

Article

The role of green economy in enhancing revenue growth in the renewable energy sector

Meutia Zahhara, Busra

Politeknik Negeri Lhokseumawe, Indonesia

Received : June 24th, 2026

Revised : July 26th, 2026

Accepted : August 18th, 2026

Corresponding Author :

Meutia Zahhara

Politeknik Negeri Lhokseumawe, Indonesia

Email : meutiazahhara29@gmail.com

Copyright © 2026 Jurnal Ekonomi Pembangunan & Pariwisata (JEPP), Faculty of Economics and Business, Universitas Palangka Raya. This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided that the original work is properly cited.

Keywords: local government expenditure; domestic investment; employment; real economic output; panel data

Abstract

Regional economic development depends on the interaction between public expenditure, private investment, and employment. This study examines the associations of local government expenditure, domestic investment, and employment with real economic output across 35 regencies and cities in Central Java Province, Indonesia, during 2019–2023. Secondary data comprised 175 observations and were analysed using a logarithmic fixed effects panel regression selected through Chow and Hausman tests. Economic output was measured using gross regional domestic product at constant 2010 prices. The results show that government expenditure, domestic investment, and employment were positively and statistically significantly associated with real output. Their estimated elasticities were 0.0251, 0.0116, and 0.2670, respectively. The reported model was statistically significant overall, with an R^2 of 0.9981 that includes the contribution of regional fixed effects. These findings support coordinated development policies that improve expenditure allocation, facilitate domestic investment, and strengthen employment opportunities. However, the dependent variable captures output levels rather than annual economic growth rates, and the observational design does not establish causality. Foreign investment was excluded because of data limitations. Future research should incorporate additional investment sources, distinguish expenditure composition, and examine common temporal shocks and potential endogeneity to strengthen understanding of regional economic performance and inform local policymaking.

Introduction

Indonesia's energy transition presents an important development challenge: meeting growing energy needs while reducing the environmental pressures associated with fossil fuel dependence. Coal remains central to discussions of the country's electricity system and transition priorities (Pahlevi, 2024). Reliance on fossil fuels raises concerns about greenhouse gas emissions and environmental pollution, reinforcing the need to examine alternatives that support both energy provision and environmental protection (Alvanis et al., 2024). These challenges extend beyond the availability of energy resources to include the economic conditions under which cleaner energy can be developed and commercialised.

The green economy provides a framework for connecting environmental objectives with economic development. The United Nations Environment Programme (UNEP, 2011) describes a transition towards lower-carbon, resource-efficient, and socially inclusive economic activity. Renewable energy is an important component of this transition because it can support changes in energy production while creating opportunities for investment and enterprise development. Andini et al. (2024) similarly place environmental sustainability and social welfare within discussions of the green economy. However, the green economy is a broad concept that cannot be represented fully by energy indicators alone. This study therefore focuses on two energy-related indicators rather than treating them as a comprehensive measure of green economic performance.

Indonesia's transition agenda provides the policy context for this investigation. Hermawan (2024) discusses the country's net-zero emissions ambitions, while the International Energy Agency's roadmap examines pathways towards achieving net-zero emissions by 2060 (IEA, 2022). This long-term objective requires changes in energy supply, infrastructure, investment, and consumption. It also raises questions about the financial performance of companies expected to participate in the transition. Environmental objectives may encourage renewable energy development, but the translation of that development into company revenue remains an empirical question.

Renewable energy development offers opportunities to diversify energy supply and reduce dependence on finite resources. Pangabea (2024) highlights its relevance to future energy needs, while Maidasari et al. (2023) discuss challenges surrounding the development of Indonesia's renewable energy potential. The distinction between resource potential and commercial deployment is important: abundant resources do not automatically result in operational projects or financially sustainable businesses. The *Indonesia Energy Transition Outlook* similarly examines possible energy pathways and the changes needed to support a broader transition (International Renewable Energy Agency, 2022).

Investment and institutional conditions influence whether these opportunities become commercially viable. Yustika (2024) discusses concerns relating to investment conditions, contractual arrangements, and procedural transparency. Such issues are relevant because renewable energy projects require financing and arrangements through which production can generate revenue. Changes in the energy mix may signal a more supportive environment for renewable energy, but company outcomes may also depend on project implementation, sales arrangements, and operational conditions. Consequently, sectoral development and corporate financial outcomes should be examined as related but distinct phenomena.

