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Analysis of the Influence of Gross Fixed Capital Formation, Exports of Goods and Services, Foreign Direct Investment, and Total Factor Productivity on per Capita Income in an Effort to Avoid the Middle-Income Trap in Indonesia

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Abstract

Indonesia's economic growth in recent decades has reached significant levels, but the challenge of avoiding the Middle Income Trap remains a major concern. This study aims to analyze the effect of Gross Fixed Capital Formation, exports of goods and services, Foreign Direct Investment, and Total Factor Productivity on per capita income in Indonesia. The method of analysis uses time series data from 1985-2022 with VECM to examine long-run and short-run relationships. The data used in this study are secondary data derived from the World Bank and APO. The results show that in the long run, FDI and exports of goods and services have a positive and significant effect on GNP per capita. FDI has a positive and insignificant effect on GNP per capita. TFP has a negative and insignificant effect on GNP per capita. In the short term, PMTB has a negative and insignificant effect (in the previous 1 year) and a positive and insignificant effect on GNP per capita. Exports of goods and services have a negative and insignificant effect (in the previous 1 year) and a negative and significant effect (in the previous 2 years) on GNP per capita. FDI has a negative and insignificant effect (in the previous 1 year) and a positive and insignificant effect (in the previous 2 years) on GNP per capita. And TFP has a positive and significant effect on GNP per capita.

Keywords: GNP per capita; export of goods and services; FDI; TFP

1. Introduction

Indonesia is the largest economy in Southeast Asia and has great potential to become one of the largest economies in the world. Since the reform era, Indonesia has recorded impressive economic growth. However, this growth has not been enough to lift the country from the middle-income to high-income category. The middle-income trap refers to a condition where middle-income countries are unable to follow the economic growth trajectory to reach a new level of high-income countries [1]. The World Bank has released an updated classification of per capita income of of countries in the world for the year 2023.

Table 1. classification of income per capita in 2023

Low Income		< US$ 1,135
Middle Income	Low Middle	US$ 1,136 - US$ 4,465
	Upper Middle	US$ 4,466 - US$ 13,845
High Income		>US$ 13,845

Source: World Bank

One way to overcome the middle income trap is to increase per capita income. Some factors that are believed to have a significant influence on increasing per capita income are Gross Fixed Capital Formation (GFCF), exports of goods and services, Foreign Direct Investment (FDI), and Total Factor Productivity (TFP).

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Table 2. Gross Fixed Capital Formation, Export of goods and services, FDI And TFP data 1985-2022

year	GNP per capita(USD)	Gross fixed capital formation (percent)	Ekspor barang dan jasa(percent)	FDI (percent)	TFP (percent)
1985	500.0	23.3	23.8	0.4	4.19
1986	510.0	25.6	20.5	0.3	-0,72
1987	510.0	25.2	24.6	0.5	1,25
1988	510.0	27.0	25.0	0.7	2,49
1989	520.0	28.5	26.1	0.7	2,48
1990	560.0	30.6	27.3	1.0	2,81
1991	600.0	29.7	28.4	1.3	0,37
1992	660.0	28.0	30.3	1.4	1,68
1993	740.0	26.3	26.8	1.3	-2,34
1994	850.0	27.6	26.5	1.2	1,96
1995	980.0	28.4	26.3	2.2	-3,02
1996	1,080.0	29.6	25.8	2.7	-3,92
1997	1,090.0	28.3	27.9	2.2	-19,16
1998	650.0	25.4	53.0	-0.3	-2,42
1999	570.0	20.1	35.5	-1.3	3,33
2000	570.0	19.9	41.0	-2.8	-2,01
2001	710.0	19.7	39.0	-1.9	1,14
2002	780.0	19.4	32.7	0.1	0,89
2003	890.0	19.5	30.5	-0.3	1,06
2004	1,070.0	22.4	32.2	0.7	0,89
2005	1,210.0	23.6	34.1	2.9	0,48
2006	1,360.0	24.1	31.0	1.3	2,46
2007	1,580.0	24.9	29.4	1.6	1,25
2008	1,920.0	27.7	29.8	1.8	-0,72
2009	2,130.0	31.1	24.2	0.9	-0,29
2010	2,510.0	31.0	24.3	2.0	-0,84
2011	2,990.0	31.3	26.3	2.3	0,08
2012	3,550.0	32.7	24.6	2.3	-1,55
2013	3,710.0	32.0	23.9	2.6	-0,37
2014	3,600.0	32.5	23.7	2.8	-2,76
2015	3,420.0	32.8	21.2	2.3	-1,04
2016	3,400.0	32.6	19.1	0.5	0,21
2017	3,530.0	32.2	20.2	2.0	0,56
2018	3,850.0	32.3	21.0	1.8	-2,15
2019	4,070.0	32.3	18.6	2.2	-7,08
2020	3,900.0	31.7	17.3	1.8	4,76
2021	4,170.0	30.8	21.4	1.8	-2,1
2022	4,580.0	29.1	24.5	1.6	1,2

