

Institutional Integrity and Regional Economic Recovery: Evidence from Sumatra in Indonesia and Implications for Southeast Asia

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Received: April 18, 2026; **Revised:** August 25, 2026; **Accepted:** Sept 15, 2026

Abstract: This study examines the conditional associations between institutional integrity, inflation, unemployment, and regional economic growth across ten provinces in Sumatra, Indonesia, during the 2020–2024 pandemic-to-recovery period. Annual secondary data from Statistics Indonesia (BPS) and the Corruption Eradication Commission (KPK) form a balanced panel of 50 province-year observations. The analysis considers pooled, fixed-effects, and random-effects specifications and uses the Chow, Hausman, and Breusch–Pagan Lagrange Multiplier tests for model selection. The selection evidence is mixed: the Chow cross-section F test does not reject pooled estimation at the 5% level ($p = 0.0539$), the Chow chi-square result supports province-specific effects ($p = 0.0140$), the Hausman test favors fixed effects ($\chi^2(3) = 18.005400$, $p = 0.0004$), and the LM test does not favor random effects over pooled estimation ($p = 0.2400$). The Fixed Effects Model is retained as the primary specification because the Hausman result and the research context indicate that unobserved provincial characteristics may be correlated with the regressors. Institutional integrity is negatively but not significantly associated with growth ($\beta = -0.018254$, $p = 0.8662$), inflation is positively associated with growth ($\beta = 0.428665$, $p = 0.0070$), and unemployment is negatively associated with growth ($\beta = -2.097523$, $p = 0.0001$). The model is statistically significant overall ($F = 2.754790$, $p = 0.008951$), with $R^2 = 0.471862$ and adjusted $R^2 = 0.300574$. Because the design is observational and does not resolve endogeneity or common year shocks, the coefficients are interpreted as conditional associations rather than causal effects. The findings suggest that regional recovery strategies may benefit from greater attention to employment conditions, the sources of inflationary pressure, and institutional strengthening linked to measurable administrative outcomes, while these implications should be interpreted cautiously given the observational design.

Keywords: Institutional Integrity; Regional Economic Growth; Inflation; Unemployment; Panel Data; Pandemic-to-Recovery Period; Sumatra

How to Cite: Damanik, D., Nopeline, N., Marita, M., & Hutabarat, A. S. (2026). Institutional Integrity and Regional Economic Recovery: Evidence from Sumatra in Indonesia and Implications for Southeast Asia. *Journal of Economic Education and Entrepreneurship Studies*, 7(5), 76-88 <https://doi.org/10.62794/je3s.v7i5.511>.

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INTRODUCTION

The period from 2020 to 2024 should be understood as a pandemic-to-recovery window rather than as a uniformly post-pandemic phase. Indonesia moved from the severe disruption of

2020 toward renewed growth, but the pace and composition of recovery changed as mobility restrictions eased, commodity conditions shifted, and fiscal and monetary settings normalized (Temenggung et al., 2021; Suryahadi et al., 2021; Halimatussadiah et al., 2022). By 2022, the economy had regained momentum while facing new pressures from global price volatility, tighter financial conditions, and uneven sectoral adjustment (Anas et al., 2022). Subsequent policy choices sought to restore fiscal space without undermining recovery, indicating that macroeconomic normalization remained an active process rather than a completed transition (Indrawati et al., 2024). Household evidence also shows that the pandemic shock and the recovery were heterogeneous across income groups, regions, and education levels (Ridhwan et al., 2024). These patterns make subnational analysis necessary because national averages can conceal substantial differences in regional exposure and adjustment.

Sumatra provides an analytically useful setting for examining these differences because its ten provinces combine resource-based economies, manufacturing centers, trade gateways, and different infrastructure and human-capital endowments. Previous research on the island has linked regional growth to investment, infrastructure, human capital, and convergence, while also showing that the relevant relationships vary across provinces and specifications (Yolanda et al., 2021; Hidayat et al., 2023). Evidence from Indonesian provinces further indicates that regional economic structure can alter the transmission of macroeconomic conditions, including inflation responses to monetary policy (Aginta & Someya, 2022). More broadly, regional-growth research emphasizes that common national shocks can produce different trajectories because regional structures and local capacities are not uniform (Grillitsch et al., 2021). The 2020–2024 period therefore offers a setting in which the same national recovery framework interacted with different provincial conditions. Examining Sumatra at the province level can clarify whether governance and short-run macroeconomic indicators move with growth after persistent provincial characteristics are taken into account.

