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Research Paper

Fiscal Strategy for Local Food Resilience

Empirical Evidence from East Java 2018-2024

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Abstract

This research examines the influence of fiscal capacity and regional spending on food security across 38 regencies/cities in East Java from 2018 to 2024. Capital expenditures in the economy, health, education, and housing sectors are analyzed as these functions shape key determinants of food resilience. Using panel data with fixed effects and mean group estimators, the study evaluates both contemporaneous and lagged effects on the Regional Food Security Index (IKPD). Results show that fiscal capacity and health-sector capital expenditure consistently strengthened food security, indicating the central role of health infrastructure and personnel. In contrast, spending on the economic, education, and housing sectors showed inconsistent impacts, suggesting limited targeting of food-related outcomes. Structural factors—such as access to clean water, women's education, and the availability of health personnel—also significantly shaped IKPD performance. These findings highlight the need for adaptive, evidence-based fiscal policies tailored to local contexts to guide the 2025–2029 mid-term regional development planning.

Keywords: Capital Expenditure; East Java; Fiscal Capacity; Food Security; Panel Data.

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1. Introduction

Food security has been designated as one of the national development priorities in Indonesia's Medium-Term National Development Plan (RPJMN) under the administration of President Prabowo Subianto. Within the framework of *Asta Cita*—literally translated as "Eight National Aspirations"—the second national priority emphasizes national self-reliance through food, energy, and water sovereignty, as well as the development of green and blue economies. The *Asta Cita* program outlines eight strategic goals that serve as the foundation of Indonesia's national development agenda for 2025–2029, integrating economic transformation, human resource development, and environmental sustainability.

East Java plays an important role as one of Indonesia's staple food producers. Based on data from the Central Statistics Agency (BPS), the province produced 9.27 million tons of rice in 2024, which was about 17.45 percent of the national total. This contribution was the largest compared to other provinces, followed by Central Java (8.89 million tons or 16.73 percent) and West Java (8.62 million tons or 16.23 percent).

However, East Java now faces serious problems such as lower rice yields, loss of productive land, and unequal access to clean water and food infrastructure across regions (Werdiono, 2024). These conditions require flexible and responsive planning in the Regional Medium-Term Development Plan (RPJMD) for 2025–2029 at both provincial and city levels.

Although the Regional Food Security Index (IKPD) in East Java has generally improved in the last seven years, it dropped in 2021, probably due to the economic and health impacts of the COVID-19 pandemic (Figure 1). This trend shows that regional food security is influenced not only by local factors but also by national and global situations.

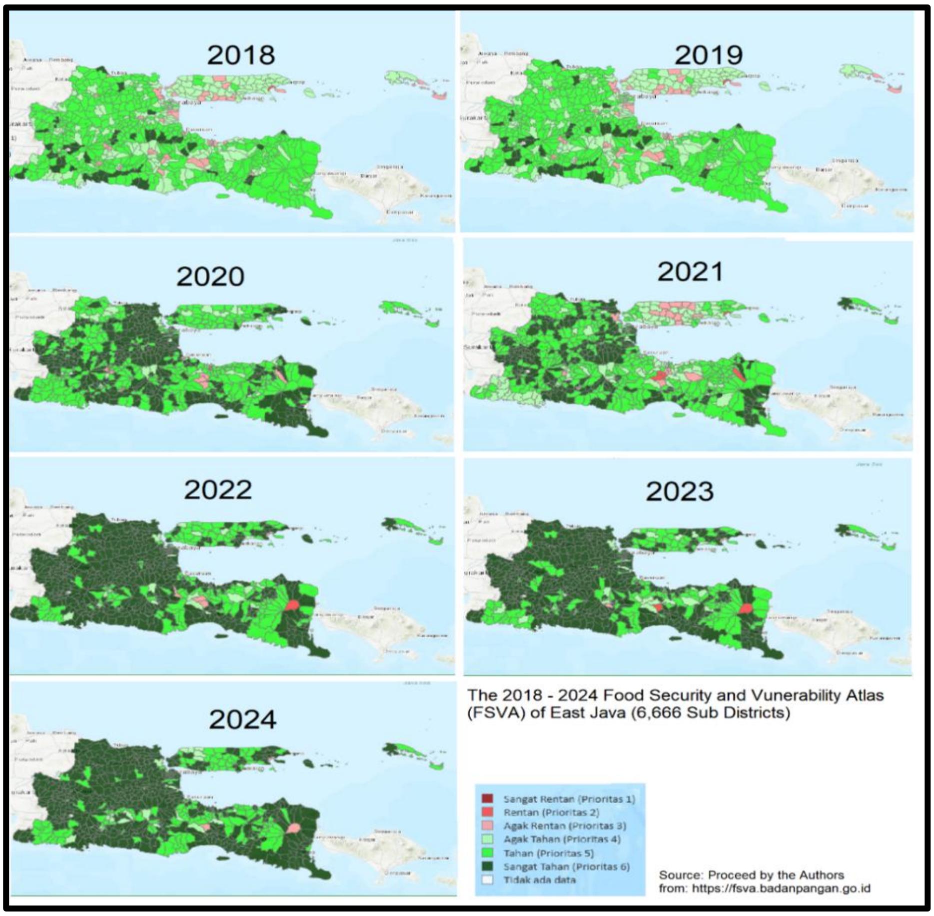

Figure 1. Progress of IKPD at the Sub-District Level in East Java 2018-2024 (Badan Pangan Nasional, 2025)

International literature consistently shows that public investment and infrastructure significantly influence food system performance. Lefe et al. (2024) report that improvements in transportation and electricity infrastructure increase food security in Sub-Saharan Africa, while Mohamed et al. (2024) and Marson (2025) demonstrate that agricultural spending enhances land productivity and export capacity. These studies illustrate the developmental role of fiscal policy, but differences in institutional settings and decentralization frameworks limit direct generalization to the Indonesian context.

Indonesian studies provide complementary evidence. Julia et al. (2015) show that agricultural spending positively affects GRDP and employment, while Zainuddin (2021) and Mukiwihando (2020) find that Special Allocation Funds (DAK) support agricultural performance. Wahyuni et al. (2018) and Daru & Sukadana (2024) emphasize the relevance of infrastructure, particularly roads, for agricultural productivity. Lisna et al. (2013) highlight the importance of fiscal capacity in reducing agricultural poverty. Taken together, these studies underscore the role of fiscal instruments in supporting economic and agricultural outcomes. However, they do not examine how these fiscal tools translate into regional food security indicators such as the IKPD. As a result, empirical evidence on the fiscal–food security linkage at the subnational level remains limited.

Other studies draw attention to external and structural vulnerabilities. Efendi (2023) finds that the pandemic reduced diet quality in rural households; FAO (2021) reports disruptions to global supply chains; Sinaga et al. (2022) highlight adaptive practices such as urban farming; and Tono et al. (2023) and Sutikno & Surjono (2014) document how infrastructure deficits exacerbate food insecurity. These findings collectively affirm that food security is shaped by a combination of fiscal, structural, and external factors. Nonetheless, they also reveal heterogeneity across regions, suggesting that locally tailored strategies are necessary.

Previous studies have provided important insights into the determinants of food security in East Java. Research by Masitoh (2016) and Rochmah (2019) highlights the roles of clean water access, life expectancy, and spatial socioeconomic variability. Other studies—such as Fitri (2022), Farida et al. (2023), and Amanda et al. (2025)—focus on clustering and mapping patterns of food security, while Zamrodah (2020) proposes local strategies using qualitative assessments. Although these studies contribute to understanding social and spatial disparities, they largely emphasize household and demographic factors. Their findings do not explicitly link regional variations in food security to differences in local fiscal capacity or government spending patterns.