The relationship between renewable energy development and revenue warrants particular attention. Ningsih (2024) connects green economic development with financial opportunities in the renewable energy sector. Nevertheless, revenue and profit are different outcomes. Higher sales do not necessarily indicate improved profitability because costs, financing obligations, and other expenses also affect financial results. The present study therefore concentrates specifically on company revenue and does not interpret it as a direct measure of profitability, environmental performance, or overall corporate sustainability.

The new and renewable energy mix represents the relative contribution of these energy sources within the energy system covered by the indicator. Its association with company revenue may reflect changes in market opportunities and the broader conditions supporting renewable energy activity. However, interpretation depends on whether the measure is defined at the national, sectoral, or company level. A national indicator describes a shared operating context, whereas a company-specific measure captures differences between businesses. The geographical and organisational scope of the indicator must therefore remain explicit when interpreting the empirical results.

Electricity-equivalent production provides a complementary operational perspective by expressing production in a comparable energy unit. Greater production may create opportunities for additional revenue, but production and sales are not necessarily identical. The relationship may vary with realised selling prices, contractual arrangements, and the composition of company activities. Moreover, the meaning of electricity-equivalent production depends on a consistent conversion method and reporting boundary. Examining production alongside the energy mix enables the study to consider operational activity and transition-related conditions within a common analytical framework.

The research problem thus concerns the connection between energy transition indicators and company-level revenue. The literature cited above establishes the importance of renewable energy, policy support, and investment conditions, but these considerations do not independently demonstrate how the selected indicators relate to revenue among listed companies. This study addresses that question through a panel analysis, without claiming that the broader green economy has been fully measured or that the estimated relationships establish causality.

Accordingly, this study examines the associations of the new and renewable energy mix and electricity-equivalent production with revenue among six renewable energy companies listed on the Indonesia Stock Exchange, using 30 observations. Its contribution is to connect energy-related indicators with a clearly defined corporate financial outcome. The findings are intended to inform discussion of renewable energy business development and transition policy, while recognising the limited company coverage and the distinction between national energy progress and individual company performance.

Literature Review

Green Economy and Corporate Environmental Strategy. The green economy connects economic activity with environmental protection and social welfare. Rather than treating environmental quality as separate from development, this perspective emphasises how production, investment, and resource use can support more sustainable outcomes. Yanti et al. (2024) discuss the importance of policy support and stakeholder participation in this transition. In the present study, the green economy provides the broader context, while the empirical analysis focuses specifically on energy-related indicators and company revenue.

The natural-resource-based view provides a more direct connection to corporate activity. [Hart \(1995\)](#) argues that firms' relationships with the natural environment can shape capabilities and competitive advantage. Environmental challenges may therefore influence operational practices, investment priorities, and opportunities for business development. This perspective supports examining renewable energy companies as economic actors participating in environmental transition, without assuming that their activities automatically generate superior financial outcomes.

The resource-based view similarly explains why companies operating in the same sector may achieve different outcomes. [Barney \(1991\)](#) emphasises differences in firm resources as a basis for competitive advantage. Renewable energy companies may differ in technological expertise, access to finance, project portfolios, and commercial relationships. These differences suggest that a favourable energy transition environment need not translate into equivalent revenue gains across firms.

Dynamic capabilities extend this reasoning by considering firms' ability to integrate and reconfigure competencies under changing conditions. [Teece et al. \(1997\)](#) provide a basis for understanding how companies adapt to technological and market developments. Their perspective suggests that the financial relevance of energy transition opportunities may depend on organisational responses. However, the present study does not measure these capabilities directly, so they serve as explanatory context rather than tested variables.

[Porter and van der Linde \(1995\)](#) further argue that appropriately designed environmental regulation can stimulate innovation and resource productivity. Their argument does not imply that every environmental policy increases revenue. Instead, it identifies a potential mechanism through which regulatory change can encourage firms to improve processes and pursue new opportunities. Revenue, profitability, and resource efficiency remain distinct outcomes requiring separate measurement.

Renewable Energy and Commercial Development. Renewable energy originates from sources replenished through natural processes, including sunlight, wind, water flows, biomass, and geothermal resources. [Silitonga and Ibrahim \(2020\)](#) discuss these sources, while [Azhar and Satriawan \(2018\)](#) highlight the relevance of geographical conditions to their utilisation. Renewable resources differ in availability, technological requirements, and operating characteristics, which can influence their commercial development.

