count of $16.94 > t\text{-table } 1.97353$. This means that H₀ is rejected and H_a is accepted, indicating that the labor variable has a significant effect on manufacturing value added in middle-income countries during the period 2005–2022.
3. The results of the t-test show that the foreign direct investment variable has a probability of $0.0000 < 0.05$ and a calculated t-count of $2.66 > t\text{-table } 1.97353$. This means that H₀ is rejected and H_a is accepted, indicating that the foreign direct investment variable has a significant effect on manufacturing value added in middle-income countries during the period 2005–2022.

3.4.2 F-Test

Table 7. Results of F-Test

F-statistic	F-table	Prob > F	Conclusion
443.70	2.66	0.0000	Reject H ₀

Source: Stata Output, Processed Data 2025.

The F-table value is obtained using the formula $df1 = k - 1$ and $df2 = n - k$, where $df1 = 4 - 1 = 3$ and $df2 = 180 - 4 = 176$. Thus, the F-table value is 2.66. It is known that the F-statistic value is $443.70 > F\text{-table } 2.66$, with a probability of $0.0000 < 0.05$, which means rejecting H₀ and accepting H_a. This indicates that the variables of trade openness, labor, and foreign direct investment, collectively (simultaneously), have a significant effect on manufacturing value added in middle-income countries during the period 2005–2022.

3.5 Coefficient of Determination

Table 8. Results of Coefficient of Determination

R-Squared	Adjusted R-Squared
0.9696	0.9674

Source: Stata Output, Processed Data 2025.

Based on the regression results in Appendix 8 the R-Squared value is 0.9696. This figure indicates that 96.96% of the variation in the manufacturing value added variable, as reflected by manufacturing value added, can be explained by the variables of trade openness, labor, and foreign direct investment. Meanwhile, the remaining 3.04% is due to other variations outside the panel data regression model.

3.6 Discussion Analysis

3.6.1 The Effect of Trade Openness on the Manufacturing Industry

The research results show that during the period from 2005 to 2022, trade openness had a significant and negative effect on the manufacturing industry in middle-income countries. This finding is in line with the study conducted by Novitasari (2015), which stated that in the long term, trade openness has a significant negative effect on manufacturing value added [10].

The manufacturing industry in middle-income countries often relies on imported raw materials and technology. Therefore, during global crises, the prices of raw materials and the costs of importing technology tend to fluctuate and increase due to global economic instability. As a result, trade openness makes domestic manufacturing industries more vulnerable to global price shocks, leading to higher production costs and a decrease in the value added produced. In addition, the manufacturing industry in middle-income countries often lacks strong competitiveness compared to industries in developed countries. Trade openness forces domestic industries to compete with cheaper and higher-quality imported products, especially during crisis periods when consumers become more price-sensitive. Without adequate protective policies or incentives, domestic manufacturing industries struggle to maintain their market share, leading to a decline in manufacturing value added.

3.6.2 The Effect of Labor on the Manufacturing Industry

The results of this study indicate that during the period from 2005 to 2022, labor had a positive and significant effect on the manufacturing industry in middle-income countries. This result is consistent with the study conducted by Novitasari (2015), which stated that labor has a significant positive effect on manufacturing value added [10].

The manufacturing industry in middle-income countries is generally labor-intensive, meaning that this sector heavily depends on the availability of labor to produce goods. Labor is one of the main factors of production in the manufacturing industry, especially in middle-income countries that have not fully adopted automation and high technology. As the number of workers increases, production capacity also grows, leading to an increase in manufacturing value added. Labor in middle-income countries generally earns lower wages compared to workers in developed countries. This results in lower production costs and enhances the competitiveness of manufactured products in the global market. For instance, the textile and garment industries in Bangladesh and Vietnam take advantage of low-cost labor to compete in export markets.

3.6.3 The Effect of Foreign Direct Investment on the Manufacturing Industry

The results of this study indicate that during the period from 2005 to 2022, foreign direct investment had a positive and significant effect on the manufacturing industry in middle-income countries. This finding is in line with the study conducted by Rasaan, Adijat, and Abubakar (2017), which examined the effect of FDI on the manufacturing industry in Nigeria. The study revealed that FDI in the manufacturing sector had a significant positive impact on manufacturing value added [21].

Foreign companies investing in middle-income countries often bring more advanced technology and knowledge, which helps domestic manufacturing industries improve production efficiency and product quality. In addition, foreign direct investment can create new jobs in the manufacturing sector, which in turn increases income and purchasing power among the population. One example is FDI in the electronics sector in Vietnam, which, over the past decade, has created millions of jobs. Multinational companies have shifted to middle-income countries to diversify their risks during crises. These investments help domestic manufacturing industries to survive and even grow. FDI also helps manufacturing industries in middle-income countries integrate into global supply chains, enabling them to export products to international markets. For instance, FDI in the textile sector in Bangladesh has made the country one of the largest garment exporters in the world.

3.6.4 The Joint Effect of Trade Openness, Labor, and Foreign Direct Investment on the Manufacturing Industry

The results of this study indicate that during the period from 2005 to 2022, trade openness, labor, and foreign direct investment jointly (simultaneously) have a significant effect on manufacturing value added in middle-income countries. According to the research conducted by Azolibe (2021), low- and middle-income countries were combined into one group, where the GMM panel results showed that only gross capital formation, household consumption expenditure, labor force, and trade openness significantly increased industrial value added in low- and middle-income countries, while other variables such as infrastructure development, banking system credit, foreign direct investment, and political stability/absence of violence and terrorism had no significant effect on manufacturing value added [22].

4. CONCLUSION

1. Trade openness has a significant effect on manufacturing value added in middle-income countries during the period 2005–2022.
2. Labor has a significant effect on manufacturing value added in middle-income countries during the period 2005–2022.
3. Foreign direct investment has a significant effect on manufacturing value added in middle-income countries during the period 2005–2022.
4. Trade openness, labor, and foreign direct investment jointly have a significant effect on manufacturing value added in middle-income countries during the period 2005–2022.

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