Despite these contributions, there remains a clear knowledge gap: the empirical role of local fiscal capacity and capital spending in shaping regional food security outcomes has not been systematically analyzed, particularly in the context of decentralized governance and regional heterogeneity. Existing studies either focus on agricultural outputs or examine food security from social and spatial perspectives without integrating fiscal mechanisms.

This study addresses that gap by analyzing the influence of fiscal capacity and regional capital spending on the Food Security Index (IKPD) across 29 regencies and 9 municipalities in East Java from 2018 to 2024. Guided by Musgrave (1959) public finance framework, the study examines how fiscal instruments contribute to allocation, distribution, and stabilization functions relevant to regional food systems. By incorporating both fiscal and structural variables into a panel data approach, the study aims to provide evidence that can support the formulation of adaptive, context-specific fiscal strategies for food security. The findings are expected to inform the preparation of the 2025–2029 Regional Medium-Term Development Plan (RPJMD) and contribute to the design of more resilient and equitable food security policies in East Java.

2. Methods

This study applies a quantitative panel econometric approach to examine how regional fiscal tools and structural factors relate to the District/City Food Security Index (IKP) in East Java Province from 2018 to 2024. In this study, the term "structural factors" refers to the sub-components of the Regional Food Security Index (IKPD), as conceptualized by the National Food Agency (*Badan Pangan Nasional*). These include indicators representing the three main dimensions of food security: (1) Availability, such as Net Consumption per Capita Ratio; (2) Accessibility, reflected by poverty rate, and household food expenditure ratio; and (3) Utilization, proxied by nutrition- and health-related variables such as access to clean water, stunting prevalence, and life expectancy. Together, these structural factors capture the underlying social, economic, and infrastructural conditions that shape local food security performance over time. To capture both short-term and long-term effects, the analysis is carried out in three main stages.

The first model used is a Two-Way Fixed Effect Panel Regression to estimate the contemporaneous relationship between variables at the level, using the formula:

$$IKP_{it} = \alpha_i + \lambda_t + \beta_1 RKFD_{it} + \beta_2 Eko_{it} + \beta_3 Pnd_{\ it} + \beta_4 Kes_{it} + \beta_5 \text{Rum\_Fas}_{it} + \delta X_{it} + \gamma_1 Covid\_d_t + \gamma_2 Kota\_d_i + \gamma_3 Policy\_d_t + \varepsilon_{it}$$

Where:
IKP_{it} = Food Security Index in the region *i* in year *t*
α_i = Fixed Effect of District/City.
λ_t = Year fixed effects. Controlling for shared shocks across regions in a given year.
$\mathrm{R}KFD_{it}$ = Fiscal Capacity Ratio of Region *i* in year *t*
Eko_{it} = Capital Expenditure on economic affairs in region *i* in year *t*
Pnd_{it} = Capital Expenditure on education in region *i* in year *t*
Kes_{it} = Capital Expenditure on the health sector in region *i* in year *t*
Rum_Fas_{it}= Capital Expenditure on housing in region *i* in year *t*
X_{it} = Composite Control Variables of IKPD (Poverty, Stunting, Life Expectancy, etc.)
$Covid\_d$= Pandemic dummy: 1= pandemic year (2020 & 2021), 0= other years
$Policy\_d$ = National Policy Dummy: 1 = 2023, 0 = other years
$Kota\_d$ = Dummy Region: 1 = City, 0 = Regency
ε_{it} = error term

The purpose of this estimation is to capture the direct influence between variables within the same year. A two-way model is used to control for regional (α_i) and year (λ_t) heterogeneity. To ensure the model meets all classical assumptions, a series of tests was performed, including heteroscedasticity (Modified Wald test), autocorrelation (Wooldridge test), cross-unit correlation (Pesaran's CD test), and stationarity (Levin-Lin-Chu test). To determine whether a fixed effects or random effects model is used, an exogeneity test (Hausman test) was performed.

The second model is a two-way panel regression with a one-year lag. Capital expenditure policies in the Economy, Education, Health, Housing, and Public Facilities sectors are assumed to influence the IKPD in the following year. The formula used is:

$$IKP_{it} = \alpha_i + \lambda_t + \beta_1 RKFD_{it} + \beta_2\_Eko_{it} + \beta_3 L\_Eko_{it} + \beta_4 \text{Kes}_{it} + \beta_5 \text{L\_Kes}_{it} + \beta_6\text{\_Pnd}_{it} + \beta_7 \text{L\_Pnd}_{it} + \beta_8 \text{Rum\_Fas}_{it} + \beta_9 \text{L\_Rum\_Fas}_{it} + \delta X_{it} + \gamma_1 Covid\_d_t + \gamma_2 Kota\_d_i + \gamma_3 Policy\_d_t + \varepsilon_{it}$$

Where the variable description is the same as the first formula, with the addition of a one-year delay effect variable on fiscal instruments.

Next, a simulation of the two-year delay effect of the impact of capital expenditure on IKPD was carried out using the following formula:

$$IKP_{it} = \alpha_i + \lambda_t + \beta_1 RKFD_{it} + \beta_2 Eko_{it} + \beta_3 L\_Eko_{it} + \beta_4 L2\_Eko_{\ it} + \beta_5 Pnd_{it} + \beta_6 L\_Pnd_{it} + \beta_7 L2\_Pnd_{it} + \beta_8 Kes_{it} + \beta_9 L\_Kes_{it} + \beta_{10}\_L2\_Kes_{it} + \beta_{11}\_Rum\_Fas_{it} + \beta_{12}\_L\_Rum\_Fas_{it} + \beta_{13} \text{L2\_Rum\_Fast}_{it} + \delta X_{it} + \gamma_1 Covid\_d_t + \gamma_2 Kota\_d_i + \gamma_3 Policy\_d_t + \varepsilon_{it}$$

This formula adds a two-year lag effect variable to the capital expenditures of the four observed regional government affairs. This formula estimates the average relationship between fiscal variables and the IKPD by controlling for fixed heterogeneity across regions and over time. However, the model assumes that the regression coefficients are homogeneous (fixed) across all regencies/cities, which in the context of cross-regional policymaking can be a significant limitation.

Therefore, this study adds a third model, the Mean Group (Pesaran & Smith, 1995), to accommodate the possibility that the structure of food security determinants differs across regencies/cities. This model provides flexibility by estimating the relationship between variables separately for each regional unit and then calculating the average coefficient across units to represent the entire population.

Heterogeneous panel regression formula for Regency/City = 1,2,3… N, during t= 1,2,, T:

$$IKP_{it} = \alpha_i + \beta_{1i}RKFD_{it} + \beta_{2i}Eco_{it} + \beta_{3i}Pend_{\ it} + \beta_{4i}Kes_{it} + \beta_{5i}\text{Rum\_Fas}_{it} + \delta X_{it} + \gamma_1 Covid\_d_t + \gamma_2 Kota\_d_{di} + \gamma_3 Policy\_d_t + \varepsilon_{it}$$

where:
α_i = District/City specific intercept
β_{ji}= coefficients differ between regions
ε_{it}= random error

Through this approach, the study not only identifies the average effect of fiscal variables on food security but also shows structural differences among regions. This understanding is important for creating policies that better match local conditions rather than using one general approach. The results of these estimations can help form specific fiscal policy recommendations for each regency or city, based on their unique characteristics.