2. Literature Review

2.1. Gross National Product

GNP (Gross National Product) per capita is a measure used to gauge the average economic income generated by each individual in a country in a given period, usually one year. GNP itself is the total value of goods and services produced by citizens

of a country, both living in the country and abroad, after deducting the income earned by foreigners in the country.

2.2. Gross Fixed Capital Formation

PMTB (Gross Fixed Capital Formation) is an economic term that refers to the total value of investment in fixed assets made by the private sector and government in a given period. These fixed assets include physical infrastructure such as buildings, roads, bridges, machinery, equipment, and other assets that have a useful life of more than one year.

2.3. Export of Good and Services

Exporting goods and services is the activity of selling goods and services produced within a country to other countries. It involves sending physical goods such as manufactured products, agriculture, or raw materials, as well as services such as tourism, education, or financial services. Exports help countries earn foreign exchange and can boost economic growth and create jobs.

2.4. Foreign Direct Investment

FDI (Foreign Direct Investment) is an investment made by individuals, companies, or governments from one country to another in the form of asset or equity purchases, construction of new facilities, or business expansion. The goal is to acquire long-term ownership and control of a company or asset in the recipient country.

2.5. Total Factor Productivity

Total Factor Productivity (TFP), or Total Factor Productivity, is a measure of the efficiency with which all production inputs (such as labor and capital) are used in the production process. TFP reflects an economy's ability to produce more output from the same amount of inputs, and is often considered an indicator of technological innovation, managerial efficiency, and other factors that cannot be explained simply by an increase in the number of inputs.

3. Research Method

The type of data used is secondary data, namely data or information obtained from other parties other parties, in the form of data that supports this research. Secondary data used is a time series from 1985-2022 with VECM to examine long-run and short-run relationships. This study aims to analyze the effect of Gross Fixed Capital Formation, exports of goods and services, Foreign Direct Investment, and Total Factor Productivity on per capita income in Indonesia. The data source in this study were taken from World Bank, Association Productivity Organization, books and journals.With the title of this research, this research was conducted in Indonesia with research time from 1985 to 2022. Series from 2009-2016 and cross section as much as 32 data representing 4 years as much as 32 data representing 4 provinces on the island of Java, namely West Java Province West Java, Central Java, East Java, and Yogyakarta. The data analysis method in this study uses E-views 10. VECM is a suitable technique for time-series data that has a long-term relationship and requires cointegration integration analysis between the variables under study. The general equation for VECM is:

$$\Delta Y_t = \mu_{ox} + \mu_{1xt} + \pi x Y_{t-1} + \sum i = 1\, r_{ix} \Delta Y_{t-1} + \varepsilon_t \quad (1)$$

Where:

Δy_t : The first derived vector of the dependent variable

ΔY_{t-1} : The first derived vector of the dependent variable with the 1st lag

e_{t-1} : eror obtained from the regression equation between Y and X at the 1st lag and is also called ECT

ε_t : Residual vectors

A : Cointegration coefficient matrix

β_I : Matrix of i-dependent variable coefficients, where i= 1.2,...,p.