Inflation and unemployment are central to this analysis because both changed meaningfully during the crisis and recovery. Inflation can weaken purchasing power and raise planning uncertainty, but moderate price increases can also accompany demand normalization and output recovery, making the growth relationship dependent on the source and level of price pressure (Khan & Senhadji, 2001; Ali & Asfaw, 2023). Regional evidence shows that monetary and structural conditions can generate heterogeneous inflation responses rather than a single uniform pattern (Duran & Karahasan, 2022; Aginta & Someya, 2022). Recent panel studies likewise emphasize the roles of institutional conditions, macroeconomic interactions, and external shocks in shaping inflation dynamics (Ujkani & Gara, 2023; Mauto et al., 2025; Merza et al., 2025). Unemployment, by contrast, directly reflects unused labor capacity and is expected to move inversely with output in the short run, although reverse adjustment from output to labor demand remains possible (Ball et al., 2017). During Indonesia's pandemic adjustment, employment losses, shifts toward informal work, and uneven wage recovery reinforced the importance of labor-market conditions for interpreting regional growth (Temenggung et al., 2021; Suryahadi et al., 2021).

Institutional integrity introduces a different time horizon into the recovery question. Institutional theory treats rules, enforcement, accountability, and administrative credibility as conditions that shape incentives and the efficiency of resource allocation (North, 1990; Acemoglu et al., 2005; Rodrik et al., 2004). Recent cross-country research generally finds that institutional quality is associated with economic performance, but the magnitude and transmission channels differ across income groups, sectors, and empirical designs (Parsa & Datta, 2023; Pradhan et al.,

2023; Oppong et al., 2023). Other studies show that institutional quality can condition the growth effects of finance, resource governance, trade, and public debt rather than operating only as a direct annual growth determinant (Asante et al., 2023; Kansheba & Marobhe, 2022; Duodu et al., 2025). Provincial evidence from China similarly suggests that institutional quality can matter within countries, while the relationship may depend on development stage and institutional thresholds (Glawe & Wagner, 2023). Evidence from the Middle East and North Africa also demonstrates that individual governance dimensions need not have identical growth associations (Zaibi et al., 2024). These findings caution against assuming that a short-window integrity index must produce an immediate and uniformly positive coefficient on annual regional growth.

The Indonesian governance context strengthens the case for a subnational approach. Decentralization gives provincial and local institutions a substantial role in public-service implementation, fiscal management, and administrative coordination, so differences in capacity can shape how national policy is translated into local outcomes (Setiawan et al., 2022; Shair-Rosenfield, 2025). Indonesian evidence links institutional quality and accountability to inclusive development, while local-government innovation is also associated with development performance (Mardiyani et al., 2023; Hilmawan et al., 2023). Foreign-investment research further suggests that governance conditions affect the environment in which capital responds to decentralization and institutional arrangements (Farhan et al., 2025; Bhujabal et al., 2024). More directly, recent subnational evidence finds that corruption is negatively associated with Indonesia's regional economic performance when dynamic and spatial dependence are addressed (Yunan et al., 2025). Cross-country pandemic research likewise indicates that governance quality can condition the effectiveness of fiscal responses and the economic consequences of emergency measures (Matei, 2024; Topçu & Gülşen, 2025). Governance may therefore matter for recovery through implementation capacity and policy transmission even when its direct short-run coefficient is weak.

Despite this growing literature, three limitations remain relevant to Sumatra. First, studies of the island have concentrated mainly on structural growth drivers such as investment, infrastructure, and human capital rather than combining an institutional-integrity measure with short-run inflation and unemployment in the same recovery model (Yolanda et al., 2021; Hidayat et al., 2023). Second, much of the recent Indonesian recovery literature is national or household based, which is informative about the shock and policy response but does not identify how provincial growth covaries with governance and macroeconomic conditions (Halimatussadiah et al., 2022; Anas et al., 2022; Indrawati et al., 2024; Ridhwan et al., 2024). Third, international institutional studies often use longer panels or cross-country samples, whereas a five-year provincial window may capture short-run adjustment rather than the slower channels through which governance changes affect productivity, investment, and public-sector performance (Parsa & Datta, 2023; Rodríguez-Pose & Ketterer, 2020). Regional fiscal evidence from other developing settings also shows that recovery effects can vary substantially with local conditions and policy design (Calmotti & Caba, 2023). The remaining empirical gap concerns whether annual variation in institutional integrity is detectably associated with provincial economic growth during a short and volatile recovery period when inflation, unemployment, and time-invariant provincial characteristics are considered simultaneously.

