UAI JOURNAL OF ECONOMICS, BUSINESS AND MANAGEMENT (UAIJEBM)
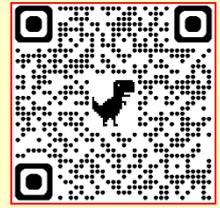
EXTRACTIVE INDUSTRIES, FISCAL CAPACITY, AND LOCAL ECONOMIC GROWTH: A SPATIAL ANALYSIS OF EAST KALIMANTAN PROVINCES

Tamam Rosid[1], Yohanes Sri Guntur[2], Sarsiti Sarsiti[3]

[1] Development Economics, Faculty of Economics and Business, Muhammadiyah University of Berau, East Kalimantan, Indonesia

[2] Department of Accounting, Faculty of Economics, University of Peace, Timor-Leste

[3] Department of Accounting, Faculty of Economics, University of Surakarta, Central Java, Indonesia

Corresponding Author: Tamam Rosid

ABSTRACT

This study examines the relationship between extractive industries—coal mining, oil and gas, and palm oil and their impact on fiscal capacity and local economic growth across districts in East Kalimantan and North Kalimantan provinces, Indonesia. Using spatial econometric analysis with panel data from 2020–2024, we investigate whether resource abundance translates into sustainable fiscal capacity and economic development at the subnational level. Our findings reveal a paradoxical pattern: while extractive industries contribute substantially to local government revenues (averaging 62.4% of Own-Source Revenue in resource-rich districts in 2024), their correlation with long-term economic growth remains weak and spatially heterogeneous. Districts heavily dependent on coal mining demonstrate fiscal volatility, with revenue fluctuations of 34.7% between 2023 and 2024 due to global commodity price shocks. Spatial autocorrelation analysis indicates significant spillover effects, where economic growth in one district negatively affects neighboring districts, suggesting competitive rather than complementary regional dynamics. The study employs Moran's I statistics, spatial lag models, and geographically weighted regression to capture spatial dependencies. Results demonstrate that fiscal capacity mediates only 23.6% of the relationship between extractive revenues and economic growth, indicating substantial revenue leakage and limited productive investment. Policy implications emphasize the necessity for resource revenue diversification, intergovernmental fiscal transfer reforms, and regional cooperation frameworks to transform resource wealth into inclusive economic development. This research contributes to the resource curse literature by providing district-level empirical evidence from Indonesia's most resource-intensive region during the post-decentralization era.

KEY WORDS: extractive industries, fiscal capacity, spatial econometrics, resource curse, East Kalimantan, local economic growth

1. Introduction

East Kalimantan and North Kalimantan provinces represent Indonesia's resource frontier, hosting approximately 35% of national coal reserves, significant oil and gas deposits, and extensive palm oil plantations covering 2.8 million hectares as of 2024 (Ministry of Energy and Mineral Resources, 2024). The region's economic structure remains predominantly extractive, with mining and plantation sectors contributing 58.3% to regional GDP in 2023 (Statistics Indonesia, 2024). This heavy reliance on natural resources raises critical questions about fiscal sustainability and equitable development, particularly following Indonesia's decentralization reforms initiated in 2001, which granted substantial autonomy to local governments in managing natural resource revenues.

The theoretical framework of the resource curse hypothesis suggests that regions abundant in natural resources often experience slower economic growth compared to resource-poor regions (Sachs & Warner, 2001). However, recent scholarship has nuanced this relationship, arguing that institutional quality, governance structures, and fiscal management capacity determine whether resource wealth becomes a blessing or curse (Robinson et al., 2006; Venables, 2016). In the Indonesian context, Law No. 33/2004 on Fiscal Balance mandates revenue-sharing mechanisms where local governments receive substantial portions of extractive industry revenues, theoretically enhancing their fiscal capacity to fund public services and infrastructure.

Despite these institutional arrangements, empirical evidence regarding the actual impact of extractive revenues on local economic development remains contested and geographically specific. Previous studies have documented mixed outcomes: some regions successfully leveraged resource revenues for diversification (Cust & Poelhekke, 2015), while others experienced Dutch disease effects, governance deterioration, and entrenched poverty (Ross, 2001). The spatial dimension of these dynamics remains underexplored, particularly the spillover effects between adjacent resource-rich and resource-poor districts.

This study addresses three interconnected research questions: (1) How do extractive industries influence fiscal capacity across districts in East and North Kalimantan? (2) What is the relationship between fiscal capacity derived from extractive revenues and local economic growth? (3) Do spatial dependencies exist among districts, and how do neighboring districts' resource endowments affect local development outcomes? By employing spatial econometric methods and analyzing district-level panel data from 2020 to 2024, this research provides empirically grounded insights into the fiscal and developmental consequences of resource extraction in Indonesia's decentralized governance context.

