

# Nunukan District Government Support Strategy to Increase the Contribution of Leading Industries Through Regional Product Optimization

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## ABSTRACT

**Purpose** – This study examines the effects of Government Support and Optimization of Regional Products on the Contribution of Leading Industries in Nunukan Regency, a strategic Indonesian border region facing infrastructure, financing, market-access, and product-development constraints.

**Design/methodology/approach** – The study employed an explanatory sequential mixed-methods design. Quantitative data were collected from 93 respondents consisting of MSME actors and local government representatives and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS. The quantitative findings were subsequently supported and contextualized through semi-structured interviews with 10 key informants comprising five local government representatives and five MSME actors.

**Findings/Results** – Government Support has a positive and significant effect on the Contribution of Leading Industries ( $\beta = 0.591$ ;  $t = 4.552$ ;  $p < 0.001$ ) and on Optimization of Regional Products ( $\beta = 0.575$ ;  $t = 8.360$ ;  $p < 0.001$ ). However, Optimization of Regional Products has a positive but non-significant effect on the Contribution of Leading Industries ( $\beta = 0.196$ ;  $t = 1.338$ ;  $p = 0.181$ ) and does not significantly mediate the relationship between Government Support and leading industries ( $\beta = 0.113$ ;  $t = 1.238$ ;  $p = 0.216$ ). Interview findings indicate that limited financing, weak market access, insufficient standardization, innovation constraints, and limited value-chain integration reduce the effectiveness of product optimization.

**Originality/Value** – The study provides evidence from a border-region context and highlights the need to integrate government support with certification, branding, financing, innovation, market expansion, and institutional collaboration to strengthen leading industries.

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## **1. Introduction**

Increasing the contribution of leading industries through the optimization of regional products has become an urgent issue in regional economic development, particularly for border areas such as Nunukan Regency. As a strategic border region between Indonesia and Malaysia, Nunukan has abundant local economic potential in agriculture, plantations, fisheries, mining, and small-scale manufacturing. However, this potential has not been fully transformed into strong industrial competitiveness and sustainable regional economic contribution. The urgency of this issue is reflected in the economic structure of Nunukan, where the Gr

oss Regional Domestic Product (GRDP) at current prices reached IDR 40.54 trillion in 2024, with economic growth of 4.03 percent compared to the previous year. This shows that Nunukan has a growing economic base, but stronger policy intervention is needed to ensure that regional products and leading industries contribute more significantly to inclusive local development (BPS Kabupaten Nunukan, 2025)

The phenomenon in Nunukan shows a clear gap between regional potential and its optimization. Local commodities such as Adan rice in Krayan, palm oil in Sebuk, cocoa and agricultural products in Sebatik, as well as fisheries products such as seaweed and tuna, have strong economic prospects. In the fisheries sector, for example, Nunukan produced 587,459 tons of seaweed in 2022 with an estimated value of IDR 1.3 trillion, indicating a large opportunity for downstream processing and value-added industries (Arfan, 2025). However, much of this potential is still constrained by limited processing capacity, weak market access, transportation barriers, financing limitations, and insufficient product diversification. These conditions indicate that the problem is not merely the availability of local resources, but the limited ability to optimize them into competitive regional products and leading industries.

Local government support is therefore a crucial factor in strengthening the contribution of leading industries. The government can intervene through licensing facilitation, infrastructure development, training, incentives, market access, product standardization, and the integration of local products into public procurement systems. In this context, Lembaga Kebijakan Pengadaan Barang/Jasa Pemerintah (LKPP, 2024) explains that the e-catalogue is not only a procurement platform but also an instrument to strengthen domestic products, expand market access for micro, small, and cooperative enterprises, and ensure that spending through the State Revenue and Expenditure Budget (APBN) and the Regional Revenue and Expenditure Budget (APBD) creates direct benefits for local economies.

In Nunukan, this policy direction has begun to appear through the inclusion of local MSME products in the local e-catalogue. In 2024, there were 1,905 local products from 162 providers across 29 storefronts in the Nunukan local e-catalogue. However, several storefronts remained empty, and the main challenge was not only placing products in the catalogue, but ensuring that these products were actually purchased by government institutions and connected to wider markets. This condition creates an empirical gap: government support instruments already exist, but their effectiveness in increasing the contribution of leading industries remains uncertain.