This study addresses that gap by estimating a balanced panel model for the ten provinces of Sumatra from 2020 to 2024. It asks how institutional integrity, inflation, and unemployment are conditionally associated with annual regional economic growth within the observed pandemic-to-recovery period. The study contributes empirically by combining a standardized institutional-

integrity proxy with two short-run macroeconomic indicators in a province-level model. Conceptually, it distinguishes the direct annual associations estimated in the model from longer-term institutional transmission mechanisms discussed in the literature but not tested directly in this study. The design is observational, so the analysis does not claim that changes in integrity, inflation, or unemployment cause changes in growth. The contribution is instead to determine which associations are statistically detectable within the available panel and to interpret them in relation to regional heterogeneity and the limits of short-run inference. The hypotheses are stated below in a form consistent with that noncausal design.

H1: Institutional integrity is positively associated with regional economic growth.

H2: Inflation is significantly associated with regional economic growth during the 2020–2024 pandemic-to-recovery period.

H3: Unemployment is negatively associated with regional economic growth.

H4: Institutional integrity, inflation, and unemployment are jointly associated with regional economic growth at the model level.

METHOD

Research Design, Setting, and Data Structure

The study used a quantitative longitudinal panel design based entirely on annual secondary data for the ten provinces of Sumatra over 2020–2024. The analytical units were Aceh, North Sumatra, West Sumatra, Riau, the Riau Islands, Jambi, Bengkulu, the Bangka Belitung Islands, Lampung, and South Sumatra, giving complete provincial coverage of Sumatra for the stated period rather than a probability sample. Combining ten cross-sectional units with five annual observations produced a balanced panel of 50 province-year observations. Regional economic growth, inflation, and the open unemployment rate were obtained from Statistics Indonesia (BPS), while institutional integrity was represented by the Integrity Assessment Survey (SPI) index issued by the Corruption Eradication Commission (KPK). Data entries were standardized to a common decimal format and cross-checked against the corresponding provincial series before estimation.

Variables and Measurement

Table 1. Variable Measurement

Variable	Symbol	Measurement	Source
Regional economic growth	EG	Annual growth of provincial gross regional domestic product (%)	BPS
Institutional integrity	II	Integrity Assessment Survey (SPI) index	KPK
Inflation	INF	Annual change in the consumer price index (%)	BPS
Unemployment	UNEMP	Open unemployment rate (%)	BPS

Source: Authors' compilation from BPS and KPK data.

EG measures the annual percentage change in provincial gross regional domestic product. II is proxied by the SPI index, a standardized integrity measure used in the source manuscript to summarize integrity risks, transparency, accountability, and corruption-related vulnerabilities in public institutions; higher scores indicate stronger assessed integrity. INF measures annual consumer-price inflation, and UNEMP is the percentage of the labor force that is unemployed and actively seeking work. Because the study uses administrative and official secondary indicators rather than a researcher-developed questionnaire or test, psychometric validity and reliability procedures such as Cronbach's alpha are not applicable. Measurement quality is instead

dependent on the comparability and consistency of the underlying BPS and KPK series, and the use of a single SPI proxy remains a limitation because institutional quality is multidimensional.

Empirical Model and Estimation Strategy

The baseline panel model is specified as follows:

$$EG_{it} = \alpha + \beta_1 II_{it} + \beta_2 INF_{it} + \beta_3 UNEMP_{it} + \mu_i + \varepsilon_{it}$$

where EG_{it} is regional economic growth in province i and year t ; II_{it} is the institutional integrity index; INF_{it} is inflation; $UNEMP_{it}$ is the open unemployment rate; μ_i captures time-invariant province-specific effects; and ε_{it} is the idiosyncratic error term. Three estimators were considered: the Common Effect Model, Fixed Effects Model, and Random Effects Model. The Chow test was used to compare pooled and fixed-effects specifications, the Hausman test to compare fixed and random effects, and the Breusch–Pagan Lagrange Multiplier test to compare pooled and random-effects estimation, following standard panel-data practice (Baltagi, 2021). The Fixed Effects Model was retained as the primary specification because the Hausman test rejected the random-effects consistency assumption and because persistent provincial characteristics are substantively likely to correlate with the included regressors. The specification includes province fixed effects but not year fixed effects; consequently, common annual shocks remain a limitation when interpreting coefficients from the 2020–2024 period.