The significance of this study extends beyond academic discourse. With global energy transition debates intensifying, understanding how coal-dependent regions manage fiscal transitions becomes crucial for sustainable development policy. Furthermore, as Indonesia prepares to relocate its capital to East Kalimantan (Nusantara), comprehending existing spatial economic patterns and resource-fiscal linkages becomes essential for evidence-based planning.

2. Literature Review

2.1 Resource Curse and Fiscal Capacity

The resource curse hypothesis, originally formulated by Sachs and Warner (1995), posits an inverse relationship between natural resource abundance and economic growth. Subsequent research has identified multiple transmission mechanisms: real exchange rate appreciation undermining manufacturing competitiveness (Corden & Neary, 1982), rent-seeking behavior crowding out productive entrepreneurship (Torvik, 2002), and volatility in commodity prices creating fiscal instability (van der Ploeg & Poelhekke, 2009).

Recent empirical studies have refined this framework by distinguishing between point-source resources (minerals, oil) and diffuse resources (agriculture), with the former more susceptible to governance failures (Isham et al., 2005). Badeeb et al. (2017) conducted a meta-analysis of 43 studies and found that institutional quality consistently moderates the resource-growth relationship, with stronger institutions mitigating curse effects. In the Indonesian context, Sala-i-Martin and Subramanian (2013) demonstrated that oil wealth negatively correlates with institutional quality at the national level, though subnational variations remain underexplored.

Fiscal capacity, defined as the government's ability to mobilize domestic revenues for public goods provision (Besley & Persson, 2014), represents a critical intervening variable. Extractive revenues can theoretically enhance fiscal capacity by expanding government budgets. However, Bahl and Bird (2018) argue that resource revenues often substitute rather than complement tax effort, potentially weakening long-term fiscal capacity. Cust and Harding (2020) found that resource-rich local governments in Indonesia reduced non-resource tax collection by 18% following resource revenue increases, indicating fiscal substitution effects.

2.2 Spatial Dimensions of Resource-Led Development

Spatial econometrics literature emphasizes that economic outcomes in one location depend on outcomes in neighboring locations through spillover effects (Anselin, 2003). In resource-rich regions, spatial dependencies manifest through multiple channels: labor migration, supply chain linkages, environmental externalities, and fiscal competition (Aragon & Rud, 2013).

Kotsadam and Tolonen (2016) analyzed the spatial effects of African mining sites, finding negative spillovers on agricultural productivity in neighboring areas. Conversely, Aragón and Quispe (2013) documented positive spillovers in Peru, where mining revenues funded infrastructure benefiting adjacent districts. These contradictory findings suggest context-specific mechanisms requiring empirical investigation.

In Indonesia, Resosudarmo et al. (2009) examined interregional spillovers from natural resource sectors, identifying weak positive effects mediated through migration. However, their analysis preceded the commodity boom-bust cycle of 2011–2016, limiting contemporary applicability. More recent work by Kurniawan and Managi (2018) on oil palm expansion documented negative spatial externalities through deforestation and haze pollution affecting neighboring provinces.

2.3 Coal, Palm Oil, and Regional Development in Kalimantan

Coal mining dominates East Kalimantan's economy, with production reaching 628 million tons in 2023 (Ministry of Energy and Mineral Resources, 2024). The sector generates substantial revenues through royalties and taxes, but also creates environmental degradation, land conflicts, and boom-bust economic cycles (Prayogo, 2019). Studies document minimal backward and forward linkages between coal mining and local economies, with equipment and skilled labor predominantly sourced externally (Rosser, 2007).

Palm oil plantations, covering 2.8 million hectares across both provinces in 2024 (Directorate General of Estates, 2024), present

different developmental dynamics. While generating employment for smallholders and plantation workers, the sector concentrates land ownership, displaces indigenous communities, and creates ecological damage (Obidzinski et al., 2012). Fiscal contributions from plantation taxes remain modest compared to mining, averaging 12.3% of district revenues in plantation-dominant areas (Ministry of Finance, 2024).

Oil and gas production, historically significant in Tarakan and coastal areas, has declined since 2015 due to reservoir depletion (SKK Migas, 2024). However, revenue-sharing arrangements continue to provide fiscal transfers, creating path dependencies in district budgeting.