This model assumes that the residuals from one region are not related to those from other regions in the same year. To check this assumption, the study uses Pesaran's Cross-sectional Dependence (CD) Test. If the p-value is less than 0.05, meaning the independence assumption is rejected, the Common Correlated Effects Mean Group (CCEMG) method is applied. This method takes into account common unobserved factors that may influence all regions by including the cross-sectional averages of panel variables for each year in the regression.

$$IKP_{it} = \alpha_i + \beta'_i X_{it} + \emptyset_{1i}\overline{IKP}_t + \emptyset_{2i}\bar{X}_t + \mu_{it}$$

where:
$\overline{IKP}_t$ = average IKPD for all districts/cities in year t
$\bar{X}_t$ = the average of all independent variables in year t
$\emptyset_{1i}$dan $\emptyset_{2i}$ = loading coefficient on unobserved general factors.

The CCEMG model strengthens the methodological integrity of this study by addressing the influence of simultaneous national shocks across regions and increasing the inferential validity of the coefficient estimation results. This model also allows for more accurate estimation of structural heterogeneity between districts/cities.

3. Results and Discussions

3.1 Descriptive Statistics of Food Security in East Java

The data obtained is a panel from 38 districts/cities in East Java Province during the 2018–2024 period. The total observations in the dataset reach 266 data points (annual panel). Table 3 displays the mean, standard deviation, and minimum and maximum values of each variable used in the econometric model.

Table 1. Descriptive Statistics of Dependent and Independent Variables

Variable	Average	Std. Dev	Min	Max
Regional Food Security Index (Point)	74.33	8.91	50.68	90.83
Fiscal Capacity Ratio (point 1 - 5)	2.62	1.04	1	5
Capital Expenditure for Economic Sector (Billion IDR)	57.43	48.29	0	234.3
Capital Expenditure for the health sector (Billion IDR)	35.2	33.74	0	186.49
Capital Expenditure for Education Sector (Billion IDR)	30.17	30.65	0	154.42
Capital Expenditure for Housing (Billion IDR)	27.98	31.02	0	189.84
Poverty Ratio (%)	11.23	3.28	4.21	21.34
Child Stunting Rate (%)	24.91	7.34	8.12	42.58
household with food expenditure >65% of Total (%)	24.17	7.06	7.21	39.91
household without electricity (%)	2.29	2.42	0	12.42
household without Clean Water Access (%)	7.34	6.35	0	27.39
Life Expectancy (years)	72.78	1.87	67.1	76.5
Female Education (year)	7.89	1.23	5.4	10.2
Ratio of the percentage of health workers to population density	0.35	0.15	0.11	0.82
Net Consumption per Capita Ratio (NCPR)	1.12	0.21	0.71	1.78
Pandemic Dummy Variable (2020–2021 = 1)	0.29	0.45	0	1
Urban Status Dummy Variable (City = 1)	0.34	0.47	0	1

Variable	Average	Std. Dev	Min	Max
National Policy Dummy Variable (2023=1)	0.14	0.35	0	1

Source: Data Processing, 2025

The average value of the Regional Food Security Index (IKPD) was 74.33, with a standard deviation of 8.91. This shows that food security levels vary quite a lot among regions. Some areas had IKPD scores below 55, showing high food vulnerability, while others reached above 90, which reflects a very strong food security condition.

The average Regional Fiscal Capacity Ratio (RKFD) was 2.62, meaning most regions are in the "low to moderate" fiscal capacity group. Among the expenditure sectors, the economic sector received the highest average allocation (IDR 57.43 billion), followed by health, education, and housing.

Control variables such as stunting (24.91%), poverty rate (11.23%), and life expectancy (72.78 years) also indicate wide differences in social and economic conditions across regions. Around 29% of the observations represent areas affected by the pandemic (dummy = 1), and 34% come from urban regions. The national policy dummy for 2023 made up about 14% of the data, marking a year of strong fiscal intervention by the central government.

Overall, the descriptive statistics indicate substantial disparities in food security across East Java, reflecting uneven fiscal capacity and structural conditions among regions. The wide IKPD range—from highly vulnerable areas below 55 to well-performing areas above 90—shows that local governments operate under markedly different development constraints. The generally low-to-moderate fiscal capacity (average RKFD 2.62) suggests that many regions may struggle to finance essential services that support food security. Variations in stunting, poverty, and access to basic services further demonstrate that structural vulnerabilities are not uniformly distributed.

To give a clearer picture of the data, visualizations and preliminary statistical analyses were carried out. These helped to see how the IKPD changed across regions and over time, as well as to explore the initial relationship between IKPD and fiscal variables.

The distribution of district and municipal IKPD values is presented in the scatter plot in Figure 2. The average IKPD for districts was 80.41 with a standard deviation of 5.13, while that for municipalities was 78.47 with a standard deviation of 7.48. The mean difference of 1.94 is further illustrated by the boxplot in Figure 2.

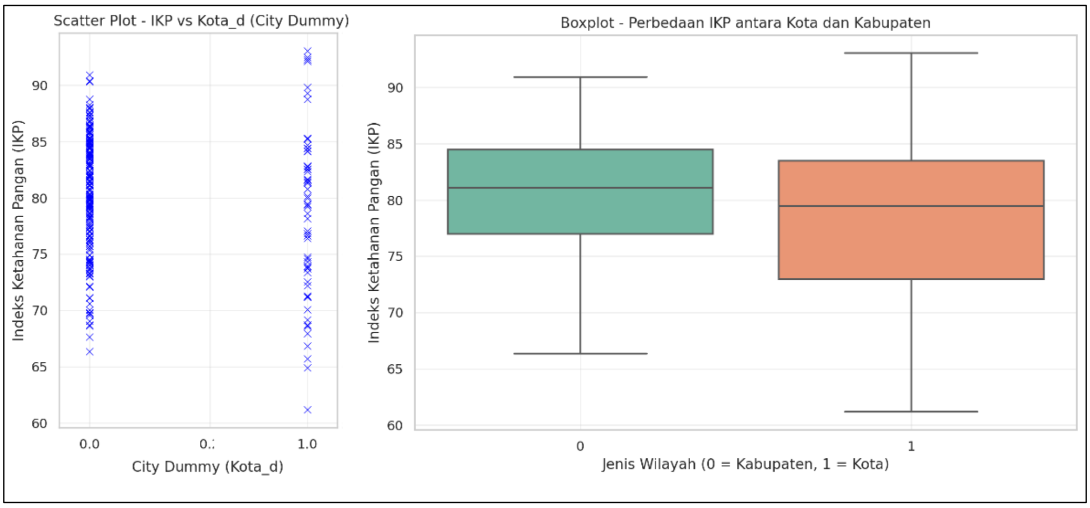

Figure 2. Scatter Plot and Boxplot of IKPD in Regencies and Cities in East Java 2018-2024 (Data Processing by the authors)

Based on the results of a two-sample t-test assuming unequal variances (Welch's t-test), the analysis yielded a p-value of 0.0582. This indicates that the difference is not statistically significant at the conventional 5% significance level (α = 0.05), although it approaches the threshold of significance. Therefore, it can be concluded that there is insufficient evidence to assert a statistically significant difference in the mean IKPD between municipalities and districts, despite indications that districts tend to have slightly higher IKPD values than municipalities.

The statistically insignificant difference between districts and municipalities implies that administrative status does not inherently determine food security outcomes; instead, local structural factors and fiscal capacity appear more influential. These patterns highlight the need for differentiated policy approaches tailored to each region's specific constraints and capabilities.