Previous studies have addressed regional products, industrial development, and government support from different perspectives. Setiajatnika and Astuti, (2022) emphasized the identification and development of superior products, Hsu and Chiang, (2001) highlighted government support for research and industrial development, Lall (2004) discussed policy support for reducing economic disparities, and Wibisono et al. (2019) examined superior product development in Jambi. However, limited research has examined how government support influences leading industries through Optimization of Regional Products in border regions such as Nunukan, where infrastructure, logistics, financing, market access, and cross-border competition remain major constraints.

The theoretical gap concerns whether Optimization of Regional Products effectively mediates the relationship between government support and leading industries. Although government support can strengthen resources, infrastructure, innovation, and market access, its impact may remain limited when local products are insufficiently diversified, standardized, processed, promoted, and integrated into wider markets. Therefore, this study integrates Government Support, Optimization of Regional Products, and the Contribution of Leading Industries in a single model, providing a contextual contribution from Nunukan Regency as a strategic border region.

This study employs a mixed-methods approach combining Structural Equation Modeling–Partial Least Squares (SEM-PLS) with qualitative interviews involving local government representatives and MSME actors. SEM-PLS examines the relationships among Government Support, Optimization of Regional Products, and the Contribution of Leading Industries, while interviews provide contextual insights into policy implementation, financing, market access, product development, and institutional collaboration. The study aims to assess the effects of Government Support and Optimization of Regional Products on leading industries and to test the mediating role of Optimization of Regional Products. The findings are expected to provide empirical evidence and policy recommendations for strengthening MSME competitiveness, market access, stakeholder collaboration, and regional economic development in Nunukan Regency.

## **2. Literature Review and Hypothesis Development**

### **2.1 Concept of Leading Industry**

Leading industries are strategic economic sectors that possess comparative and competitive advantages, contribute substantially to regional economic growth, generate employment opportunities, and serve as key drivers of regional specialization and industrial development (Pono et al., 2019). Leading industries are prominent economic sectors in a region, which have a competitive advantage compared to other regions, and are able to create strong and sustainable value chains (Isaksen & Trippel, 2014).

Leading industries refer to economic sectors that have the ability to create product differentiation, increase competitiveness, and provide significant economic impact for a region or country. Leading industries are economic sectors that have specialisation and a significant contribution to the economy of a country or region, and have high competitiveness in the global market.

## **2.2 Government Support**

Government support in economic research refers to policies and actions that aim to improve economic growth and public welfare, including fiscal incentives, subsidies, regulations, and infrastructure investments. Fagerberg and Srholec, (2016) explain that government support also involves investments in research, education, and technological infrastructure, as well as risk reduction and increased capital availability through tax incentives and pro-business regulations (OECD, 2024). In addition, Knudsen et al. (2015) added that the government focuses on infrastructure development, labour training, and trade promotion. Chen et al. (2019) also emphasised the importance of support in research, technology development, and encouraging private investment. Overall, government support aims to improve competitiveness and national economic growth (Shao & Wang, 2023).

## **2.3 Regional Products**

Regional products refer to goods, services, or economic activities developed by cooperatives, micro, small, and medium enterprises (MSMEs) based on local natural resources, human capital, cultural assets, and regional productive capabilities, which possess significant potential to drive regional economic growth and competitiveness (Setiajatnika & Astuti, 2022). These products are expected to increase community and government income, strengthen local economic resilience, and expand market opportunities at both national and international levels. Regional products are characterized by their ability to stimulate regional economic activity, maintain strong linkages with markets and raw material supply chains, sustain long-term competitiveness, and generate substantial economic and social benefits (Letelay et al., 2022). Furthermore, the development of regional products is closely associated with regional specialization, innovation, value-added creation, and the accumulation of endogenous capabilities that enhance industrial competitiveness, employment generation, and sustainable economic growth. By leveraging local assets, strengthening production networks, facilitating technological learning, and improving participation in regional and global value chains, regional products can become strategic drivers of regional development. Therefore, effective institutional support, government intervention, financial accessibility, market connectivity, product diversification, branding, and value-chain upgrading are essential to ensure that regional products contribute significantly to industrial development, economic resilience, and long-term regional prosperity (Huang et al., 2021; Oldfrey et al., 2021; Rault-Chodankar & Kale, 2023; Sanguinet & García-García, 2023; Torok et al., 2022).