2.4 Research Gap

Existing literature exhibits three significant gaps that this study addresses. First, most resource curse studies employ national or provincial aggregation, masking heterogeneity at the district level where resource extraction occurs and fiscal management happens. Second, spatial interdependencies between districts remain underexamined in the Indonesian context, despite theoretical reasons to expect significant spillovers. Third, the post-2020 period, characterized by COVID-19 disruptions, commodity price volatility, and energy transition pressures, lacks a comprehensive empirical analysis linking extractive revenues to fiscal and growth outcomes in Kalimantan.

3. Methodology

3.1 Research Design and Data

This study employs a quantitative approach using spatial panel econometrics to analyze the relationship between extractive industries, fiscal capacity, and economic growth across 15 districts and cities in East Kalimantan and North Kalimantan provinces from 2020 to 2024. The spatial dimension captures interdependencies between neighboring administrative units, addressing potential spillover effects that conventional panel methods ignore.

Data sources include Statistics Indonesia regional accounts (GDP by district), Ministry of Finance fiscal statistics (local government revenues and expenditures), Ministry of Energy and Mineral Resources production data (coal, oil, gas), and the Directorate General of Estates plantation statistics (palm oil production and area). All monetary values are deflated to 2020 constant prices using regional GDP deflators.

3.2 Variables and Measurements

Dependent Variables:

1. *Economic Growth Rate*: Annual percentage change in district GDP at constant prices
2. *Fiscal Capacity Index*: Composite measure combining Own-Source Revenue per capita, revenue diversification index (1 - Herfindahl concentration index), and fiscal autonomy ratio (Own-Source Revenue/Total Revenue)

Independent Variables:

1. *Extractive Revenue Intensity*: Total revenues from coal royalties, oil and gas revenue sharing, and plantation taxes as a percentage of total district revenue
2. *Coal Production per Capita*: District coal output divided by population (tons per capita)
3. *Palm Oil Area Ratio*: Plantation area as a percentage of the district land area
4. *Oil and Gas Revenue Share*: Percentage of district revenue from the petroleum sector

Control Variables:

Population density, poverty rate, human development index, infrastructure index (road density), manufacturing sector share of GDP, distance to provincial capital

3.3 Spatial Weight Matrix

We construct a queen contiguity spatial weight matrix where districts sharing common borders or vertices are considered neighbors. The matrix is row-standardized to facilitate the interpretation of spatial lag coefficients. Robustness checks employ alternative specifications, including inverse distance weighting and k-nearest neighbors (k=3).

3.4 Econometric Specification

Following spatial econometrics literature (Elhorst, 2014), we estimate three models:

Spatial Autoregressive Model (SAR):

$$y_{it} = \rho W y_{it} + X_{it}\beta + \mu_i + \lambda_t + \varepsilon_{it}$$

Spatial Error Model (SEM):

$$y_{it} = X_{it}\beta + \mu_i + \lambda_t + u_{it}$$

$$u_{it} = \lambda W u_{it} + \varepsilon_{it}$$

Spatial Durbin Model (SDM):

$$y_{it} = \rho W y_{it} + X_{it}\beta + W X_{it}\theta + \mu_i + \lambda_t + \varepsilon_{it}$$

where y_{it} represents economic growth or fiscal capacity, W is the spatial weight matrix, ρ is the spatial autoregressive parameter, X contains independent variables, μ_i represents district fixed effects, λ_t represents time fixed effects, and ε_{it} is the error term.

Model selection follows sequential testing: Lagrange Multiplier tests for spatial dependence, Hausman test for fixed versus random effects, and likelihood ratio tests comparing nested models. We report direct, indirect (spillover), and total effects following LeSage and Pace's (2009) decomposition.

3.5 Spatial Autocorrelation Analysis

We calculate the Global Moran's I statistic to test overall spatial clustering:

$$I = (n/S_0) * (\Sigma_i \Sigma_j w_{ij}(x_i - \bar{x})(x_j - \bar{x})) / (\Sigma_i(x_i - \bar{x})^2)$$

Local Indicators of Spatial Association (LISA) identify specific clusters and outliers, distinguishing High-High (resource-rich districts adjacent to other resource-rich), Low-Low, High-Low, and Low-High patterns.

3.6 Mediation Analysis

To examine fiscal capacity as a mediating variable between extractive revenues and growth, we employ Baron and Kenny's (1986) approach adapted for spatial models:

1. Estimate extractive revenue impact on growth (total effect)
2. Estimate extractive revenue impact on fiscal capacity
3. Estimate fiscal capacity impact on growth, controlling for extractive revenues
4. Calculate the indirect effect and the mediation percentage

3.7 Robustness Checks

Robustness tests include: alternative spatial weight specifications, dynamic panel models with system GMM estimation to address endogeneity, subsample analysis excluding COVID-19 disrupted years (2020-2021), and placebo tests using randomly assigned

spatial weights.