Furthermore, the distribution of IKPD during the pandemic and non-pandemic periods is illustrated in the scatter plot presented in Figure 3. The boxplot shows that the average IKPD in the non-pandemic period was 80.02, while during the pandemic it was 79.80, indicating only a marginal difference of 0.21 points.

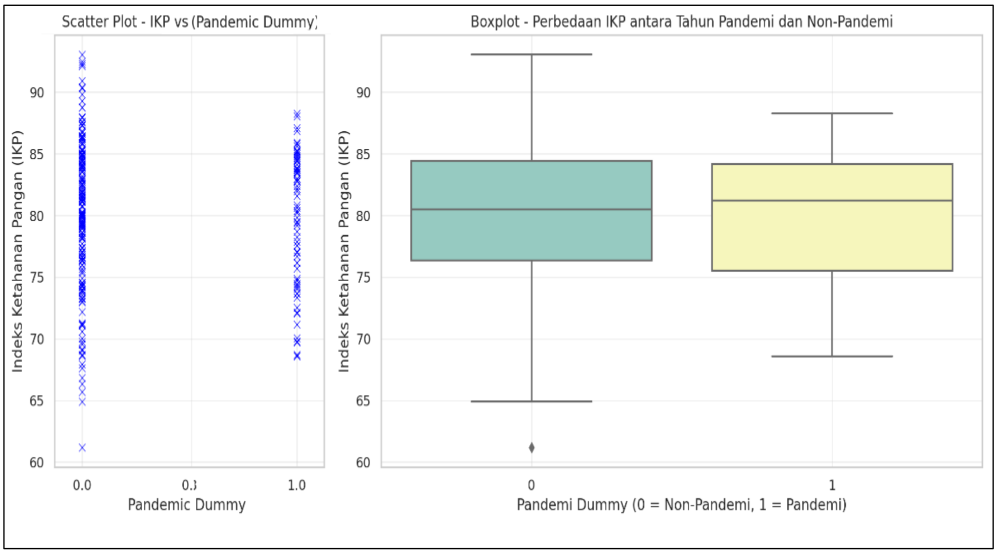

Figure 3. Scatter Plot and Boxplot of IKPD during the Pandemic and Non-Pandemic Periods in East Java -2024
(Data Processing by the authors)

The p-values obtained from the t-tests with and without the assumption of equal variances were 0.7882 and 0.7784, respectively, both well above the conventional 0.05 significance threshold. Therefore, it can be concluded that the COVID-19 pandemic did not exert a statistically significant effect on the IKPD values within the analyzed dataset.

The statistical results indicate that the pandemic did not produce a measurable shift in regional food security. The minimal difference in mean IKPD and the high p-values suggest that pandemic-related shocks were either effectively mitigated or did not substantially affect the indicators captured by IKPD. This implies that pre-existing structural and fiscal conditions remained the dominant determinants of food security, even during the COVID-19 period.

The Pearson correlation heatmap (Figure 4) shows how the variables in this study are related to each other. It visually presents the linear relationships between the Regional Food Security Index (IKPD), capital expenditures in the economic, health, education, and housing sectors, and social indicators such as poverty rate, stunting prevalence, life expectancy, and the NCPR.

In Figure 4, the color scale shows both the strength and direction of each relationship. Blue indicates a positive correlation, while red shows a negative one. The darker the color—either dark blue or dark red—the stronger the relationship, meaning correlation values are closer to +1 or −1. In contrast, lighter or white colors represent weak or almost no correlation between the variables.

The correlation patterns show that structural service variables—such as women's education, health personnel density, stunting, and clean water access—have much stronger links to food security than sectoral capital spending. This suggests that improving human capital and basic service delivery should be prioritized over increasing broad, non-targeted expenditures. Weak correlations between IKPD and economic, education, and housing capital spending further indicate that fiscal allocations must be more precisely directed toward interventions that address nutrition, health access, and household vulnerability to generate meaningful improvements in food security.

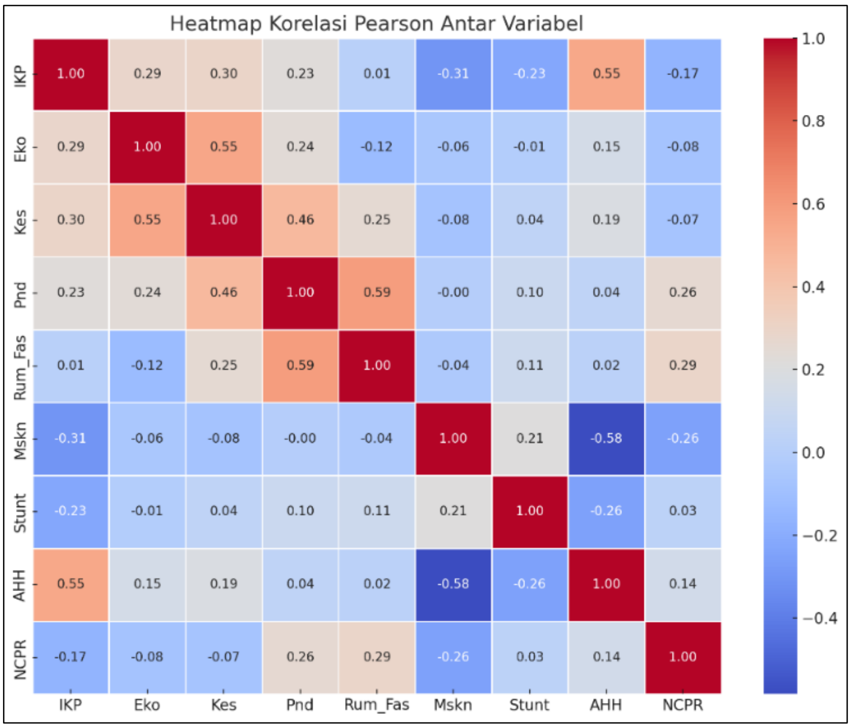

Figure 4. Pearson Correlation Heatmap Between Variables (Data Processing by the authors)

3.2 Results of Classical Assumption Tests for Panel Data

The analysis of panel data for 38 districts and cities in East Java from 2018 to 2024 began with testing the stationarity of variables using the Levin-Lin-Chu (LLC) test. The results showed that all variables were stationary except for the ratio of healthcare personnel to population density (Nakes). Therefore, a logarithmic transformation was applied, and the variable was included as Ln_Nakes.

Next, a Hausman test was performed to determine whether the unobserved regional effects were correlated with the independent variable (IKPD). The test results rejected H_0, meaning that such a correlation existed, and thus a two-way fixed effects panel regression model was considered the most suitable approach.

The Modified Wald test was then used to check for heteroskedasticity within the fixed effects model. The results—$Chi^2(38) = 665.89$, Prob > $chi^2 = 0.0000$—indicated the presence of heteroskedasticity among regional groups. The panel autocorrelation test also showed a significant lagged residual coefficient (*uhat_lag* = 0.9519), suggesting first-order autocorrelation in the residuals.

To handle these issues, the study applied a fixed effects model with cluster-robust standard errors. Therefore, the final model used was a two-way fixed effects panel regression with cluster-robust standard errors.

Considering that fiscal investment policies may take time to affect Regional Food Security (IKPD), three model scenarios were tested: (1) a regression without lag, (2) a regression with a one-year lag, and (3) a regression with a two-year lag.