Renewable energy should not be described as entirely free from pollution or environmental effects. The Intergovernmental Panel on Climate Change ([IPCC, 2022](#)) assesses energy technologies using lifecycle considerations, recognising emissions and impacts associated with manufacturing, construction, operation, and other stages. Its mitigation assessment supports the importance of lower-emission energy systems while retaining distinctions between technologies and contexts.

Technology costs also affect commercial feasibility. The International Renewable Energy Agency's report on generation costs examines differences and developments across renewable technologies ([IRENA, 2024](#)). Cost competitiveness can support deployment, but generation costs are not equivalent to selling prices or company revenue. A technically competitive project still requires operational delivery and arrangements through which energy is sold.

Innovation provides another connection between policy and deployment. [Johnstone et al. \(2010\)](#) examine renewable energy policies and technological innovation, showing the relevance of policy design to technology development. [Popp \(2010\)](#) reviews environmental innovation and diffusion in relation to climate policy. These contributions support considering technological change as part of the transition process, although neither should be interpreted as direct evidence that a particular energy indicator increases company revenue.

New and Renewable Energy Mix. The new and renewable energy mix measures the contribution of the energy sources included in its definition to a specified energy total. Its interpretation depends on the numerator, denominator, geographical scope, and reporting period. A share of primary energy supply, for example, differs from a share of electricity generation. The grouping of "new and renewable energy" must also follow the classification used in the dataset rather than being assumed identical to renewable electricity.

A higher share may indicate broader deployment and changing market conditions. However, it is not a direct measure of company sales or environmental performance. [Wüstenhagen and Menichetti \(2012\)](#) explain how energy policy influences strategic renewable energy investment choices, supporting the relevance of the wider policy environment to business decisions. ScienceDirect

[Polzin et al. \(2015\)](#) examine public policy and renewable energy investment across OECD countries. Their analysis provides an investment-related explanation for why supportive conditions

can matter to deployment. [Kitzing et al. \(2012\)](#) further document variation in renewable energy support instruments, indicating that similar transition objectives may be pursued through different policy arrangements. These studies inform the proposed mechanism but do not directly establish a relationship with Indonesian company revenue. The International Energy Agency's *Renewables 2023*, published in 2024, also distinguishes deployment trends from issues affecting renewable energy companies, competitiveness, and system integration ([IEA, 2024](#)). This distinction reinforces the need to examine whether broader energy developments correspond to financial outcomes at company level.

Electricity-Equivalent Production. Electricity-equivalent production expresses energy production using a common electricity-based unit. Its usefulness depends on transparent conversion factors and consistent reporting boundaries. It should be distinguished from installed capacity, which measures potential production capability, and from electricity sold, which measures commercial delivery. Where companies report different energy products, conversion can improve comparability only when the underlying procedures are compatible.

Production creates an opportunity to generate revenue, but the relationship depends on whether output is delivered and recognised as sales. Contractual arrangements and remuneration mechanisms are therefore important. [Couture and Gagnon \(2010\)](#) examine feed-in tariff remuneration models, demonstrating how payment structures can shape renewable energy investment conditions. Their analysis supports distinguishing physical production from the commercial arrangements determining its financial value. ScienceDirect

[Mitchell et al. \(2006\)](#) similarly consider price, volume, and balancing risks when comparing renewable electricity support mechanisms. These risks help explain why equal production volumes may not produce equal revenue across firms or periods. Consequently, electricity-equivalent production is an operational indicator whose financial relevance requires empirical assessment rather than an assumption of automatic conversion into income. ScienceDirect

Company Revenue. Company revenue concerns income generated through ordinary business activities and recognised under the applicable accounting framework. The International Accounting Standards Board's revenue standard addresses the nature, amount, timing, and uncertainty of revenue from contracts with customers ([IASB, 2014](#)). This provides a conceptual basis for distinguishing revenue recognition from physical production and cash receipts; it does not establish the specific accounting policies adopted by each sampled company. ifrs.org

Revenue must also be distinguished from profit, economic growth, and environmental performance. Profit incorporates expenses, while national economic growth concerns changes in aggregate real output. Neither can be inferred directly from company revenue. Accordingly, the present study evaluates revenue among sampled listed companies rather than claiming to measure the financial performance of Indonesia's entire renewable energy sector.

The interpretation also depends on whether the dependent variable represents total company revenue or revenue specifically attributable to renewable energy activities. For diversified companies, total revenue may include activities not captured by the production indicator. Consistent segment boundaries are therefore important when assessing the proposed relationships.