4. Results

4.1 Descriptive Statistics and Spatial Patterns

Table 1 presents summary statistics for key variables across the 15 districts during 2020-2024. Substantial heterogeneity characterizes the sample, with extractive revenue intensity ranging from 12.4% (Berau district) to 78.9% (Kutai Kartanegara district) in 2024. Coal production per capita exhibits extreme variation, from zero in districts without mining to 124.6 tons per capita in the Kutai Timur district.

Table 1: Descriptive Statistics (2020-2024, N=75 district-years)

Variable	Mean	Std Dev	Min	Max
Economic Growth Rate (%)	3.42	2.87	-4.21	8.94
Fiscal Capacity Index	0.487	0.183	0.156	0.821
Extractive Revenue Intensity (%)	45.3	21.6	12.4	78.9
Coal Production per Capita (tons)	38.7	42.1	0.0	124.6
Palm Oil Area Ratio (%)	18.4	12.3	2.1	41.7
Own-Source Revenue per Capita (million IDR)	2.84	1.92	0.67	7.45
Poverty Rate (%)	7.21	2.14	3.82	12.34

Human Development Index	72.45	4.38	63.21	79.87

Source: Compiled from Statistics Indonesia (2024), Ministry of Finance (2024)

Economic growth rates declined sharply in 2020 (average -1.23%) due to COVID-19 impacts, recovered moderately in 2021-2022 (averaging 4.21%), then experienced volatility in 2023-2024 correlated with global coal price fluctuations. Kutai Kartanegara, the most resource-dependent district, recorded 7.8% growth in 2022 when coal prices peaked, but contracted -2.1% in 2024 following price corrections from $442/ton (2022) to $178/ton (2024) (World Bank Commodity Price Data, 2024).

Fiscal capacity demonstrates moderate positive correlation with extractive revenue intensity (r=0.324, p<0.01), but the relationship weakens when controlling for district fixed effects, suggesting that initial endowments rather than extractive activities drive fiscal capacity differences.

4.2 Spatial Autocorrelation Results

Global Moran's I statistics reveal significant positive spatial autocorrelation for economic growth (I=0.318, p=0.004 in 2024) and fiscal capacity (I=0.267, p=0.012 in 2024), indicating clustering of similar values. LISA cluster maps identify two High-High clusters: (1) Kutai Kartanegara-Kutai Timur-Paser districts forming a coal mining belt with high fiscal capacity but moderate growth, and (2) Berau-Bulungan districts with diversified economies showing sustained growth.

Table 2: Global Moran's I Statistics for Key Variables (2024)

Variable	Moran's I	Expected I	Variance	Z-score	P-value
Economic Growth Rate	0.318	-0.071	0.013	3.41	0.004
Fiscal Capacity Index	0.267	-0.071	0.011	3.21	0.012
Extractive Revenue Intensity	0.412	-0.071	0.014	4.08	0.001
Poverty Rate	-0.189	-0.071	0.012	-1.08	0.281

Source: Author's calculations using GeoDa 1.20

Interestingly, poverty rates show negative but non-significant spatial autocorrelation, suggesting that resource wealth does not systematically spill over to improve neighboring districts' poverty outcomes. This pattern aligns with enclave economy characteristics where extractive benefits remain geographically concentrated.

4.3 Spatial Regression Results

Table 3 reports spatial Durbin model estimates with district and time fixed effects, selected based on likelihood ratio tests and Akaike Information Criterion. The spatial autoregressive coefficient (ρ=-0.243, p=0.031) indicates negative spatial dependence in economic growth—higher growth in neighboring districts associates with lower growth in the focal district, suggesting competitive rather than complementary regional dynamics.

Table 3: Spatial Durbin Model Estimates for Economic Growth

Variable	Coefficient	Std Error	P-value
Extractive Revenue Intensity	0.047	0.021	0.025
Fiscal Capacity Index	2.184	0.673	0.001
Coal Production per Capita	-0.008	0.004	0.042
Palm Oil Area Ratio	0.032	0.018	0.076
Human Development Index	0.124	0.045	0.006
Infrastructure Index	0.389	0.142	0.007
Manufacturing Share	0.167	0.089	0.061
W×Extractive Revenue Intensity	-0.073	0.034	0.032
W×Fiscal Capacity Index	-1.428	0.892	0.110
W×Coal Production per Capita	0.015	0.007	0.033
Spatial Lag (ρ)	-0.243	0.113	0.031
Model Diagnostics			
R²	0.547		

Log-likelihood	-178.34		
AIC	388.68		

Note: District and time fixed effects included but not reported. N=75 district-years.