Diagnostic Tests, Decision Rules, and Endogeneity Considerations

Residual normality was assessed with the Jarque–Bera test, multicollinearity with centered variance inflation factors, and first-order residual autocorrelation with the Durbin–Watson statistic. Model-level significance was evaluated using the reported F-statistic, while individual coefficients were evaluated using t-statistics and p-values; a 5% significance level was used for the main decisions, with the 10% level reported only where the original output described a marginal result. The Fixed Effects Model reduces bias from time-invariant unobserved provincial heterogeneity but does not remove reverse causality, omitted time-varying variables, measurement error, or common year shocks. Reverse relationships are plausible because economic growth can influence employment, prices, fiscal capacity, and administrative performance, while those conditions may simultaneously move with growth. The five-year time dimension and 50 observations restrict the feasibility of more demanding dynamic-panel or instrumental-variable strategies in the present study, so the coefficients are interpreted as conditional associations rather than causal effects. [PERLU VERIFIKASI: the EViews version and the covariance estimator or robust-standard-error setting are not reported in the available manuscript and should be documented if available.]

Research Procedure

The analytical sequence used in the study is summarized in Figure 1.

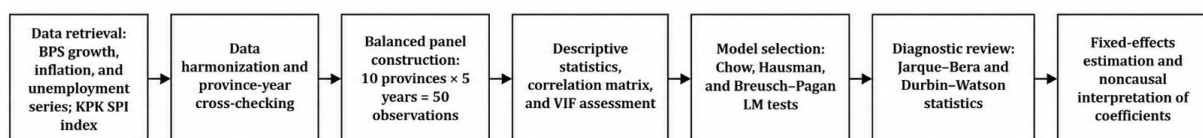


Figure 1. Analytical flow of the study

RESULTS

Descriptive Statistics and Correlation Analysis

Table 2. Descriptive Statistics

Variable	N	Mean	Std. deviation	Minimum	Maximum
Regional economic growth	50	3.1186	2.4054	−3.8000	5.2300
Institutional integrity	50	67.6774	3.5750	58.5500	75.4400
Inflation	50	3.1926	2.0060	0.8900	8.5500
Unemployment	50	5.3316	1.3526	3.1100	8.5000

Source: Authors' calculations based on the study dataset.

Regional economic growth averaged 3.1186%, with values from −3.8000% to 5.2300%, reflecting the 2020 contraction and the subsequent recovery years. Institutional integrity averaged 67.6774 and varied between 58.5500 and 75.4400, a narrower relative range than the macroeconomic variables. Inflation averaged 3.1926%, while unemployment averaged 5.3316%. The descriptive statistics show observable variation across provinces and years. However, the five-year observation window limits the extent of within-province variation available for fixed-effects estimation, particularly for variables that change gradually over time.

Table 3. Correlation Matrix

Variable	EG	II	INF	UNEMP
EG	1.0000	−0.1826	0.3598	−0.2921
II	−0.1826	1.0000	−0.1823	0.3289
INF	0.3598	−0.1823	1.0000	−0.0775
UNEMP	−0.2921	0.3289	−0.0775	1.0000

The pairwise correlations are moderate. Growth is positively correlated with inflation (0.3598) and negatively correlated with institutional integrity (−0.1826) and unemployment (−0.2921). Correlations among the explanatory variables remain well below levels that would normally indicate severe linear dependence, and the centered VIF values of 1.034750–1.153269 lead to the same descriptive conclusion. These correlations are bivariate summaries and are not substitutes for the conditional panel estimates reported below.