Hypothesis Development

New and Renewable Energy Mix and Company Revenue. An increasing new and renewable energy share may coincide with expanding opportunities for companies supplying energy and related services. The proposed mechanism operates through deployment, investment, and market development rather than through the energy share mechanically generating revenue. Research on strategic investment and policy support provides a basis for considering this connection ([Wüstenhagen & Menichetti, 2012](#); [Polzin et al., 2015](#)).

Companies must nevertheless possess the resources and organisational capacity to respond to these opportunities. The resource-based and natural-resource-based perspectives indicate that firms differ in their ability to translate environmental developments into business outcomes ([Barney, 1991](#); [Hart, 1995](#)). Policy design and market arrangements may further affect the extent to which broader deployment corresponds to commercial opportunities.

If the energy mix is measured nationally, it represents a shared annual context rather than a company-specific characteristic. Its coefficient may therefore reflect other developments occurring over the same period, requiring cautious interpretation. The hypothesis is formulated as a non-directional association, consistent with the original research question and the absence of a guaranteed positive revenue mechanism.

H1: The new and renewable energy mix is significantly associated with revenue among the sampled companies.

Electricity-Equivalent Production and Company Revenue. Electricity-equivalent production represents operational output that may support sales. When additional output is commercially delivered under comparable pricing and contractual conditions, greater production would generally be expected to correspond to higher revenue. However, remuneration structures influence the value associated with production, while price and volume risks can alter the observed relationship (Couture & Gagnon, 2010; Mitchell et al., 2006).

Revenue recognition provides an additional distinction. Physical output does not necessarily correspond to revenue in the same reporting period, and total company revenue may include activities outside the production measure (IASB, 2014). Differences in business models, reporting boundaries, and sales arrangements therefore make the relationship an empirical question.

The second hypothesis consequently retains the original non-directional formulation. This allows the analysis to assess whether production contributes statistically to explaining revenue without assuming that physical output alone determines financial outcomes.

H2: Electricity-equivalent production is significantly associated with revenue among the sampled companies.

Methods

Research Design and Data. This study employed a quantitative panel-data approach to examine the associations of the new and renewable energy mix and electricity-equivalent production with company revenue in Indonesia. The study covered six companies during 2020–2024, yielding 30 company-year observations.

The sample comprised PT Barito Renewables Energy Tbk, PT Pertamina Geothermal Energy Tbk, PT Arkora Hydro Tbk, PT Semacom Integrated Tbk, PT Kencana Energi Lestari Tbk, and PT Terregre Asia Energy Tbk. Historical observations refer to the companies' reporting records and do not imply that all six companies were listed throughout the observation period. Secondary data were collected through documentation of Statistics Indonesia publications, electricity statistics published by the Ministry of Energy and Mineral Resources, IESR reports, and company annual reports and financial statements available through corporate websites and the Indonesia Stock Exchange. Academic publications informed the theoretical framework rather than serving as substitutes for the underlying company-year data.

Variable Measurement. The dependent variable was company revenue. The explanatory variables were the new and renewable energy mix and electricity-equivalent production. Table 1 summarises their operational scope.

Table 1. Operational Scope of the Study Variables

Variable	Operational scope
Company revenue	Annual revenue reported in company financial statements
New and renewable energy mix	Annual share of new and renewable energy in the energy aggregate specified by the source
Electricity-equivalent production	Annual energy production expressed in a consistently defined electricity-equivalent unit

Source: Study variable definitions.

Revenue was distinguished from net profit because the two represent different financial outcomes. Revenue figures require a common currency and scale across companies and years. Similarly, production observations require consistent conversion factors and reporting boundaries. The energy-mix indicator must specify whether it measures primary energy supply, electricity generation, or another aggregate.

Model Specification and Estimation. Panel regression was conducted using EViews 12. Where the energy-mix measure represents a national annual indicator, the empirical relationship is expressed as:

$$REV_{it} = \alpha + \beta_1 MIX_t + \beta_2 PROD_{it} + u_{it}$$

Individual hypotheses were evaluated using coefficient significance tests, while a joint test assessed whether both slope coefficients equalled zero. Statistical significance was assessed at the 5% level. The estimates were interpreted as associations rather than causal effects.

If the energy mix is national, its variation comes from only five annual values shared across the companies. Repeating these values across companies does not create 30 independent observations of national energy conditions. Moreover, unrestricted year fixed effects would absorb this indicator completely. Model selection and inference must therefore account for its level of measurement and potential common annual influences.