## **2.4 State of The Art**

Previous studies have examined leading industries and regional products from different perspectives. (Setiajatnika & Astuti, 2022) identified superior products in Aru Islands Regency using the Growth Ratio Model (Model Rasio Pertumbuhan [MRP]), Study Area Growth Ratio (Rasio Pertumbuhan Wilayah Studi [RPS]), shift-share analysis, and Location Quotient (LQ), combined with Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis to formulate strategies for improving product quality, infrastructure, promotion, and community participation. (Hsu & Chiang, 2001) emphasized the role of government in supporting industrial research and development (R&D) through subsidies and private-sector involvement, while (Lall, 2004) highlighted government intervention through incentives, training, and industrial capability development to strengthen competitiveness and reduce income disparities. In Indonesia, (Wibisono et al., 2019) stressed the importance of incentives,

infrastructure, training, and local product promotion for leading processing industries. (Dabukke & Iqbal, 2014) showed that agricultural development policies in Thailand, India, and Japan strengthened commodity competitiveness, whereas (Letelay et al., 2022) applied the Simple Multi-Attribute Rating Technique (SMART) to identify regional products and found investment value to be the most sensitive criterion. Perdana et al. (2023) further confirmed that government financial support, infrastructure development, and market access contribute to business growth. Building on these studies, the novelty of this research lies in integrating Government Support, Optimization of Regional Products, and the Contribution of Leading Industries within a single model in Nunukan Regency. Unlike previous studies that mainly focused on superior product identification, sectoral competitiveness, or government support separately, this study examines how local government policies, incentives, training, infrastructure, financing, and market facilitation can optimize regional products and strengthen leading industries in a border region characterized by persistent infrastructure, financing, market access, product diversification, and competitiveness constraints.

## 2.5 Research Conceptual Framework

This research examines the strategies implemented by the Nunukan Regency government to increase the contribution of leading industries through the optimisation of regional products. It is important to understand the role and effectiveness of the government in supporting local economic growth and strengthening the industrial sector which is a regional advantage. The operational definitions and indicators used to measure Government Support, Optimization of Regional Products, and the Contribution of Leading Industries are presented in Table 1.

**Table 1.** Research Indicators

| Variable                      | Definition                                                                                                                          | Indicators                                     |                                                                       |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-----------------------------------------------------------------------|
| <b>Government Support (X)</b> | Efforts and policies provided by the government to support growth, development, and sustainability of specific sectors in a region. | 1. Business-supportive policies/regulations    | (Lall, 2004; Perdana et al., 2023; World Bank Group, 2025)            |
|                               |                                                                                                                                     | 2. Supporting infrastructure investments       | (World Bank Group, 2025; Wibisono et al., 2019; Perdana et al., 2023) |
|                               |                                                                                                                                     | 3. Supportive fiscal and tax incentives        | (Hsu & Chiang, 2001; Lall, 2004; Wibisono et al., 2019; OECD, 2024)   |
|                               |                                                                                                                                     | 4. Workforce training and development programs | (Lall, 2004; Wibisono et al., 2019; Perdana et al., 2023; OECD, 2024) |
|                               |                                                                                                                                     | 5. Quality of government service support       | (Perdana et al., 2023; World Bank Group, 2025; OECD, 2024)            |
|                               |                                                                                                                                     | 6. Empowerment of research and innovation      | (Hsu & Chiang, 2001; Lall, 2004;                                      |