The diagnostic tests indicate that regional differences and temporal patterns strongly influence food security outcomes, making the fixed effects model with cluster-robust standard errors the most reliable specification. These results also show that fiscal interventions may take time to materialize, so policymakers should account for delayed impacts when designing and evaluating regional food security programs.

3.3 Overview of Model Simulations

This study analyzes how fiscal spending affects the Food Security Index (IKPD) in 38 districts and cities in East Java, using a panel data approach with fixed effects across three econometric model specifications. A summary of these models is shown in Table 4.

Table 4. Overview of Econometric Models

Aspect	Model 1: No Lag	Model 2: 1-year lag	Model 3: 2-year lags
Observation	266	228	190
R-square (within)	**0.8481**	0.8337	0.8098
R-square (overall)	0.5056	**0.5795**	0.5579
Model Fit	Very Good	Very Good	Good
Lag variables	Non	Lag 1	Lag 1 & 2

Source: Data processing by the authors

As seen in Table 4, Model 1 is the simplest version without lagged variables and has the highest within R-squared value (0.8481). This means that changes in IKPD within regions over time are well explained by the independent variables in this model. Because of its simple structure and strong predictive ability, Model 1 is recommended when efficiency and low risk of overfitting are priorities.

Model 2 adds a one-year lag for the main fiscal expenditure variables. Although its within R-squared value is slightly lower, it helps capture short-term time effects, which is useful when analyzing fiscal policies that take more than one year to show results.

Model 3 includes a two-year lag and is the most complex of the three. However, since the dataset has only 190 observations and many explanatory variables, Model 3 may risk overfitting. Therefore, its results should be interpreted carefully, especially for policymaking.

3.4 Econometric Simulation Results

The detailed regression results for Model 1, Model 2, and Model 3 are presented in Appendix 1, Appendix 2, and Appendix 3, while Table 5 provides a summary of all three model simulations

Table 5. Summary of Panel Regression Simulation Results

Variable	Model 1: No Lag	Model 2: 1-year lag	Model 3: 2-year lags
Jumlah Observasi	266	228	190
Within R^2	**0.8481**	0.8337	0.8098
Overall R^2	0.5056	**0.5795**	0.5579
RKFD	0.781***	0.785***	0.744***
Eko (t)	–0.00066	–0.00054	0.00034
Eko (t–1)	—	0.00058	0.00105
Eko (t–2)	—	—	–0.00169*
Pnd (t)	0.00319	–0.00252	–0.00386
Pnd (t–1)	—	0.00397	0.00598
Pnd (t–2)	—	—	0.00399
Kes (t)	+0.00712**	+0.00757**	+0.01138**
Kes (t–1)	—	+0.00412**	0.00312
Kes (t–2)	—	—	0.00096
ln_Nakes	+0.773***	+0.793***	+0.755***
Peng_P	–0.108***	–0.129***	–0.133***
Tnp_Air	–0.193***	–0.161***	–0.165***
LSP	+0.493***	+0.516***	+0.578***
Policy_d	1.173	1.447	–1.952**
Stunting	–0.037***	–0.023**	–0.019*
AHH	-0.439	0.450	0.892
Mskn	-0.22	0.297	0.545
NCPR	-0.005	-0.043	-0.051
Covid_d	-1,303	-0.450	-2.170
Kota_d	Omitted[1]		

Note: *significant at 0.1; **significant at 0.05; ***significant at 0.001; Source: Data processing by the authors

Based on Table 5, the Regional Fiscal Capacity Ratio (RKFD) appears as a strong and consistent factor in improving the Food Security Index (IKPD). In addition, capital spending in the health sector shows a positive and lasting effect that continues for up to one year.

However, capital expenditures in the economic, education, housing, and public facilities sectors do not show statistically significant impacts. This result indicates that policy adjustments may be needed in those areas.

Among the control variables, two factors that significantly increase IKPD are the ratio of healthcare personnel (ln_Nakes) and the average years of schooling for women aged 15 and above (LSP). On the other hand, factors that reduce IKPD include limited access to clean water (Tnp_Air), a high percentage of household spending on food (over 65%) (Peng_P), and the prevalence of stunting (Stunt) among children under five.

Meanwhile, variables such as the poverty rate (Mskn), life expectancy (AHH), the ratio of normative per capita consumption to net production (NCPR), and pandemic conditions (Covid_d) do not show significant effects on regional food security. The regional classification variable (Kota_d), which differentiates municipalities from districts, was also excluded from the model due to multicollinearity issues.

The results show that only fiscal capacity and health-sector capital spending consistently improve food security, indicating that stronger budgets and health investments are the most effective levers for raising IKPD. Structural service variables—such as healthcare personnel, women's education, clean water access, stunting, and household food burden—play a far larger role than other forms of capital spending, suggesting that policy efforts should prioritize human capital and basic services rather than broad, non-targeted expenditures.

3.5 Discussion of Internal Variables

In the fixed effects (FE) panel regression model (Table 5), some key internal variables—such as the poverty rate (Mskn), life expectancy (AHH), and the city status dummy (Kota_d)—were not statistically significant in explaining IKPD. However, this does not mean that these variables are unimportant. Rather, it may be due to the technical nature of the FE model, which controls for time-invariant factors and focuses on changes within each region over time.

The FE model captures variations within regions over time and explicitly controls for all time-invariant factors within each observation unit. Consequently, if a variable such as *Kota_d* does not change over the study period (for instance, when an area consistently remains classified as either a municipality or a district), it becomes absorbed by the fixed effects and is automatically omitted from the estimation due to perfect collinearity.

As a triangulation measure, the random effects (RE) model was employed to explore potential between-region effects. Under the RE specification, these three variables exhibit statistically significant influences, as summarized in **Table 6**.

Table 6. Comparison of Fixed Effects and Random Effects Panel Regression

Variable	Model	Coefficient	Std. Error	p-value	Significance	Technical Description
Mskn	Fixed Effects	–0.0215	0.2052	0.917	✗ No	Interannual variations are small;
	Random Effects	–0.2016	0.1028	0.05	☑ Yes	Inter-regional effects detected
AHH	Fixed Effects	–0.4392	1.2104	0.719	✗ No	Dominant inter-regional variation
	Random Effects	1.0999	0.2122	0	☑ Yes	theoretically and empirically strong
Kota_*d*	Fixed Effects	Omitted	-	-	✗ No	omitted because it is time-invariant
	Random Effects	–8.3326	1.6534	0	☑ Yes	The urban area effect is significantly negative

Source: Data processing by the authors

Table 6 indicates that, according to the random-effects regression, the poverty rate (Mskn) has a negative, statistically significant effect on IKPD at the 10% level (p = 0.050). This implies that districts or municipalities with higher poverty levels tend to have lower IKPD scores. Life expectancy (AHH) exerts a positive and highly significant effect on IKPD (p < 0.001), consistent with the conceptual framework of food security. The city status dummy (Kota_d) shows a significant negative coefficient (p < 0.001), suggesting that municipalities tend to have, on average, 8.33 points lower IKPD than districts.

Although the random effects (RE) model is not the main choice—since the Hausman test shows endogeneity and supports using the fixed effects (FE) model—the RE results still offer useful insights. They help explain differences between regions that the FE model cannot capture and highlight the important roles of poverty, urban status, and life expectancy in influencing food security outcomes.