Result and Discussion

The analysis used a balanced panel of six companies observed during 2020–2024, comprising 30 company-year observations. The results are presented sequentially through descriptive statistics, the reported panel specification, diagnostic assessments, regression estimates, and overall model fit.

Descriptive Statistics. Descriptive statistics summarise the distribution of company revenue, the new and renewable energy mix, and electricity-equivalent production. Table 2 presents the central tendency, range, and dispersion of the variables used in the analysis.

Table 2. Descriptive Statistics of the Study Variables

Statistic	Company revenue (Y)	New and renewable energy mix (X1)	Electricity-equivalent production (X2)
Mean	25.19167	12.14600	10.72000
Median	24.54500	12.30000	10.80000
Minimum	21.80000	9.15000	10.00000
Maximum	28.57000	14.68000	11.50000
Standard deviation	2.35302	1.86150	0.56593
Observations	30	30	30

Source: Supplied EViews 12 output.

Company revenue averaged 25.19167 on the reported scale, with observations ranging from 21.80000 to 28.57000. Its standard deviation was 2.35302. These figures describe variation in the recorded revenue measure but do not independently establish that company revenue was high or low in economic terms.

The energy-mix indicator averaged 12.14600, ranging from 9.15000 to 14.68000. If expressed as a percentage share, its standard deviation of 1.86150 represents percentage points. Electricity-equivalent production averaged 10.72000 and ranged from 10.00000 to 11.50000. Its values should not be interpreted as percentages unless the variable definition explicitly specifies that unit. Following the descriptive assessment, panel regression was used to examine the relationships between these indicators and company revenue.

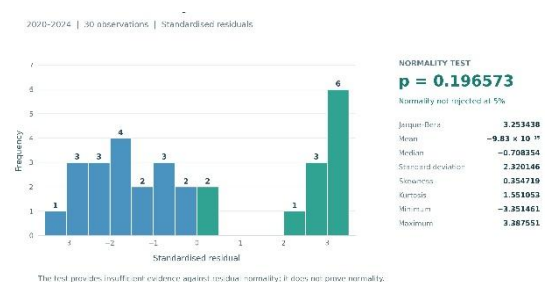
Reported Panel Specification. The supplied regression results were obtained using a random effects model. However, model-selection statistics were not included in the available results, so the preference for random effects over pooled or fixed effects cannot be independently assessed from the supplied information. The following sections therefore present and interpret the reported random effects estimates. Before examining the coefficients, residual diagnostics and the association between the explanatory variables were assessed.

Residual Normality. The residual normality assessment is presented in Figure 2. The reported probability was compared with the 5% significance threshold.

Fig 2.

Residual Distribution and Normality Test

Source: Supplied EViews 12 output.



The normality test returned a p-value of 0.196573. The null hypothesis of normally distributed residuals was therefore not rejected. This finding provides no statistically significant evidence against residual normality under the reported test; it does not establish that all regression assumptions were satisfied. The remaining diagnostic assessments examined the correlation between the explanatory variables and whether absolute residuals were systematically associated with either variable.

Multicollinearity and Heteroskedasticity Assessments. Table 3 combines the available multicollinearity screening and heteroskedasticity results. The latter assessment regressed absolute residuals on the explanatory variables using a random effects specification.

Table 3. Multicollinearity and Heteroskedasticity Diagnostic Results

Diagnostic	Variable or comparison	Reported result	Interpretation at the 5% level
Pairwise correlation screening	Energy mix and electricity-equivalent production	$r = 0.779309$	Below the adopted 0.80 screening threshold
Absolute-residual regression	Energy mix	$p = 0.8533$	Coefficient not statistically significant
Absolute-residual regression	Electricity-equivalent production	$p = 0.9775$	Coefficient not statistically significant

Source: Supplied EViews 12 output.

The correlation between the explanatory variables was 0.779309. Although below the adopted threshold of 0.80, it indicates a substantial positive association and lies close to that screening boundary. The result does not, by itself, rule out concerns about coefficient precision or all forms of multicollinearity. In the absolute-residual regression, neither explanatory variable had a statistically significant coefficient. These results provide no evidence that absolute residuals varied systematically with either regressor under the auxiliary specification. They should be interpreted as a diagnostic finding rather than conclusive proof that heteroskedasticity was absent. Following these assessments, the random effects coefficients were examined to evaluate the two research hypotheses.

Random Effects Estimates and Individual Hypothesis Tests. Table 4 presents the complete coefficient estimates, combining the regression and individual hypothesis-testing results to avoid duplication. Hypothesis decisions follow two-sided tests at the 5% significance level.