|                                               |                                                                                                                   |                                                            |                                                                              |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------------------------------------------------------|
|                                               |                                                                                                                   |                                                            | Dabukke & Iqbal, 2014; UNIDO, 2024)                                          |
|                                               |                                                                                                                   | 7. Availability of access to financing                     | (Perdana et al., 2023; OECD, 2024; World Bank Group, 2025)                   |
| <b>Optimization of Regional Products (Z)</b>  | Efforts to enhance the quality, added value, and competitiveness of local products that are regional excellences. | 1. Product diversification                                 | (Setiajatnika & Astuti, 2022; Letelay et al., 2022; UNIDO, 2024)             |
|                                               |                                                                                                                   | 2. Product quality                                         | (Setiajatnika & Astuti, 2022; Wibisono et al., 2019; Dabukke & Iqbal, 2014)  |
|                                               |                                                                                                                   | 3. Marketing and promotion                                 | (Setiajatnika & Astuti, 2022; Wibisono et al. 2019; Perdana et al., 2023)    |
|                                               |                                                                                                                   | 4. Innovation and research                                 | (Hsu & Chiang, 2001; Lall, 2004; Dabukke & Iqbal, 2014; UNIDO, 2024)         |
|                                               |                                                                                                                   | 5. Partnerships and collaboration                          | (Hsu & Chiang, 2001; Perdana et al., 2023; OECD, 2024)                       |
| <b>Contribution of Leading Industries (Y)</b> | The role played by competitive industries in economic growth and regional development.                            | 1. Importance of leading industries                        | (Lall, 2004; Wibisono et al., 2019; UNIDO, 2024)                             |
|                                               |                                                                                                                   | 2. Contribution of leading industries to job creation      | (Lall, 2004; Wibisono et al., 2019; OECD, 2024; UNIDO, 2024)                 |
|                                               |                                                                                                                   | 3. Product quality from leading industries                 | (Setiajatnika & Astuti, 2022; Wibisono et al. , 2019; Dabukke & Iqbal, 2014) |
|                                               |                                                                                                                   | 4. Environmental impact of leading industries              | (UNIDO, 2024; OECD, 2024)                                                    |
|                                               |                                                                                                                   | 5. Contribution of leading industries to regional progress | (Lall, 2004; Wibisono et al., 2019; Perdana et al., 2023; UNIDO, 2024)       |

As shown in Table 1, Government Support covers policies, infrastructure, fiscal incentives, workforce development, public services, research and innovation, and financing access.

Optimization of Regional Products includes diversification, product quality, marketing, innovation, and partnerships, while the Contribution of Leading Industries is assessed through industrial importance, job creation, product quality, environmental impact, and regional development.

## **2.6 Hypothesis Development**

**H1: Government support has a positive effect on increasing the contribution of leading industries in Nunukan Regency.**

Optimization of Regional Products is expected to strengthen the contribution of leading industries by improving the competitiveness and added value of local products. Regional products are developed from local natural resources, human resources, and cultural advantages, and can become sources of regional economic strength when supported by product quality improvement, infrastructure, promotion, and community participation (Setiajatnika & Astuti, 2022). Letelay et al. (2022) further emphasize that superior products are characterized by uniqueness, competitiveness, financial potential, and their capacity to strengthen human resources.

This argument is relevant to Nunukan Regency, where high-value local commodities still require stronger diversification, standardization, processing, promotion, innovation, and market integration. Leading industries cannot rely solely on resource availability but also require value-added processing and stronger product competitiveness. Previous studies support this relationship: Wibisono et al. (2019) highlight the importance of incentives, infrastructure, training, and local product promotion; Dabukke and Iqbal (2014) show that development policies can strengthen commodity competitiveness; and Perdana et al. (2023) confirm that infrastructure, financial support, and market access contribute to business growth. Therefore, Optimization of Regional Products is expected to enhance the contribution of leading industries.

**H2: Optimization of Regional Products has a positive effect on increasing the contribution of leading industries in Nunukan Regency.**

This study further proposes that Optimization of Regional Products mediates the relationship between government support and the contribution of leading industries. Government support may not automatically improve industrial performance unless it is translated into better product quality, diversification, innovation, promotion, and market access. In this relationship, government support provides the enabling environment, while Optimization of Regional Products serves as the mechanism through which policy support is converted into stronger product competitiveness and industrial performance. This view is consistent with Lall (2004), who emphasizes the role of policy instruments in strengthening industrial capabilities, and Hsu and Chiang (2001), who show that government support becomes more effective when it promotes research, innovation, and private-sector involvement. Setiajatnika and Astuti (2022) and Letelay et al. (2022) likewise stress the importance of systematic strategies for strengthening regional product competitiveness.

The need to test this mediation is also supported by the research gap. Previous studies have generally examined superior products, sectoral competitiveness, or government support separately, while limited research has investigated how government support affects leading industries through Optimization of Regional Products, particularly in border regions. This

issue is especially relevant in Nunukan, where infrastructure limitations, logistics barriers, financing constraints, weak market access, and cross-border competition may reduce the effectiveness of existing support such as licensing facilitation, infrastructure development, training, incentives, market access, and local e-catalogue policies. Consequently, Optimization of Regional Products is expected to function as a mediating mechanism between government support and the contribution of leading industries.