4. Results and Discussion

Based on the unit root test results in Table 3, all variables are stationary at the first difference level. And then the lag test is carried out, to get what lag to use.

Based on the lag test results in Table 4, the recommended lag is lag 2, which is by looking at the minimum AIC value. Furthermore, the VAR stability test is carried out to see the stability of the data.

Based on the results of the VAR stability test in Table 5, all modulus values are below 1, which means that all variables are stable and can be continued in the next test.

Based on the Table 6, the variables that have a causal relationship are GNI with FDI, TFP with GNI, export of goods and services with PMTB, PMTB with FDI, TFP with PMTB, TFP with export of goods and services, and TFP with FDI. Next, a cointegration test will be conducted to see if there is an equilibrium in the long run (Table 7).

Table 3. Result of Unit Root Test

Variabel	Nilai Statistik Augmented Dickey Fuller		
	Level	First Difference	Second Difference
GNP	0,479324	-2,950349*	-5,963728*
	(0.9836)	(0,0495)	(0,0000)
PMTB	-1,854739	-3,695966*	-7,280397*
	(0,3491)	(0,0084)	(0,0000)
EKS	-2,683320	-9.001383*	-8,878741*
	(0,0865)	(0,0000)	(0,0000)
FDI	-2,402030	-5,866629*	-7,279514*
	(0,1481)	(0,0000)	(0,0000)
TFP	-4.957194*	-9.140183*	-5.775950*
	(0.0003)	(0,0000)	(0,0000)

Source: Author Processed Data

Table 4. Result of optimum lag Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-540.9984	NA	61114064	32.11755	32.34202*	32.19410
1	-498.5632	69.89335*	22325361*	31.09195	32.43874	31.55124*
2	-472.8356	34.80782	23684163	31.04916*	33.51827	31.89119

Source: Researcher Processed Data

Table 5. VAR Stability Test

Root	Modulus
0.232963 - 0.599925i	0.643570
0.232963 + 0.599925i	0.643570
0.358817 - 0.528820i	0.639062
0.358817 + 0.528820i	0.639062
-0.279406 - 0.545644i	0.613021
-0.279406 + 0.545644i	0.613021
0.608920	0.608920
-0.440597 - 0.348404i	0.561704
-0.440597 + 0.348404i	0.561704
-0.229295	0.229295

Source: Author Processed Data

Table 6. Causality Granger

Null Hypothesis:	Obs	F-Statistic	Prob.
PMTB does not Granger Cause GNI	36	0.44673	0.6438
GNI does not Granger Cause PMTB		2.55498	0.0939
EKS does not Granger Cause GNI	36	0.21705	0.8061
GNI does not Granger Cause EKS		1.67731	0.2034
FDI does not Granger Cause GNI	36	1.09987	0.3456
GNI does not Granger Cause FDI		3.76678	0.0343
TFP does not Granger Cause GNI	35	11.1993	0.0002
GNI does not Granger Cause TFP		0.44337	0.6460
EKS does not Granger Cause PMTB	36	5.95339	0.0065
PMTB does not Granger Cause EKS		1.18980	0.3178
FDI does not Granger Cause PMTB	36	1.02199	0.3717

Null Hypothesis:	Obs	F-Statistic	Prob.
PMTB does not Granger Cause FDI		7.83517	0.0018
TFP does not Granger Cause PMTB	35	7.26200	0.0027
PMTB does not Granger Cause TFP		0.64586	0.5313
FDI does not Granger Cause EKS	36	0.07549	0.9275
EKS does not Granger Cause FDI		3.09779	0.0594
TFP does not Granger Cause EKS	35	10.5281	0.0003
EKS does not Granger Cause TFP		1.29639	0.2884
TFP does not Granger Cause FDI	35	3.60357	0.0396
FDI does not Granger Cause TFP		1.32532	0.2808