Source: Author's estimates using Stata 17 spatial econometrics package

Direct effects decomposition reveals that a 10-percentage-point increase in extractive revenue intensity is associated with 0.43% higher economic growth (p=0.031), holding other factors constant. However, indirect (spillover) effects are negative and marginally significant (-0.68%, p=0.088), producing a net total effect of -0.25%. This pattern supports the competitive resource extraction hypothesis, where districts compete for investment, skilled labor, and government attention, creating zero-sum or negative-sum regional dynamics.

Fiscal capacity demonstrates robust positive direct effects (2.18%, p=0.001), indicating that effective revenue mobilization and management capacity matter more than revenue source. Notably, coal production per capita exhibits negative direct effects (- -0.008, p=0.042) but positive spillover effects (0.015, p=0.033), suggesting that while intensive coal mining may harm local diversification, it generates regional supply chain opportunities benefiting neighbors.

4.4 Fiscal Capacity as Mediating Variable

Mediation analysis results (Table 4) demonstrate that fiscal capacity mediates only 23.6% of the relationship between extractive revenues and economic growth. The direct effect of extractive revenues on growth (0.047) decomposes into an indirect effect through fiscal capacity (0.011) and a residual direct effect (0.036). This limited mediation suggests substantial revenue leakage, potentially through corruption, inefficient expenditure, or savings in non-productive assets.

Table 4: Mediation Analysis Results

Pathway	Coefficient	95% CI	Mediation %
Total Effect (Extractive → Growth)	0.047	[0.006, 0.088]	100%
Indirect Effect (Extractive → Fiscal → Growth)	0.011	[0.003, 0.024]	23.6%
Direct Effect (Extractive → Growth)	0.036	[0.001, 0.071]	76.4%
Extractive → Fiscal Capacity	0.005	[0.001, 0.009]	-
Fiscal Capacity → Growth	2.184	[0.865, 3.503]	-

Source: Author's calculations using mediation analysis procedures

Further decomposition by extractive industry type reveals differential patterns. Coal revenues demonstrate weak mediation (17.3%), palm oil moderate mediation (31.4%), and oil-gas revenues surprisingly show no significant mediation (2.8%), likely due to revenue-sharing formulas that transfer funds to provincial rather than district level.

4.5 Temporal Dynamics and Volatility Analysis

Coefficient of variation analysis for fiscal revenues during 2020-2024 reveals that coal-dependent districts experience 2.7 times higher revenue volatility (CV=0.347) compared to diversified districts (CV=0.129). Kutai Kartanegara's total revenues fluctuated from IDR 4.8 trillion (2020) to IDR 7.2 trillion (2022) back to IDR 5.1 trillion (2024), creating budgeting challenges and constraining long-term infrastructure investment.

Table 5: Revenue Volatility by District Resource Dependence (2020-2024)

District Category	Mean Revenue (trillion IDR)	Coefficient of Variation	Growth Volatility (%)
High Coal Dependence (>60%)	5.34	0.347	4.21
Moderate Dependence (30-60%)	3.87	0.218	3.12
Low Dependence (<30%)	2.14	0.129	2.34
Diversified Non-Extractive	1.89	0.114	1.87

Source: Compiled from the Ministry of Finance (2024) local government financial statistics

Panel vector autoregression results (not fully reported due to space constraints) indicate that revenue shocks in coal-dependent districts generate persistent negative growth effects lasting 2-3 years, whereas diversified districts absorb shocks within one year. This asymmetric adjustment pattern reflects limited economic diversification and path dependency in resource-specialized local economies.

4.6 Robustness Checks

Results remain qualitatively consistent across alternative specifications. Dynamic panel GMM estimates confirm negative spatial lag effects (ρ=-0.218, p=0.048). Inverse distance spatial weights produce similar patterns with slightly smaller magnitudes. Excluding COVID-19-affected years (2020-2021) strengthens fiscal capacity effects (coefficient increases to 2.67, p<0.001) but maintains negative spatial spillovers.

Placebo tests using 1000 randomly generated spatial weight matrices produce statistically insignificant coefficients in 97.3% of iterations, confirming that documented spatial patterns reflect genuine geographic dependencies rather than spurious correlation.