**H3: Optimization of Regional Products mediates the effect of government support on increasing the contribution of leading industries in Nunukan Regency.**

Optimization of Regional Products is proposed as a mediator because government support is expected to strengthen industrial outcomes when it improves product competitiveness, added value, and market access. In Nunukan Regency, this mechanism is important because high-potential commodities remain constrained by processing, financing, transportation, market access, and diversification limitations. Previous studies support the roles of regional product development, government support, and industrial competitiveness (Hsu & Chiang, 2001; Lall, 2004; Setiajatnika & Astuti, 2022; Wibisono et al., 2019). However, limited research has examined these relationships simultaneously in a border-region context, justifying the mediating role of Optimization of Regional Products in this study.

### **3. Methodology**

#### **3.1 Research Design**

This study adopted an explanatory sequential mixed-methods design to examine the relationship between Government Support, Optimization of Regional Products, and the Contribution of Leading Industries in Nunukan Regency. In the first stage, quantitative data were collected and analyzed using SEM-PLS to test the structural relationships among the variables. In the second stage, qualitative interviews were conducted to explain, support, and contextualize the quantitative findings. The qualitative approach was used to obtain deeper information regarding government support strategies, MSME conditions, market access, financing constraints, and challenges in optimizing regional products. This design was selected because the study aimed not only to test the statistical relationships among variables, but also to understand why certain relationships, particularly the mediating role of Optimization of Regional Products, were not statistically significant.

#### **3.2 Population, Sampling Technique, and Sample Size**

Primary data were collected through questionnaires distributed to 93 respondents, consisting of MSME actors and representatives of the Nunukan Regency Local Government. Respondents were selected using purposive sampling because they were considered to have knowledge, experience, and direct involvement in the development of regional products and leading industries.

The adequacy of the sample size was evaluated using the inverse square root method proposed by Kock and Hadaya (2018), which is recommended for estimating minimum sample requirements in PLS-SEM based on statistical power and the expected strength of path coefficients. The calculation applied a significance level of 5% ( $\alpha = 0.05$ ), statistical power of 80%, and a minimum expected path coefficient of 0.30. A path coefficient of 0.30 was selected because it represents a small-to-moderate effect that is commonly considered acceptable in

social science and management research. Based on these assumptions, the minimum required sample size was 69 respondents. Therefore, the final sample of 93 respondents exceeded the minimum requirement and was considered adequate for estimating the structural model and conducting mediation analysis using SEM-PLS.

### **3.3 Research Variables and Measurement**

The research variables consisted of government support as the independent variable, Optimization of Regional Products as the mediating variable, and the contribution of leading industries as the dependent variable. Government support was measured through indicators of policy support, infrastructure, fiscal incentives, training, government services, innovation support, and access to financing. Optimization of Regional Products was measured through product diversification, product quality, marketing, innovation, and partnerships. Meanwhile, the contribution of leading industries was measured through industrial importance, job creation, product quality, environmental impact, and contribution to regional progress.

### **3.4 Data Collection Procedures**

In addition to the questionnaire, qualitative data were obtained through interviews with MSME actors and local government representatives to strengthen the interpretation of the quantitative findings. A total of 10 key informants participated in the interviews, consisting of 5 local government representatives and 5 MSME actors. The local government representatives were selected because of their involvement in policy formulation, MSME empowerment, infrastructure support, licensing facilitation, and regional product development programs. MSME actors were selected because they had direct experience in producing, marketing, and developing local products in Nunukan Regency. Each interview lasted approximately 30–45 minutes and was conducted using a semi-structured interview guide. The interviews explored government support strategies, Optimization of Regional Products, MSME constraints, market access, financing, innovation, partnerships, and the contribution of leading industries to regional economic development.

The interview data were analyzed descriptively using thematic analysis. The analysis process involved transcribing the interview results, identifying recurring themes, grouping responses based on the main research variables, and comparing qualitative findings with the quantitative SEM-PLS results. The qualitative data were used to support, explain, and contextualize the statistical findings, particularly the significant direct effect of Government Support and the non-significant mediation effect of Optimization of Regional Products.