3.6 Discussion of External Variables

In the fixed effects (FE) model, the pandemic dummy variable was not statistically significant (p = 0.187) in explaining changes in IKPD. This may be because of the strong correlation between the pandemic dummy and the-2021-year dummy, which serves as the baseline year. Since 2021 was the peak of the COVID-19 pandemic in Indonesia, its effect was likely captured by the year dummy, making it difficult to separate the specific impact of the pandemic within the FE model.

In contrast, under the random effects (RE) model—which does not remove time-invariant variables in the same way—the *Covid_d* dummy has a negative and statistically significant effect on IKPD. The RE model with a two-year lag shows that, on average, IKPD during the pandemic period was 2.22 points lower than in non-pandemic years (p = 0.000). However, this model does not meet the classical panel regression assumptions based on the Hausman test.

The FE model also shows that the *Policy_d* variable, representing the 2023 national policy intervention, has a negative and statistically significant coefficient. This suggests that IKPD performance declined in 2023, the year when expenditure-tagging policies were introduced to strengthen the education and health sectors.

One possible explanation is that the shift to a new budgeting system created short-term administrative challenges. The adjustment process to the tagging policy may have caused temporary delays or changes in program priorities. In the RE model, however, *Policy_d* is not statistically significant, meaning that across regions, there is no strong evidence of a consistent policy impact on average IKPD levels.

The difference between the FE and RE results reflects the models' distinct focuses: the FE model captures changes within each region over time, while the RE model looks at variations between regions. Therefore, the negative and significant result in the FE model likely represents a short-term local adjustment effect rather than evidence of overall policy failure. This finding highlights the need to monitor field-level implementation closely to ensure that fiscal policies deliver their intended results effectively.

3.7 Mean Group Estimation Results

The two-way panel regression produced overall coefficients to estimate how the predictor variables affect changes in the Regional Food Security Index (IKPD). However, these effects can differ slightly from one region to another. To capture this variation, the study used the Mean Group (MG) estimator developed by Pesaran and Smith (1995). The complete MG estimation results are provided in Appendix 5 and Appendix 6.

Based on Pesaran's Cross-sectional Dependence (CD) Test, the p-values were greater than 0.05, meaning there is no cross-sectional dependence among regions. This confirms that the MG model is valid, and using the Common Effects Mean Group (CEMG) model is unnecessary. Table 7 presents selected MG results that highlight key implications for different districts and municipalities.

Table 7. MG Model Estimation Results Snippet

No Id	District/City	Kes	L_Kes	ln_Nakes	Tnp_Air	LSP	Policy_d	Covid_d
	Mean Group*	0.005	0.04	0.079	-0.202	0.112	0.002	-0.253
0	Panel Regression	0.011	0.003	0.755	-0.165	0.578	-1.952	-2.170
3	Trenggalek	-0.027	-0.012	0.755	-0.435	0.578	-1.952	-2.170
13	Probolinggo	0.023	0.226	2.349	-0.165	0.670	-1.952	-2.170
26	Bangkalan	-0.033	-0.003	0.755	-0.367	0.578	-1.952	-1.274
35	Kota Mojokerto	0.117	-0.459	0.755	0.603	0.578	-1.952	-1.335
37	Kota Surabaya	-0.001	0.022	1.440	-0.570	0.578	-1.952	-2.170

Source: Data processing by the authors

Table 7 shows that, on average across East Java, an additional one billion rupiahs of capital spending in the health sector during year *t* increases the Regional Food Security Index (IKPD) by 0.011 points in the same year and by 0.003 points in the following year (*t+1*). The strongest positive effect, however, is seen in Probolinggo District, where health investment raises IKPD by 0.023 points in year *t* and by 0.226 points in year *t+1*.

In contrast, the opposite pattern occurs in Trenggalek and Bangkalan Districts, where higher health-related capital expenditure corresponds to declines in IKPD over both current and subsequent years—showing an upward trend in Probolinggo but a downward one in Trenggalek. In Surabaya City, health spending reduces IKPD in year *t* but increases it in year *t+1*, whereas the inverse is observed in Mojokerto City.

Table 7 also indicates that a 10% increase in the density of healthcare personnel per square kilometer is associated with a 0.075-point increase in IKPD on average, although the effect is notably higher in Probolinggo District (0.234 points) and Surabaya City (0.14 points). Another important implication is that an additional year in the average schooling duration of women aged 15 years and above raises IKPD by 0.578 points on average, and by as much as 0.67 points in Probolinggo.

The results of this model can be used as a reference for policy development. Local governments in East Java can apply these findings when preparing their food security strategies for the 2025–2029 Regional Medium-Term Development Plan (RPJMD).

3.8 Discussion of Policy Implications

The findings show that food security in East Java between 2018 and 2024 was strongly influenced by regional fiscal capacity and investment in the health sector. Government capital spending on health had a positive and statistically significant effect on the Regional Food Security Index (IKPD), both in the same year and with a one-year lag.

The availability of healthcare personnel—measured by the ratio of health workers to population density—also shows a strong relationship with food security. This highlights how important it is to strengthen health infrastructure and improve the quality of basic health services as key elements of local food security.

Another important finding is that capital spending in the economic, education, housing, and public facilities sectors did not show significant effects on IKPD. This suggests that spending in these areas may not yet be well-targeted toward programs that directly support food security. One possible explanation is that local governments have not clearly separated food-related spending from other economic activities. As a result, investment in these sectors might be too broad, weakening its impact on food security outcomes.

Even so, the study offers several useful policy directions. In the economic sector, public investments that help increase household income are essential to reduce food vulnerability. Households that spend more than 65% of their income on food are especially at risk, and reducing this group can significantly improve IKPD.

In education, promoting access for women plays an important role in household food security. The study found that women's average years of schooling (aged 15 and above) have a positive and significant effect on IKPD, likely because education helps improve household management and food decision-making.

For housing and public facilities, investment in basic infrastructure—especially clean water access—is crucial. Areas with many households lacking clean water consistently have lower IKPD levels, showing that improving water access is key to strengthening food security.

From a fiscal point of view, the Regional Fiscal Capacity Ratio (RKFD) is one of the most consistent predictors of better IKPD performance. Regions with stronger fiscal capacity can fund essential services more effectively and respond faster to shocks. Therefore, increasing local revenue and optimizing central government transfers are important strategies for building sustainable food security.

The study also emphasizes the need to understand spatial and temporal dynamics. Although average IKPD levels between cities and districts are not significantly different, the Random Effects model shows that urban areas tend to have lower IKPD. This may be because cities rely heavily on external food supply chains and have limited agricultural land.

The COVID-19 pandemic did not show a significant effect in the main Fixed Effects model, though it was significant in the Random Effects model. This suggests that the pandemic's impact was more of a general shock across regions, rather than a difference within individual regions over time. These results underline the importance of building food systems that can withstand large-scale disruptions such as pandemics.

Interestingly, the 2023 national fiscal policy—especially the expenditure-tagging mechanism for education and health sectors—was linked to a decline in IKPD in the FE model. This might be due to short-term administrative adjustments or transitions that temporarily reduced program efficiency. Future evaluations will be needed to measure the long-term impact of this policy.

The Mean Group analysis shows that regional responses to fiscal policies differ. For example, Probolinggo experienced a strong positive impact from health spending, while Bangkalan saw a decline in IKPD. This indicates that fiscal policies must be tailored to each region's unique characteristics rather than applying one uniform approach.

Overall, these findings highlight the importance of designing evidence-based regional fiscal policies that consider both structural and regional differences. Strengthening household income, improving health systems, supporting women's education, expanding clean water access, and increasing fiscal capacity are key strategies for achieving sustainable and resilient food security in East Java.