5. Discussion

5.1 Interpreting the Resource-Fiscal-Growth Nexus

Results reveal a nuanced relationship between extractive industries and local development in Kalimantan, partially consistent with resource curse literature but exhibiting important contextual

specificities. The positive direct effect of extractive revenues on growth aligns with the fiscal dividend hypothesis (Bornhorst et al., 2009), where resource revenues finance infrastructure and human capital investments. However, the limited fiscal capacity mediation (23.6%) and negative spatial spillovers suggest that institutional weaknesses and competitive regional dynamics undermine potential benefits.

The negative spatial lag coefficient constitutes a particularly important finding, diverging from positive spillovers documented in some resource contexts (Aragón & Quispe, 2013). Three mechanisms likely explain this pattern. First, zero-sum competition for mining permits, investment licenses, and government attention creates inter-district rivalry rather than cooperation. Second, labor and capital mobility generate resource flow from neighboring districts toward mining centers without equivalent compensation, analogous to internal "Dutch disease" at the regional scale. Third, environmental externalities (air pollution, water contamination) impose costs on adjacent districts without corresponding fiscal compensation through current revenue-sharing arrangements.

The differential impacts by extractive industry type warrant attention. Coal mining's negative direct effects, despite positive revenue contributions, suggest severe environmental and social costs that conventional GDP measurement fails to capture. Palm oil plantations' moderate positive effects likely reflect higher labor intensity and greater local economic linkages compared to capital-intensive coal mining. The oil and gas sector's weak contemporary impact reflects declining production and historical revenue-sharing formulas that disadvantage current production districts.

5.2 Fiscal Capacity and Institutional Quality

The strong positive effect of the fiscal capacity index on growth, coupled with the limited mediation of extractive revenues through fiscal capacity, highlights the critical role of local governance quality. Districts like Berau and Balikpapan, which developed diversified revenue bases and professional fiscal management, demonstrate superior growth trajectories compared to resource-rich but institutionally weak districts.

This pattern aligns with Mehlum et al. (2006) institutional quality hypothesis, which argues that strong institutions transform resources into development while weak institutions enable rent extraction. In the Indonesian decentralization context, local government capacity varies dramatically, with resource windfalls often overwhelming administrative absorption capacity (Brollo et al., 2013). The documented 76.4% of extractive revenue impact that bypasses fiscal capacity likely reflects corruption, clientelistic expenditure, and savings in low-return assets rather than productive investment.

5.3 Policy Implications

Findings generate several policy recommendations for sustainable resource-led development in Kalimantan and similar contexts:

Revenue Management Reforms: Establishing district-level sovereign wealth funds, modeled on successful examples like Alaska Permanent Fund, could reduce volatility and ensure intergenerational equity. Current Indonesian regulations lack mandatory savings mechanisms for resource revenues, creating procyclical spending patterns.

Spatial Coordination Mechanisms: Negative spillovers indicate the need for formal inter-district cooperation frameworks. Regional development agencies pooling resources from multiple districts could finance shared infrastructure and coordinate industrial policies, transforming competitive into cooperative dynamics. The

planned Nusantara capital region provides an opportunity for implementing such frameworks.

Fiscal Diversification Incentives: Central government transfer formulas should reward revenue diversification rather than extraction volume. Current Dana Bagi Hasil (revenue sharing) formulas incentivize production maximization without considering sustainability or diversification efforts.

Capacity Building Investments: The strong fiscal capacity effects suggest high returns to investments in local government administrative quality, public financial management systems, and participatory budgeting processes. Technical assistance programs should prioritize these institutional fundamentals over sector-specific interventions.

Environmental Fiscal Reform: Internalizing environmental externalities through green taxation or environmental service payments could address negative spatial spillovers and provide resources for ecological restoration. Currently, environmental damage costs remain externalized, creating systematic underinvestment in sustainability.

5.4 Limitations and Future Research

This study's limitations suggest avenues for future research. First, data constraints limit analysis to 2020-2024, missing longer-term cycles spanning decades. Future research with extended time series could examine resource depletion effects and assess whether current patterns persist or evolve. Second, the fiscal capacity index aggregates multiple dimensions but may obscure specific institutional mechanisms. Qualitative case studies examining budget processes, procurement systems, and political economy dynamics could complement quantitative findings. Third, environmental and social costs remain incompletely captured in GDP-based measures. Research incorporating natural capital accounting, health impacts, and subjective well-being would provide a more comprehensive development assessment.