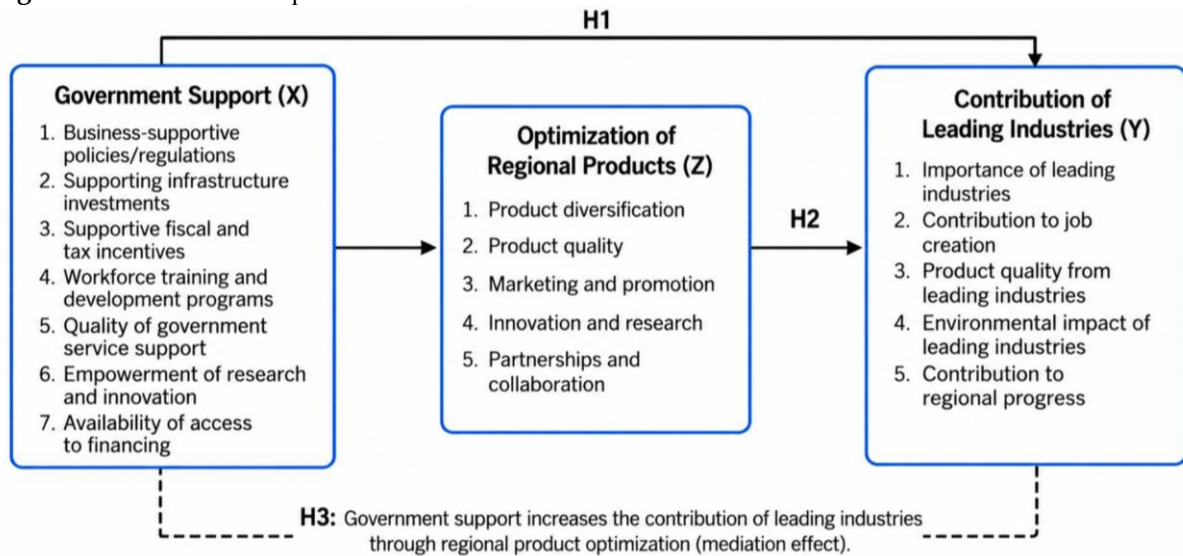
### **3.5 Ethical Considerations**

Participation in this study was voluntary. All respondents and interview informants were informed about the objectives of the study and provided their consent before data collection. The confidentiality and anonymity of participants were maintained throughout the research process, and the data were used solely for academic purposes.

### **3.6 Research Conceptual Framework**

Figure 1 presents the conceptual framework of the study. Government support is hypothesized to directly influence the contribution of leading industries and indirectly influence it through Optimization of Regional Products as a mediating variable.

**Figure 1.** Research Conceptual Framework



### 3.7 Data Analysis Technique

Data were collected through questionnaires and semi-structured interviews with MSME actors and local government representatives. Quantitative data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with SmartPLS by evaluating the measurement and structural models. The measurement model assessed validity and reliability using outer loadings, Average Variance Extracted, Composite Reliability, and Cronbach's Alpha (Kock & Hadaya, 2018), while the structural model tested direct and indirect effects using path coefficients, t-statistics, p-values, and bootstrapping. Qualitative interview data were analyzed thematically to explain empirical conditions, constraints, and strategic support needs.

Quantitative and qualitative findings were integrated during interpretation. SEM-PLS results identified significant and non-significant relationships, while interview findings helped explain the non-significant mediating role of Optimization of Regional Products between Government Support and the Contribution of Leading Industries. Key constraints included limited market access, weak product standardization, insufficient innovation capacity, limited partnerships, financing constraints, and weak value-chain integration. These findings indicate that government support contributes more directly to leading industry development, while product optimization has not yet functioned effectively as a transmission mechanism.

## 4. Result and Discussion

### 4.1 Data Management Analysis of Research Results

#### Primary Data and Sample Size (Respondents)

A total of 93 respondents participated in this study, consisting of 72 MSME actors (77.4%) and 21 local government representatives (22.6%). The respondents were selected using purposive sampling because they possessed direct experience and knowledge related to government support, Optimization of Regional Products, and the development of leading industries in Nunukan Regency. In terms of gender, 55.9% of respondents were male and 44.1% were female. Most respondents were between 31 and 40 years old (31.2%), followed by those aged

41–50 years (29.0%). Regarding educational background, the majority held a bachelor's degree (38.7%), while 31.2% had completed senior high school education. In terms of business or professional experience, most respondents had between 5 and 10 years of experience (37.6%), indicating that the respondents possessed sufficient knowledge and practical experience regarding regional economic development and MSME activities. The detailed characteristics of respondents are presented in Table 2.