Conclusion

This study shows that regional food security in East Java was shaped by two fiscal determinants: regional fiscal capacity and capital spending in the health sector. Stronger fiscal capacity consistently improved IKPD, indicating that regions with wider fiscal space were better able to maintain essential services and respond to shocks. Health-sector capital expenditure also produced positive and lasting effects, underscoring the central role of health infrastructure and the availability of health personnel in supporting food resilience.

More specifically, spending in the economic, education, and housing sectors did not generate consistent improvements in food security, suggesting that these budgets were either insufficiently targeted or not directly connected to food-relevant outcomes. Structural factors such as women's education, clean water access, and health-worker density were also key predictors of performance. The varied regional responses identified through the Mean Group estimation highlight that local characteristics significantly shaped policy impact.

The main lesson from this study is that fiscal strategy in improving food security requires not only expanding fiscal capacity but also sharpening expenditure priorities. Local governments need to direct health-related investments more strategically, strengthen basic services such as clean water access, and ensure that broader sectoral spending is linked to programs with clear and measurable relevance to food resilience.

Limitations

This study has some limitations because it depends on secondary panel data from 2018 to 2024, which might have some measurement inconsistencies between regions and years. The econometric models used in this research assume linear and uniform relationships, but in reality, the fiscal and structural factors that affect food security are more complex and dynamic. Although the Mean Group estimator helps to deal with some regional differences, other factors, such as variations in policy implementation, data reliability, and local conditions that are not directly observed, could still affect the results. Moreover, the relatively short time period of observation and the lack of qualitative information make it difficult to generalize the findings beyond East Java or to other periods.

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Apendix-1: Panel Regression Estimation Fixed Effect Robust Standard Error Model 1 (without lag)

```
note: Kota_d omitted because of collinearity.
note: 2021.Tahun omitted because of collinearity.
note: 2023.Tahun omitted because of collinearity.

Fixed-effects (within) regression               Number of obs     =        266
Group variable: wilayah_id                      Number of groups  =         38

R-squared:                                      Obs per group:
     Within  = 0.8481                                         min =          7
     Between = 0.3804                                         avg =        7.0
     Overall = 0.5056                                         max =          7

                                                F(20,37)          =     124.31
corr(u_i, Xb) = -0.0590                         Prob > F          =     0.0000

                             (Std. err. adjusted for 38 clusters in wilayah_id)
```

IKP	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
RKFD	.7813912	.2477203	3.15	0.003	.2794623	1.28332
Eko	-.0006629	.0005099	-1.30	0.202	-.001696	.0003702
Pnd	.0031923	.0037651	0.85	0.402	-.0044365	.010821
Kes	.0071202	.0034865	2.04	0.048	.0000558	.0141846
Rum_Fas	.0004768	.0011713	0.41	0.686	-.0018964	.00285
NCPR	-.0047658	.0200263	-0.24	0.813	-.0453429	.0358113
Mskn	-.021502	.2052209	-0.10	0.917	-.4373191	.3943151
Peng_P	-.1080217	.0212059	-5.09	0.000	-.1509889	-.0650546
Tnp_Ls	.5404484	.6922257	0.78	0.440	-.862134	1.943031
Tnp_Air	-.1931892	.0218232	-8.85	0.000	-.2374072	-.1489712
LSP	.4933084	.1650247	2.99	0.005	.1589365	.8276803
ln_Nakes	.7730745	.13188	5.86	0.000	.5058603	1.040289
AHH	-.4392479	1.210367	-0.36	0.719	-2.891684	2.013188
Stunt	-.0369797	.011587	-3.19	0.003	-.0604571	-.0135023
Covid_d	-1.302876	.9687359	-1.34	0.187	-3.265722	.6599691
Kota_d	0	(omitted)				
Policy_d	1.172634	1.263041	0.93	0.359	-1.38653	3.731798
Tahun						
2019	-.8820084	.5355268	-1.65	0.108	-1.967089	.2030721
2020	1.167818	.363011	3.22	0.003	.4322877	1.903348
2021	0	(omitted)				
2022	.6265419	.8654973	0.72	0.474	-1.127122	2.380206
2023	0	(omitted)				
2024	3.294699	1.593402	2.07	0.046	.0661593	6.523239
_cons	113.3952	86.96802	1.30	0.200	-62.81876	289.6091
sigma_u	3.9694278					
sigma_e	1.3295204					
rho	.89913112	(fraction of variance due to u_i)				

Apendix-2: Fixed Effect Robust Standard Error Panel Regression Estimation Model 2 (one-year lag)

```
note: Kota_d omitted because of collinearity.
note: 2021.Tahun omitted because of collinearity.
note: 2023.Tahun omitted because of collinearity.

Fixed-effects (within) regression               Number of obs     =        228
Group variable: wilayah_id                      Number of groups  =         38

R-squared:                                      Obs per group:
     Within  = 0.8337                                         min =          6
     Between = 0.5119                                         avg =        6.0
     Overall = 0.5795                                         max =          6

                                                F(23,37)          =     141.37
corr(u_i, Xb) = -0.0670                         Prob > F          =     0.0000

                             (Std. err. adjusted for 38 clusters in wilayah_id)
```

IKP	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
RKFD	.7850408	.2372035	3.31	0.002	.3044209	1.265661
Eko	-.0005389	.0006557	-0.82	0.416	-.0018674	.0007896
L_Eko	.0005763	.0011411	0.51	0.617	-.0017358	.0028885
Pnd	-.0025165	.0040233	-0.63	0.536	-.0106685	.0056356
L_Pnd	.0039722	.0035734	1.11	0.273	-.0032682	.0112127
Kes	.0075703	.0034072	2.22	0.032	.0006667	.0144739
L_Kes	.0041169	.0017428	2.36	0.024	.0005857	.0076481
Rum_Fas	.0011294	.0014354	0.79	0.436	-.001779	.0040378
L_Rum_Fas	.0011132	.0009628	1.16	0.255	-.0008376	.003064
NCPR	-.0428201	.0267507	-1.60	0.118	-.0970222	.011382
Mskn	.2970413	.3007265	0.99	0.330	-.3122884	.906371
Peng_P	-.1290866	.0266467	-4.84	0.000	-.1830779	-.0750954
Tnp_Ls	.0443155	.6904895	0.06	0.949	-1.354749	1.44338
Tnp_Air	-.1614497	.0192751	-8.38	0.000	-.2005047	-.1223947
LSP	.515527	.1530022	3.37	0.002	.2055152	.8255389
ln_Nakes	.7929218	.1294994	6.12	0.000	.5305311	1.055312
AHH	.4504736	1.445485	0.31	0.757	-2.478358	3.379305
Stunt	-.0232739	.0092818	-2.51	0.017	-.0420807	-.004467
Covid_d	-.4504892	.7760257	-0.58	0.565	-2.022867	1.121888
Kota_d	0	(omitted)				
Policy_d	1.447117	1.120257	1.29	0.204	-.8227388	3.716972
Tahun						
2020	1.284443	.5025805	2.56	0.015	.2661181	2.302768
2021	0	(omitted)				
2022	1.095129	.7208566	1.52	0.137	-.3654651	2.555724
2023	0	(omitted)				
2024	3.352559	1.649694	2.03	0.049	.0099616	6.695157
_cons	44.57633	103.862	0.43	0.670	-165.868	255.0207
sigma_u	3.4295368					
sigma_e	1.1938464					
rho	.89191855	(fraction of variance due to u_i)				