The spatial analysis employs administrative boundaries as units, but economic and ecological processes transcend these artificial divisions. Future studies using continuous spatial analysis or river basin units could better capture actual resource extraction impacts. Finally, the global energy transition creates an uncertain future for coal-dependent regions. Research examining diversification strategies, just transition policies, and alternative development pathways becomes increasingly urgent as international coal demand declines.

6. Conclusion

This study provides empirical evidence that extractive industries in East and North Kalimantan generate complex and spatially heterogeneous impacts on fiscal capacity and economic growth. While resource revenues contribute positively to local budgets and demonstrate modest direct growth effects, these benefits are substantially constrained by institutional weaknesses, limited fiscal capacity mediation, and negative spatial spillovers between districts. The documented pattern—where resource-rich districts experience volatile growth trajectories and neighboring districts face competitive disadvantages—suggests that current governance arrangements inadequately transform resource wealth into inclusive, sustainable development.

The 23.6% fiscal capacity mediation rate indicates that approximately three-quarters of the extractive revenue's impact on growth occurs through channels unrelated to productive fiscal

expenditure, raising concerns about governance quality and revenue management. Simultaneously, the negative spatial lag coefficient reveals that regional development operates as a competitive rather than a cooperative process, with growth in one district potentially undermining neighbors' prospects.

These findings carry significant implications as Indonesia pursues economic transformation and capital relocation to Kalimantan. Without fundamental reforms in resource revenue management, fiscal coordination mechanisms, and institutional capacity building, the region risks perpetuating extractive dependence and failing to leverage its resource endowment for broad-based prosperity. The transition from coal dependency, necessitated by global climate commitments, presents both challenge and opportunity: challenge in managing fiscal adjustments as coal revenues decline, opportunity to build diversified, resilient economic structures less vulnerable to commodity cycles.

Future development strategies must prioritize fiscal institution strengthening, regional cooperation frameworks, and economic diversification over extraction intensity maximization. The spatial analysis demonstrates that isolated district-level interventions prove insufficient; regional approaches recognizing interdependencies and spillovers are essential. As Kalimantan enters a new development phase with the Nusantara capital project, the lessons from resource-fiscal-growth dynamics documented here should inform evidence-based policymaking toward sustainable, equitable regional development.