Model Selection and Diagnostic Results

Table 4. Model Selection and Diagnostic Tests

Test	Result	Interpretation
Chow test: cross-section F	p = 0.0539	Pooled estimation is not rejected at 5%; result is marginal
Chow test: cross-section chi-square	p = 0.0140	Supports province-specific effects
Hausman test	$\chi^2(3) = 18.005400$; p = 0.0004	Fixed effects preferred to random effects
LM test: cross-section Breusch–Pagan	p = 0.2400	Random effects not preferred to pooled estimation
Residual normality	Jarque–Bera p = 0.084407	Normality is not rejected at 5%
Multicollinearity	Centered VIF = 1.034750–1.153269	No serious multicollinearity indicated
Durbin–Watson	2.152186	No indication of substantial first-order residual autocorrelation

The model-selection evidence is mixed rather than uniformly decisive. The Chow cross-section F test is marginal and does not reject pooled estimation at the 5% level, whereas the cross-section

chi-square statistic supports province-specific effects. The Hausman statistic strongly rejects the random-effects consistency assumption ($\chi^2(3) = 18.005400$, $p = 0.0004$), while the LM test does not prefer random effects to pooled estimation ($p = 0.2400$). Given the Hausman result and the substantive likelihood that persistent provincial characteristics are correlated with the regressors, the Fixed Effects Model is retained as the primary specification. The diagnostics reported in Table 4 do not indicate serious multicollinearity, non-normal residuals at the 5% level, or substantial first-order residual autocorrelation, but they do not test every potential panel-data problem.

Fixed Effects Regression Results

Table 5 reports the Fixed Effects Model estimates for 50 observations across ten provinces and five years.

Table 5. Fixed Effects Regression Results

Variable	Coefficient	Std. error	t-statistic	p-value	Decision
Constant	14.168580	7.352850	1.926950	0.0617	Marginal at 10%
Institutional integrity	-0.018254	0.107603	-0.169641	0.8662	Not significant
Inflation	0.428665	0.149982	2.858110	0.0070	Significant at 1%
Unemployment	-2.097523	0.465058	-4.510235	0.0001	Significant at 1%

Table 6. Fixed Effects Model Statistics

Indicator	Value
Observations	50
Cross-sections	10
Periods	5
Model degrees of freedom	12
Residual degrees of freedom	37
R-squared	0.471862
Adjusted R-squared	0.300574
Standard error of regression	2.011716
F-statistic	2.754790
Prob. (F-statistic)	0.008951
Durbin-Watson statistic	2.152186

The overall Fixed Effects Model is statistically significant ($F = 2.754790$, $p = 0.008951$). The R-squared of 0.471862 indicates that the included regressors together with the province fixed effects account for 47.19% of the in-sample variation in regional economic growth, while the adjusted R-squared is 0.300574 after accounting for model complexity. Institutional integrity has a small negative coefficient ($\beta = -0.018254$) that is not statistically distinguishable from zero ($p = 0.8662$), so H1 is not supported. Inflation is positively associated with growth ($\beta = 0.428665$, $p = 0.0070$), supporting H2 as an association within the observed period. Unemployment is negatively associated with growth ($\beta = -2.097523$, $p = 0.0001$), supporting H3. The reported overall F-statistic provides model-level evidence relevant to H4, but the available output does not report a dedicated joint Wald test of only the three slope coefficients; H4 is therefore described as receiving model-level support rather than as a separately verified restriction test.

Table 7. Hypothesis Testing Summary

Hypothesis	Statement	Result
H1	Institutional integrity is positively associated with regional economic growth.	Not supported
H2	Inflation is significantly associated with regional economic growth during the 2020–2024 pandemic-to-recovery period.	Supported
H3	Unemployment is negatively associated with regional economic growth.	Supported
H4	Institutional integrity, inflation, and unemployment are jointly associated with regional economic growth at the model level.	Model-level support; dedicated slope joint test not reported

Discussion

The results portray Sumatra's 2020–2024 recovery as a process in which short-run macroeconomic adjustment is more statistically visible than annual variation in the institutional-integrity proxy. Inflation and unemployment are individually significant in the Fixed Effects Model, whereas the SPI-based integrity measure is not. This pattern is consistent with the broader chronology of Indonesia's recovery, where reopening, labor-market adjustment, commodity conditions, fiscal normalization, and changing price pressures moved relatively quickly after the 2020 shock (Temenggung et al., 2021; Halimatussadiyah et al., 2022; Anas et al., 2022; Indrawati et al., 2024). Household evidence also documents heterogeneous income and consumption effects of lockdowns, supporting the view that the path back to growth was not uniform across groups or locations (Ridhwan et al., 2024). Because province fixed effects absorb time-invariant provincial differences, the estimated coefficients reflect within-province covariation after controlling for the other included regressors, not a comparison of high- and low-performing provinces in levels. The findings should therefore be read as evidence about detectable short-window associations rather than as a ranking of the underlying importance of institutions, prices, and labor markets.