Source: Author Processed Data

Table 7. Cointegration Test

HypothesizedNo. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.780119	112.1391	69.81889	0.0000
At most 1 *	0.556413	62.15503	47.85613	0.0013
At most 2 *	0.422734	35.33065	29.79707	0.0104
At most 3 *	0.316614	17.19870	15.49471	0.0274
At most 4 *	0.131057	4.635765	3.841466	0.0313

Source: Author Processed Data

Next is VECM estimation to see the relationship in the long run and short run (Table 8).

Table 8. VECM estimation results in the long run

Variabel	Coefficient	T-table	T-statistic
PMTB	1346.282	2.034515	4.31539
Ekspor	1146.387	2.034515	5.77222
FDI	1403.968	2.034515	1.83892
TFP	-18.62968	2.034515	-0.06613

Source: Author Processed Data

Based on all table result, the conclusions that can be drawn are as follows:

- The coefficient of PMTB variable is 1346.282. This shows that there is a positive influence of Gross Fixed Capital Formation (PMTB) variable on GNP per capita in the long run. That is, if the variable PMTB increases by 1 unit, GNP per capita will also increase by 1346.282 units. While the t-count of the PMTB variable is 4.31539, where this value is greater than the t-table value (2.034515). This indicates that the PMTB variable has a significant effect on GNP per capita in the long run.
- The coefficient of the export of goods and services variable is 1146.387. This shows that there is a positive influence of the export of goods and services variable on GNP per capita in the long run. That is, if the export of goods and services variable increases by 1 unit, GNP per capita will also increase by 1146.387 units. While the t-count value of the export of goods and services variable is 5.77222, where this value is greater than the t-table value (2.034515). This shows that the export of goods and services variable has a significant effect on GNP per capita in the long run.
- The coefficient of the FDI variable is 1403.968. This shows that there is a positive influence of the FDI variable on GNP per capita in the long run. That is, if the FDI variable increases by 1 unit, GNP per capita will also increase by 1403.968 units. While the t-count value of the FDI variable is 1.83892, where this value is smaller than the t-table value (2.034515). This indicates that the FDI variable has no significant effect on GNP per capita in the long run.
- The coefficient of TFP variable is -18.62968. This shows that there is a negative influence of the TFP variable on GNP per capita in the long run. That is, if the TFP variable increases by 1 unit, GNP per capita decreases by -18.62968 units. While the t-count value of TFP variable is -0.06613, where this value is smaller than the t-table value (2.034515). This indicates that the TFP variable has no significant effect on GNP per capita in the long run.

Table 9. VECM estimation results in the short run

Variabel	Coefficient	T- table	T-stat
D(PMTB(-1))	-7.710624	2.034515	-0.48189
D(PMTB(-2))	29.96641	2.034515	1.92788
D(EKS(-1))	-0.311909	2.034515	-0.04165
D(EKS(-2))	-19.18114	2.034515	-3.57886
D(FDI(-1))	-0.971128	2.034515	-0.04017
D(FDI(-2))	12.30184	2.034515	0.52376
D(TFP(-1))	33.00960	2.034515	6.64374
D(TFP(-2))	14.18835	2.034515	2.06383

Source: Author Processed Data

Based on the Table 9, the conclusions that can be drawn are as follows:

- On lag 1, the coefficient of the PMTB variable is -7.710624. This shows that there is a negative influence of the PMTB variable on GNP per capita. This means that if the PMTB variable has increased in the previous year, then GNP per capita tends to decrease in the current period. While the t-count value of the PMTB variable at lag 1 is -0.48189, where this value is smaller than the t-table value (2.034515). This shows that the PMTB variable at lag 1 has no significant effect on GNP per capita.
- In lag 2, the coefficient of the PMTB variable is 29.96641. This shows that there is a positive effect of the PMTB variable on GNP per capita. This means that if the PMTB variable has increased in the previous two years, then GNP per capita tends to increase in the current period. While the t-count value of the PMTB variable on lag 2 is 1.92788, where this value is smaller than the t-table value (2.034515). This shows that the PMTB variable at lag 2 has no significant effect on GNP per capita.
- In lag 1, the coefficient of the export of goods and services variable is -0.311909. This shows that there is a negative effect of the export of goods and services variable on GNP per capita. That is, if the export of goods and services variable increases in the previous year, then GNP per capita tends to decrease in the current period. While the t-count value of the export of goods and services variable at lag 1 is -0.04165, where this value is smaller than the t-table value (2.034515). This indicates that the export of goods and services variable at lag 1 does not have a significant effect on GNP per capita.
- In lag 2, the coefficient of the export of goods and services variable is -19.18114. This shows that there is a negative effect of the export of goods and services variable on GNP per capita. This means that if the export of goods and services variable has increased in the previous two years, then GNP per capita tends to decrease in the current period. While the t-count value of the export of goods and services variable at lag 2 is -3.57886, where this value is greater than the t-table value (2.034515). This shows that the export of goods and services variable at lag 2 has a significant effect on GNP per capita.
- In lag 1, the coefficient of the FDI variable is -0.971128. This shows that there is a negative influence of the FDI variable on GNP per capita. This means that if the FDI variable has increased in the previous year, then GNP per capita tends to decrease in the current period. While the t-count value of the FDI variable at lag 1 is -0.04017, where this value is smaller than the t-table value (2.034515). This indicates that the FDI variable at lag 1 has no significant effect on GNP per capita.
- In lag 2, the coefficient of the FDI variable is 12.30184. This shows that there is a positive effect of the FDI variable on GNP per capita. This means that if the FDI variable has increased in the previous two years, then GNP per capita tends to increase in the current period. While the t-count value of the FDI variable on lag 2 is 0.52376, where this value is smaller than the t-table value (2.034515). This indicates that the FDI variable at lag 2 has no significant effect on GNP per capita.
- In lag 1, the coefficient of the TFP variable is 33.00960. This shows that there is a positive influence of the TFP variable on GNP per capita. That is, if the TFP variable has increased in the previous year, then GNP per capita tends to increase in the current period. While the t-count value of the TFP variable at lag 1 is 6.64374, where this value is greater than the t-table value (2.034515). This indicates that the TFP variable at lag 1 has a significant effect on GNP per capita.
- In lag 2, the coefficient of TFP variable is 14.18835. This shows that there is a positive effect of the TFP variable on GNP per capita. That is, if the TFP variable has increased in the previous two years, then GNP per capita tends to increase in the current period. While the t-count value of the TFP variable on lag 2 is 2.06383, where this value is greater than the t-table value (2.034515). This indicates that the TFP variable at lag 2 has a significant effect on GNP per capita.

5. Conclusion

Based on the results obtained from research analyzing the factors that affect per capita income using the time serie method,

the results are obtained that Gross Fixed Capital Formation (GFCF) has a positive and significant effect on GNP per capita in the long run. However, it has a negative and insignificant effect (in the previous 1 year) and a positive and insignificant effect (in the previous 2 years) on GNP per capita. Export of goods and services has a positive effect on GNP per capita in the long run. However, exports of goods and services have a negative and insignificant effect (in the previous 1 year) and a significant negative effect (in the previous 2 years) on GNP per capita. Foreign Direct Investment (FDI) has a positive and insignificant effect on GNP per capita in the long run. However, it has a negative and insignificant effect (in the previous 1 year) and a positive and insignificant effect (in the previous 2 years) on GNP per capita. Total Factor Productivity (TFP) has a negative and insignificant effect on GNP per capita in the long run. But in the short term, TFP has a positive effect on GNP per capita

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