Table 4. Random Effects Regression Estimates and Hypothesis Decisions

Variable	Coefficient	Standard error	t-statistic	p-value	Hypothesis decision
Constant	30.617650	4.228073	7.241514	0.0000	—
New and renewable energy mix (X1)	0.493621	0.171184	2.883571	0.0076	H1 supported
Electricity-equivalent production (X2)	-1.065439	0.563071	-1.892192	0.0692	H2 not supported

Source: Supplied EViews 12 random effects output.

The energy-mix indicator exhibited a positive and statistically significant coefficient of 0.493621, with a p-value of 0.0076. Holding electricity-equivalent production constant, a one-unit increase in the energy-mix measure was associated with a 0.493621-unit increase in the dependent variable on its estimation scale. If the energy mix is recorded as a percentage, this change represents a one-percentage-point increase. The result supports H1.

Electricity-equivalent production exhibited a negative coefficient of -1.065439, but its p-value of 0.0692 exceeded 0.05. The evidence was therefore insufficient to establish an association at the adopted significance level, and H2 was not supported. The negative estimate should not be interpreted as demonstrating that additional production reduces company revenue.

The estimated systematic component of the regression was:

$$\widehat{Y}_{it} = 30.617650 + 0.493621X1_{it} - 1.065439X2_{it}$$

The constant represents the predicted dependent-variable value when both explanatory variables equal zero, with the random effect set to its expected value of zero. Because zero lies outside the observed ranges of both regressors, the intercept has limited substantive relevance.

The coefficients cannot be interpreted directly as percentage changes in revenue without confirming the dependent variable's transformation. In particular, the energy-mix coefficient does not establish a 49% revenue increase. The individual tests instead identify a significant positive association for the energy mix and an insignificant association for electricity-equivalent production. The analysis next assessed whether the explanatory variables were jointly significant and how closely the fitted specification represented the observed data.

Overall Model Significance and Fit. Table 5 consolidates the F-test and model-summary statistics, which were repeated across several tables in the original results.

Table 5. Overall Significance and Fit of the Random Effects Model

Indicator	Value
F-statistic	7.979012
Probability of F-statistic	0.001894
R ²	0.371479
Adjusted R ²	0.324922
Standard error of the regression	0.528398
Company-year observations	30

Source: Supplied EViews 12 output.

The F-test was statistically significant, with a p-value of 0.001894. The null hypothesis that both slope coefficients were zero was therefore rejected. This indicates that at least one explanatory variable contributed statistically to the fitted specification; it does not imply that both variables were individually significant.

The reported R² was 0.371479, equivalent to approximately 37.15%, while the adjusted R² was 0.324922, or approximately 32.49%. These statistics describe the fit reported for the random effects estimation. If drawn from EViews' weighted-statistics section, their interpretation concerns the transformed estimation data rather than a simple decomposition of raw company revenue. The remaining variation was not captured by the specification and cannot be attributed exclusively to omitted variables. Overall, the reported results identify a positive and statistically significant association between the energy mix and company revenue, while electricity-equivalent production was not significant at the 5% level. These findings remain conditional on the measurement definitions and the suitability of the reported random effects specification.

Discussion

The findings indicate that the new and renewable energy mix was positively associated with company revenue, whereas electricity-equivalent production did not exhibit a statistically significant association at the 5% level. This distinction suggests that transition-related conditions and physical production should be examined separately when assessing corporate financial outcomes. The results concern six sampled companies during 2020–2024 and should not be interpreted as a comprehensive evaluation of Indonesia's renewable energy sector.

New and Renewable Energy Mix and Company Revenue. The positive and statistically significant energy-mix coefficient supports H1. Within the estimated specification, higher values of the energy-mix indicator coincided with higher company revenue after accounting for electricity-equivalent production. This finding is consistent with the possibility that renewable energy deployment creates commercial opportunities, although the analysis does not identify the mechanisms responsible for the association.

The policy and investment literature provides a relevant explanation. [Wüstenhagen and Menichetti \(2012\)](#) examine how energy policy influences renewable energy investment decisions, while [Polzin et al. \(2015\)](#) investigate the relationship between public policy and renewable investment. These studies suggest that the conditions supporting deployment may also shape opportunities for companies. However, their investment-related findings do not independently establish that a higher energy share causes company revenue to increase.