The insignificant institutional-integrity coefficient is particularly important because it narrows, rather than rejects, the institutional argument. The coefficient of -0.018254 is imprecisely estimated and cannot support the conclusion that stronger integrity reduces growth. Recent international evidence typically links institutional quality to growth over longer horizons or through mediating channels such as investment, finance, public debt, and trade (Parsa & Datta, 2023; Pradhan et al., 2023; Oppong et al., 2023; Asante et al., 2023; Duodu et al., 2025). Subnational Indonesian evidence also finds a negative relationship between corruption and regional economic performance when longer dynamic and spatial structures are modeled (Yunan et al., 2025), while Indonesian research on inclusive development associates institutional quality with regional development outcomes (Mardiyani et al., 2023). The present five-year result is therefore not directly contradictory to that literature because SPI may capture governance conditions whose economic transmission is slower than annual output adjustment. The result is better interpreted as an absence of a statistically detectable direct annual association in this specific sample and specification.

A second interpretation is that institutional effects may operate through implementation capacity rather than through a single contemporaneous growth coefficient. Research on decentralized Indonesia shows that local-government capacity affects public-service delivery and that public-sector innovation is associated with development outcomes (Setiawan et al., 2022; Hilmawan et al., 2023). Governance also shapes the investment environment in South and Southeast Asia and the functioning of decentralization in Indonesia (Bhujabal et al., 2024; Farhan et al., 2025). During major shocks, intergovernmental coordination can strengthen or weaken the

benefits of decentralized governance, which is especially relevant in Southeast Asia (Shair-Rosenfield, 2025). Cross-country evidence further suggests that governance quality conditions the effectiveness of fiscal stimulus and the sustainability of public-resource mobilization (Topçu & Gülşen, 2025; Ndiaye et al., 2026). These mechanisms suggest possible channels through which institutional integrity could be associated with economic performance, including procurement quality, licensing efficiency, expenditure management, coordination, and investment confidence. However, these pathways were not measured directly in the present study. Future work with longer panels and additional institutional dimensions would be better suited to distinguish those indirect and lagged pathways.

The positive inflation coefficient must also be interpreted in the context of the recovery phase. A one-percentage-point increase in inflation is associated with a 0.428665-percentage-point increase in growth, conditional on the included variables and province fixed effects, but this does not imply that deliberately increasing inflation would raise output. Inflation-growth research shows that the relationship can vary with the inflation range, economic structure, policy regime, and source of price pressure (Khan & Senhadji, 2001; Ali & Asfaw, 2023). Regional monetary evidence confirms heterogeneous responses across economic structures, while recent panel studies emphasize interactions among inflation, output, institutions, and external shocks (Duran & Karahasan, 2022; Ujkani & Gara, 2023; Mauto et al., 2025; Merza et al., 2025). In the 2020–2024 window, demand normalization and production recovery could have coincided with higher prices, while supply shocks could have pushed inflation independently of productive activity. The absence of year fixed effects means that common annual shocks may contribute to this positive association, so the coefficient should be treated as recovery-period comovement rather than as a stable structural parameter. For policy, the relevant distinction is between price increases associated with recovering demand and those driven by persistent food, energy, logistics, or exchange-rate pressures.

The unemployment result is more consistent with established short-run macroeconomic reasoning. The coefficient of -2.097523 indicates a strong negative conditional association between the open unemployment rate and provincial growth, in line with the inverse output-unemployment relationship summarized by Okun-type models (Ball et al., 2017). Indonesia's pandemic experience provides a plausible context for this association because employment losses, movement into informal and agricultural work, and uneven real-wage recovery were central features of the adjustment process (Temenggung et al., 2021; Suryahadi et al., 2021). The high-frequency household evidence on income and consumption losses during lockdowns further illustrates how labor-market disruption can transmit to demand and expectations (Ridhwan et al., 2024). Nevertheless, the direction of influence cannot be identified from the present specification because slower growth can itself reduce labor demand and raise unemployment. The result therefore supports employment recovery as an important policy correlate of regional growth without establishing a causal multiplier. Sector-relevant training, job matching, labor mobility, and productivity-oriented enterprise support are consistent with this interpretation because they target the labor-utilization channel directly.