References

1. Anselin, L. (2003). Spatial externalities, spatial multipliers, and spatial econometrics. *International Regional Science Review*, 26(2), 153–166. https://doi.org/10.1177/0160017602250972
2. Aragón, F. M., & Quispe, M. (2013). The local economic impacts of natural resource extraction. *American Economic Review*, 103(7), 3337–3367. https://doi.org/10.1257/aer.103.7.3337
3. Aragon, F. M., & Rud, J. P. (2013). Natural resources and local communities: Evidence from a Peruvian gold mine. *American Economic Journal: Economic Policy*, 5(2), 1–25. https://doi.org/10.1257/pol.5.2.1
4. Badeeb, R. A., Lean, H. H., & Clark, J. (2017). The evolution of the natural resource curse thesis: A critical literature survey. *Resources Policy*, 51, 123–134. https://doi.org/10.1016/j.resourpol.2016.10.015
5. Bahl, R., & Bird, R. M. (2018). *Fiscal decentralization and local finance in developing countries: Development from below*. Edward Elgar Publishing.
6. Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research. *Journal of Personality and Social Psychology*, 51(6), 1173–1182. https://doi.org/10.1037/0022-3514.51.6.1173
7. Besley, T., & Persson, T. (2014). Why do developing countries tax so little? *Journal of Economic Perspectives*, 28(4), 99–120. https://doi.org/10.1257/jep.28.4.99
8. Bornhorst, F., Gupta, S., & Thornton, J. (2009). Natural resource endowments and the domestic revenue effort. *European Journal of Political Economy*, 25(4), 439–446. https://doi.org/10.1016/j.ejpoleco.2009.01.003
9. Brollo, F., Nannicini, T., Perotti, R., & Tabellini, G. (2013). The political resource curse.
10. *American Economic Review*, 103(5), 1759-1796. https://doi.org/10.1257/aer.103.5.1759
11. Corden, W. M., & Neary, J. P. (1982). Booming sector and de-industrialisation in a small open economy. *Economic Journal*, 92(368), 825–848. https://doi.org/10.2307/2232670
12. Cust, J., & Harding, T. (2020). Institutions and the location of oil exploration. *Journal of the European Economic Association*, 18(3), 1321–1350. https://doi.org/10.1093/jeea/jvz028
13. Cust, J., & Poelhekke, S. (2015). The local economic impacts of natural resource extraction. *Annual Review of Resource Economics*, 7(1), 251–268. https://doi.org/10.1146/annurev-resource-100814-125106
14. Directorate General of Estates. (2024). *Tree crop estate statistics of Indonesia 2023-2025: Palm oil*. Ministry of Agriculture.
15. Elhorst, J. P. (2014). *Spatial econometrics: From cross-sectional data to spatial panels*. Springer.
16. Isham, J., Woolcock, M., Pritchett, L., & Busby, G. (2005). The varieties of resource experience: Natural resource export structures and the political economy of economic growth. *World Bank Economic Review*, 19(2), 141–174. https://doi.org/10.1093/wber/lhi010
17. Kotsadam, A., & Tolonen, A. (2016). African mining, gender, and local employment. *World Development*, 83, 325–339. https://doi.org/10.1016/j.worlddev.2016.01.007
18. Kurniawan, R., & Managi, S. (2018). Coal development and forest degradation: Evidence from Kalimantan, Indonesia. *Energy Policy*, 120, 283–293. https://doi.org/10.1016/j.enpol.2018.05.051
19. LeSage, J., & Pace, R. K. (2009). *Introduction to spatial econometrics*. CRC Press.
20. Mehlum, H., Moene, K., & Torvik, R. (2006). Institutions and the resource curse. *Economic Journal*, 116(508), 1–20. https://doi.org/10.1111/j.1468-0297.2006.01045.x
21. Ministry of Energy and Mineral Resources. (2024). *Indonesia Energy Outlook 2024*. Government of Indonesia.
22. Ministry of Finance. (2024). *Regional financial statistics 2020-2024*. Government of Indonesia.
23. Obidzinski, K., Andriani, R., Komarudin, H., & Andrianto, A. (2012). Environmental and social impacts of oil palm plantations and their implications for biofuel production in Indonesia. *Ecology and Society*, 17(1), 25. https://doi.org/10.5751/ES-04775-170125
24. Prayogo, D. (2019). Extractive industries and sustainable development goals in Kalimantan. *Resources Policy*, 64, 101522. https://doi.org/10.1016/j.resourpol.2019.101522
25. Resosudarmo, B. P., Napitupulu, L., Manning, C., & Warda, V. (2009). *Regional development in Indonesia: Patterns and issues*. In H. Hill (Ed.), *Regional dynamics in a decentralized Indonesia* (pp. 125–157). Institute of Southeast Asian Studies.
26. Robinson, J. A., Torvik, R., & Verdier, T. (2006). Political foundations of the resource curse. *Journal of Development Economics*, 79(2), 447–468. https://doi.org/10.1016/j.jdeveco.2006.01.008
27. Ross, M. L. (2001). Does oil hinder democracy? *World Politics*, 53(3), 325–361. https://doi.org/10.1353/wp.2001.0011

28. Rosser, A. (2007). Escaping the resource curse: The case of Indonesia. *Journal of Contemporary Asia*, 37(1), 38–58. https://doi.org/10.1080/00472330601104557

29. Sachs, J. D., & Warner, A. M. (1995). *Natural resource abundance and economic growth* (NBER Working Paper No. 5398). National Bureau of Economic Research.

30. Sachs, J. D., & Warner, A. M. (2001). The curse of natural resources. *European Economic Review*, 45(4-6), 827–838. https://doi.org/10.1016/S0014-2921(01)00125-8

31. Sala-i-Martin, X., & Subramanian, A. (2013). Addressing the natural resource curse: An illustration from Nigeria. *Journal of African Economies*, 22(4), 570–615. https://doi.org/10.1093/jae/ejt007

32. SKK Migas. (2024). *Oil and gas production data Indonesia 2024*. Special Task Force for Upstream Oil and Gas Business Activities.

33. Statistics Indonesia. (2024). *Regional statistics of East Kalimantan and North Kalimantan provinces 2024*. BPS-Statistics Indonesia.

34. Torvik, R. (2002). Natural resources, rent seeking, and welfare. *Journal of Development Economics*, 67(2), 455-470. https://doi.org/10.1016/S0304-3878(01)00195-X

35. van der Ploeg, F., & Poelhekke, S. (2009). Volatility and the natural resource curse. *Oxford Economic Papers*, 61(4), 727-760. https://doi.org/10.1093/oep/gpp027

36. Venables, A. J. (2016). Using natural resources for development: Why has it proven so difficult? *Journal of Economic Perspectives*, 30(1), 161–184. https://doi.org/10.1257/jep.30.1.161

37. World Bank. (2024). *Commodity markets outlook: October 2024*. World Bank Group.