The natural-resource-based view offers a complementary interpretation. [Hart \(1995\)](#) explains how firms' relationships with environmental challenges can shape capabilities and competitive opportunities. Companies participating in cleaner energy development may benefit when their resources and activities align with changing market needs. [Barney \(1991\)](#) and [Teece et al. \(1997\)](#) further suggest that firms differ in their ability to recognise and respond to such opportunities. These perspectives help explain why a shared transition environment may produce different outcomes across companies, but the present study does not directly measure organisational capabilities.

Innovation may also connect environmental policy with business development. [Porter and van der Linde \(1995\)](#) identify circumstances under which environmental regulation can encourage innovation and resource productivity, while [Johnstone et al. \(2010\)](#) examine policy-related innovation in renewable energy technologies. These mechanisms provide theoretical context rather than confirmed explanations for the reported revenue association.

Several interpretive boundaries remain important. First, revenue growth does not establish higher profit because expenses and financing obligations also affect profitability. Second, the estimated coefficient does not directly measure environmental improvement. Third, if the energy mix is a national annual indicator, its variation is shared across companies and derives from only five observed years. The coefficient may therefore capture other concurrent developments, including changes in energy demand, prices, or economic conditions. Accordingly, the result supports further investigation of the relationship between energy transition progress and corporate revenue. It does not establish the effectiveness of particular incentives or targets, since individual policies were not separately evaluated.

Electricity-Equivalent Production and Company Revenue. Electricity-equivalent production had a negative coefficient, but its p-value of 0.0692 exceeded the adopted 5% threshold. H2 was therefore not supported. The result provides insufficient evidence of an independent association within the sample; it does not demonstrate that additional production reduces revenue or that production is economically irrelevant.

Physical production and recognised revenue represent different stages of commercial activity. Production must be connected to sales, delivery arrangements, and applicable prices before its financial value can be established. [Couture and Gagnon \(2010\)](#) examine different renewable electricity remuneration models, illustrating the relevance of payment structures to commercial conditions. [Mitchell et al. \(2006\)](#) similarly consider price, volume, and balancing risks. These studies provide a basis for understanding why production volumes alone may not explain company revenue.

Revenue recognition introduces a further distinction. [IASB \(2014\)](#) addresses the timing and measurement of revenue from customer contracts, highlighting why physical output and recognised revenue need not coincide within the same reporting period. Moreover, if the dependent variable measures total company revenue while production covers only a particular energy activity, differences in reporting boundaries may weaken the observed relationship.

Technology costs and operational conditions may matter to financial performance, but they should not be used to explain this result without supporting data. [IRENA \(2024\)](#) documents generation-cost developments across renewable technologies; however, higher costs primarily concern expenses and profitability rather than directly determining revenue. The present model does not establish that inefficient operations, overproduction, or falling electricity prices caused the insignificant production coefficient.

The result also does not contradict production theory. Such a conclusion would require a clearly specified production–sales relationship, verified measurement units, and consideration of prices and other relevant conditions. Here, the analysis estimates a conditional association using a small observational panel rather than testing a complete theory of production and revenue. The correlation of 0.779309 between the explanatory variables provides an additional consideration. Although below the adopted screening threshold, this substantial association may limit the precision with which their separate relationships are estimated. It does not establish severe multicollinearity, but it reinforces the need to interpret the production coefficient alongside its uncertainty.

Integrated Interpretation and Practical Implications. The significant overall F-test indicates that the explanatory variables contributed jointly to the fitted specification, meaning that at least one slope coefficient differed from zero. It does not establish that both variables were individually significant or that they interacted. The reported R^2 of approximately 37.15% likewise describes model fit rather than the proportion of revenue causally attributable to the indicators.

Taken together, the findings support distinguishing transition-related opportunities from the commercial conversion of production into revenue. For company managers, this implies monitoring realised sales, contract conditions, reporting segments, and production alongside broader energy developments. Production expansion should be evaluated against the arrangements through which additional output can generate recognised revenue.

For policymakers, the results support attention to a predictable environment for renewable energy development, but do not identify a specific policy instrument as effective. The policy diversity discussed by [Kitzing et al. \(2012\)](#) indicates why deployment incentives, investment conditions, and revenue arrangements require separate evaluation. A positive energy-mix coefficient alone cannot determine which intervention should be expanded.

Interpretive Limitations. The small sample and five-year observation period limit estimation precision and generalisation. The appropriateness of the random effects specification also requires supporting model-selection evidence and consideration of whether unobserved company characteristics are correlated with the explanatory variables. Measurement uncertainty concerning revenue, electricity-equivalent production, and the scope of the energy-mix indicator further restricts substantive interpretation.