Taken together, the findings reinforce the importance of regional heterogeneity in recovery policy. Sumatra's provinces share a national macroeconomic framework but differ in economic structure, infrastructure, human capital, resource exposure, and administrative capacity, conditions already emphasized in research on the island and on regional growth more generally (Yolanda et al., 2021; Hidayat et al., 2023; Grillitsch et al., 2021). Comparative work on pandemic policies also shows that institutional conditions can alter the growth effects of emergency

measures across countries, while regional fiscal evidence indicates that the same policy instrument can have different local effects (Matei, 2024; Calmotti & Caba, 2023). For Southeast Asia, the implication is therefore contextual rather than mechanical: Sumatra does not provide coefficients that can be transferred directly to other ASEAN economies. Earlier ASEAN policy analysis and more recent work on decentralization both emphasize differences in coordination and institutional readiness across the region (Djalante et al., 2020; Shair-Rosenfield, 2025). A defensible regional-policy lesson is to combine macroeconomic stabilization with attention to labor-market conditions and subnational implementation capacity rather than assuming that one national recovery package will produce uniform outcomes.

The study's contribution lies in placing institutional integrity and short-run macroeconomic adjustment in the same subnational recovery model while maintaining a clear boundary between observed association and causal explanation. This design complements long-horizon institutional research by showing that a governance proxy can be theoretically important yet statistically weak over a short, shock-dominated window, a pattern consistent with evidence that institutional effects vary by context and transmission mechanism (Glawe & Wagner, 2023; Zaïbi et al., 2024; Kansheba & Marobhe, 2022). Several limitations constrain stronger inference: the panel covers only five years, SPI is the only governance proxy, the model omits year fixed effects, time-varying controls such as investment and fiscal variables are not included, endogeneity is unresolved, and the available output does not document robust covariance settings. The reported diagnostic tests also do not address cross-sectional dependence or every form of heteroskedasticity that may matter in provincial panels. Longer panels could support lagged governance specifications, two-way fixed effects, dynamic-panel or instrumental-variable approaches, and spatial models that explicitly account for interprovincial dependence. Those extensions should be treated as future research rather than retrofitted into the present results because the required data and estimations are not available in the current manuscript. Within these limits, the present evidence supports a cautious interpretation in which employment restoration, the composition of inflation, and institutional implementation capacity are jointly relevant to understanding regional recovery.

CONCLUSIONS

This study examined the conditional associations of institutional integrity, inflation, and unemployment with regional economic growth across the ten provinces of Sumatra during 2020–2024. The Fixed Effects Model identifies no statistically significant direct association between the SPI-based institutional-integrity measure and annual growth, while inflation is positively associated and unemployment is negatively associated with growth. The overall model is statistically significant and explains 47.19% of the in-sample variation before adjustment for model complexity, but the results do not establish causal effects. Within the observed 2020–2024 panel, statistically detectable associations with regional economic growth are identified for inflation and unemployment, whereas no statistically significant direct association is identified for the SPI-based institutional-integrity measure.

The theoretical implication is not that institutions are unimportant, but that their contribution may operate over longer horizons or through implementation channels that are not captured by a single contemporaneous SPI coefficient. For provincial policy, institutional strengthening should be linked to measurable administrative outcomes such as procurement compliance, budget execution, licensing performance, and complaint resolution, while inflation management should distinguish recovering demand from persistent supply shocks. The unemployment result supports attention to job matching, sector-relevant skills, labor mobility, and productivity-

oriented employment rather than temporary job absorption alone. These recommendations are consistent with the noncausal nature of the model and should not be read as quantified policy effects.

The study is limited by the five-year panel, a single governance proxy, provincial aggregation, omitted time-varying factors, the absence of year fixed effects, and unresolved endogeneity. Future research should use longer panels, additional governance dimensions, explicit investment and fiscal controls, lagged specifications, two-way fixed effects, robust panel covariance estimators, and, where the data permit, dynamic, instrumental-variable, or spatial approaches. Comparative work across subnational units in other Southeast Asian economies would also help determine whether the patterns observed in Sumatra reflect broader regional mechanisms or conditions specific to Indonesia's recovery. Until those extensions are available, the findings should remain bounded to the ten Sumatran provinces and the 2020–2024 pandemic-to-recovery period.

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