Apendix-3: Fixed Effect Robust Standard Error Panel Regression Estimation Model 3 (two-year lags)

```
note: Kota_d omitted because of collinearity.
note: 2023.Tahun omitted because of collinearity.
note: 2024.Tahun omitted because of collinearity.

Fixed-effects (within) regression               Number of obs     =        190
Group variable: wilayah_id                      Number of groups  =         38

R-squared:                                      Obs per group:
     Within  = 0.8098                                         min =          5
     Between = 0.5055                                         avg =        5.0
     Overall = 0.5579                                         max =          5

                                                F(26,37)          =      61.10
corr(u_i, Xb) = -0.2399                         Prob > F          =     0.0000

                             (Std. err. adjusted for 38 clusters in wilayah_id)
```

IKP	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
RKFD	.7436622	.2304319	3.23	0.003	.2767628	1.210562
Eko	.0003411	.0010068	0.34	0.737	-.0016989	.002381
L_Eko	.0010491	.0011673	0.90	0.375	-.0013161	.0034143
L2_Eko	-.0016896	.0007934	-2.13	0.040	-.0032971	-.0000821
Pnd	-.0038577	.0055171	-0.70	0.489	-.0150364	.0073211
L_Pnd	.0059793	.0064518	0.93	0.360	-.0070933	.0190518
L2_Pnd	.0039866	.0044774	0.89	0.379	-.0050855	.0130588
Kes	.0113809	.004366	2.61	0.013	.0025346	.0202272
L_Kes	.0031201	.0020573	1.52	0.138	-.0010484	.0072886
L2_Kes	.0009552	.0026222	0.36	0.718	-.0043578	.0062682
Rum_Fas	.0013213	.0017074	0.77	0.444	-.0021382	.0047808
L_Rum_Fas	.0018694	.0015708	1.19	0.242	-.0013133	.005052
L2_Rum_Fas	-.0003768	.0011762	-0.32	0.751	-.00276	.0020064
NCPR	-.0507867	.0473602	-1.07	0.291	-.1467476	.0451743
Mskn	.5454573	.4072408	1.34	0.189	-.279691	1.370606
Peng_P	-.1331001	.0266683	-4.99	0.000	-.1871352	-.0790649
Tnp_Ls	-.226009	.8210996	-0.28	0.785	-1.889715	1.437697
Tnp_Air	-.16484	.0223721	-7.37	0.000	-.2101701	-.1195098
LSP	.5776525	.1753132	3.29	0.002	.2224343	.9328707
ln_Nakes	.7545028	.1276474	5.91	0.000	.4958646	1.013141
AHH	.8922196	1.805721	0.49	0.624	-2.766519	4.550958
Stunt	-.0192222	.0107475	-1.79	0.082	-.0409986	.0025543
Covid_d	-2.169587	1.596384	-1.36	0.182	-5.404168	1.064993
Kota_d	0	(omitted)				
Policy_d	-1.951996	.7588919	-2.57	0.014	-3.489657	-.4143348
Tahun						
2021	-1.575934	.5692044	-2.77	0.009	-2.729252	-.4226161
2022	-2.50359	1.246879	-2.01	0.052	-5.030008	.0228277
2023	0	(omitted)				
2024	0	(omitted)				
_cons	12.59553	132.0001	0.10	0.924	-254.8621	280.0532
sigma_u	3.5299396					
sigma_e	1.2427955					
rho	.88971517	(fraction of variance due to u_i)				

Apendix-4: MEAN MODEAL ESTIMATION RESULTS

HASIL ESTIMASI MEAN MODEL

wilayah_id	RKFD	Kes	L_Kes	Peng_P	Tnp_Air	LSP	ln_Nakes	Policy_d	Covid_d
1	0	0.023407	0.059688	-0.21525	-0.23158	0	0.950517	0	0
2	0	0.022032	-0.00675	-0.14391	-0.32291	0	0	0	-0.43233
3	1.071895	-0.03856	-0.01474	0.148627	-0.27039	0	0	0	0
4	0	0.011087	0.000325	-0.1796	-0.22307	0	0.087336	0	0
5	0	-0.06441	-0.09161	-0.13402	-0.29034	0	0	0	1.313369
6	0	0.052412	0.000376	0.005069	-0.7657	1.859146	0	0	0
7	0	-0.02116	-0.01374	-0.12145	0.097271	0	0	0	-1.60142
8	0	-0.04634	-0.10251	-0.26115	-0.58943	0	1.001668	0	0
9	0	0.016325	0.024324	-0.31037	0.103874	0	0	0	0.537602
10	0	-0.59638	-0.29712	-0.04505	0.052461	0	0.033447	0	0
11	0	-0.20764	0.279715	-0.70434	-0.35912	-0.00022	0	0	0
12	0	0.082397	0.04668	-0.54125	-0.31067	0	0	0	-0.75644
13	0	0.011643	0.222453	-0.77864	0	0.092025	1.594097	0	0
14	0	-0.07707	1.463882	0	-0.79245	0	0.900848	0	-12.2232
15	0	-0.12648	0.175345	-0.88621	-0.43535	0	0.754246	0	0
16	0	0.524594	0.219114	-0.69081	0.7878	0	0	0	1.229625
17	0	0.050044	0.0743	-0.79744	-0.54319	0	-0.07143	0	0
18	0	0.073176	-0.04475	0.658674	0	0	-0.37347	0	-0.26059
19	0	0.016043	-0.02261	0.132521	-0.96226	0	0.46332	0	0
20	0	0.058737	-0.00217	-0.09096	-0.03622	0.771514	0	0	0
21	0	0.05948	0.040107	-0.08309	-0.32465	0	-0.08065	0	0
22	0	0.128529	-0.01392	-0.17577	-0.31252	0	0.724083	0	0
23	0	0.031747	0.04781	-0.18932	0.07943	0	0	-1.03887	0
24	1.584748	0.010604	0.008546	0.291371	-0.43623	0	0	0	0
25	0	-0.02711	-0.0464	-0.06823	-0.13995	0	-0.42937	0	0
26	0	-0.04486	-0.00581	-0.37098	-0.20253	0	0	0	0.895152
27	0	0.158092	0.133829	0.033807	-0.30137	0	0	0	0.614801
28	0	-0.00982	-0.06938	0.274527	-0.41519	0	-0.53328	0	0
29	0	-0.05028	0.036283	-0.02229	-0.07769	0	0	1.124178	0
30	0.011819	0.034411	0.039304	-0.08864	-0.06488	0	0	0	0
31	0	-0.01446	-0.07701	-0.1904	-0.04622	1.536173	0	0	0
32	0	0.071191	0.018779	-0.42676	0.286737	0	0	0	0.246581
33	0	-0.00572	-0.0228	-0.49186	-0.47851	0	-1.80109	0	0
34	0	-0.01419	-0.08197	-0.0413	-0.27735	0	-0.892	0	0
35	0	0.106011	-0.46186	-0.30431	0.767944	0	0	0	0.834278
36	-0.5602	0.003866	0.019756	-0.17972	-0.22657	0	0	0	0
37	0.50887	-0.01192	0.018891	0	-0.40552	0	0.685495	0	0
38	-0.05569	0.002995	0.013095	-0.14895	0.003914	0	0	0	0
MEAN	0.067406	0.005064	0.041248	-0.18783	-0.20164	0.11207	0.07931	0.002245	-0.2527

Keterangan : Angka adalah beda antara Koefisien agregat dengan koefisien individu wilayah