Future research should verify consistent measurement boundaries, expand company and temporal coverage, and incorporate selling prices, business segments, installed capacity, and contractual conditions. Where the energy-mix indicator is national, analysis should explicitly address shared annual variation and common shocks. These extensions would help distinguish broader transition conditions from company-specific mechanisms connecting production with revenue.

Conclusion

This study examined the associations of the new and renewable energy mix and electricity-equivalent production with revenue among six renewable energy companies in Indonesia during 2020–2024. The random effects estimates identified a positive and statistically significant association between the energy mix and company revenue, whereas electricity-equivalent production was not significant at the 5% level. The model was jointly significant, with a reported R^2 of 0.3715. These findings do not establish causal effects, increased profitability, or financial outcomes for the entire renewable energy sector. Interpretation is limited by the small sample of 30 observations, short observation period, exclusion of relevant financial and operational factors, and unresolved measurement details concerning revenue and production. If the energy mix is measured nationally, its variation across only five years further limits the independent information available for estimation. Future research should expand sample coverage, verify consistent reporting boundaries, and incorporate investment, selling prices, contractual arrangements, operating costs, and technological innovation. Policymakers should strengthen regulatory predictability, reduce unnecessary administrative barriers, and evaluate investment incentives against deployment and commercial outcomes, while company managers should align production expansion with sales opportunities and revenue arrangements.

References

- Arsyad, L. (2010). *Ekonomi pembangunan* (5th ed.). UPP STIM YKPN.
- Case, K. E., & Fair, R. C. (2007). *Principles of economics* (8th ed.). Pearson Prentice Hall.
- Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics* (5th ed.). McGraw-Hill/Irwin.
- Nariswara, Z. H. (2021). Analisis pengaruh jumlah penduduk, investasi (PMDN), dan belanja langsung terhadap pertumbuhan ekonomi di kabupaten/kota di Jawa Tengah tahun 2015–2019. *Jurnal Ilmu Ekonomi*, 5(3), 536–550.
- Nurmainah, S. (2013). Analisis pengaruh belanja modal pemerintah daerah, tenaga kerja terserap, dan indeks pembangunan manusia terhadap pertumbuhan ekonomi dan kemiskinan (studi kasus 35 kabupaten/kota di Provinsi Jawa Tengah). *Jurnal Bisnis dan Ekonomi*, 20(2), 131–141.
- Priambodo, A. (2017). Analisis pengaruh pendapatan asli daerah, belanja modal, tenaga kerja terhadap pertumbuhan ekonomi. *Economics Development Analysis Journal*, 4(1), 1–9.
- Rorimpandey, D. M., Engka, D. S. M., & Rorong, I. P. F. (2022). Pengaruh indeks pembangunan manusia, tenaga kerja dan investasi dalam negeri terhadap pertumbuhan ekonomi di Kabupaten Minahasa Utara periode 2006–2020. *Jurnal Berkala Ilmiah Efisiensi*, 22(6), 1–12.
- Sasana, H. (2012). Pengaruh belanja pemerintah daerah dan pendapatan perkapita terhadap indeks pembangunan manusia (studi kasus di kabupaten/kota di Provinsi Jawa Tengah). *Media Ekonomi dan Manajemen*, 25(1), 1–12.
- Setijawan, B., Anwar, N., & Suharno. (2021). Pengaruh investasi, tenaga kerja dan pengeluaran pemerintah terhadap pertumbuhan ekonomi di Provinsi Jawa Tengah. *J-MAS: Jurnal Manajemen dan Sains*, 6(2), 332–337.

- Simarmata, Y. W., & Iskandar, D. D. (2022). Pengaruh pengeluaran pemerintah, investasi, jumlah penduduk, kemiskinan terhadap pertumbuhan ekonomi dan indeks pembangunan manusia: Analisa two stage least square untuk kasus Indonesia. *Jurnal Dinamika Ekonomi Pembangunan*, 5(1), 78–94.
- Sukirno, S. (2011). *Makroekonomi: Teori pengantar* (3rd ed.). Rajagrafindo Persada.
- Yanti, S., Fadliyanti, L., & Manan, A. (2021). Pengaruh belanja modal, investasi PMDN dan investasi PMA terhadap pertumbuhan ekonomi kabupaten/kota di Provinsi NTB. *Ekonobis*, 7(1), 18–39.