**Table 2.** Respondent Characteristics

| Characteristics                 | Category                         | Frequency | Percentage (%) |
|---------------------------------|----------------------------------|-----------|----------------|
| <b>Respondent Type</b>          | MSME Actors                      | 72        | 77.4           |
|                                 | Local Government Representatives | 21        | 22.6           |
| <b>Gender</b>                   | Male                             | 52        | 55.9           |
|                                 | Female                           | 41        | 44.1           |
| <b>Age</b>                      | 20–30 years                      | 18        | 19.4           |
|                                 | 31–40 years                      | 29        | 31.2           |
|                                 | 41–50 years                      | 27        | 29.0           |
|                                 | >50 years                        | 19        | 20.4           |
| <b>Education Level</b>          | Senior High School               | 29        | 31.2           |
|                                 | Diploma                          | 18        | 19.4           |
|                                 | Bachelor's Degree                | 36        | 38.7           |
|                                 | Postgraduate Degree              | 10        | 10.7           |
| <b>Business/Work Experience</b> | < 5 years                        | 17        | 18.3           |
|                                 | 5–10 years                       | 35        | 37.6           |
|                                 | 11–15 years                      | 23        | 24.7           |
|                                 | > 15 years                       | 18        | 19.4           |

Source: Primary Data Processed, 2025.

Table 2 shows that most respondents were MSME actors (77.4%), supported by local government representatives (22.6%), providing perspectives from both business actors and policy implementers. Most respondents were aged 31–50 years (60.2%), held a bachelor's degree (38.7%), and had 5–10 years of business or professional experience (37.6%), indicating that the sample had sufficient practical experience and knowledge to assess government support, Optimization of Regional Products, and leading industry development in Nunukan Regency.

## 4.2 Description of Research Data Quality Test

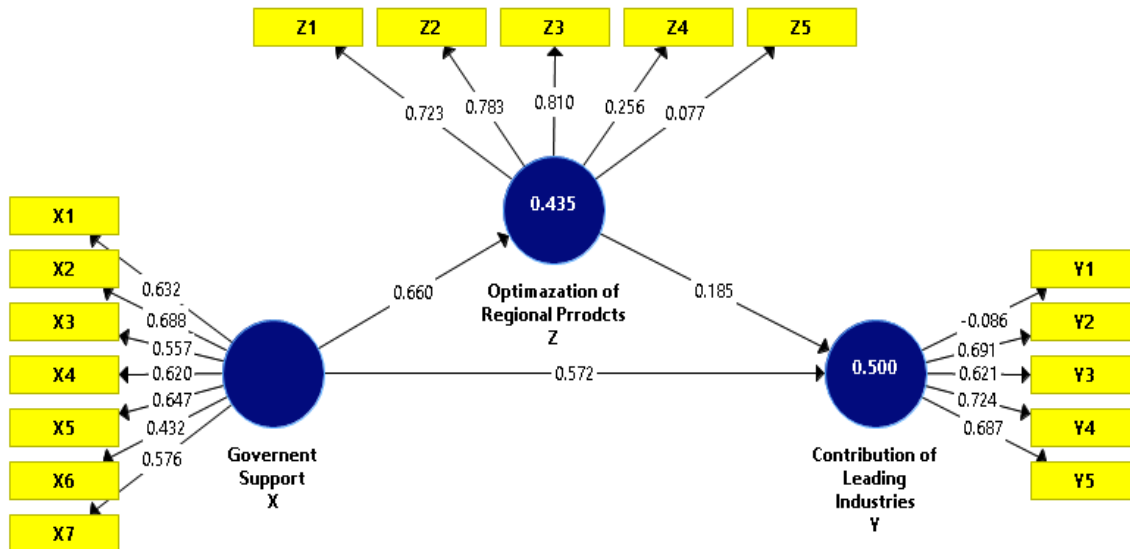
### Measurement (Outer) Model Evaluation

#### Convergent Validity

Convergent validity was assessed using outer loadings for the three constructs: Government Support, Optimization of Regional Products, and Contribution of Leading Industries. Following Hair et al. (2022), indicators with loadings below 0.50 were removed. Accordingly, X6 (0.432), Z4 (0.256), Z5 (0.077), and Y1 (-0.086) were excluded from the final model. This statistical elimination did not alter the theoretical meaning of the constructs. Optimization of Regional Products remained represented by product diversification, product quality, and marketing and promotion, which capture its core dimensions of improving product quality,

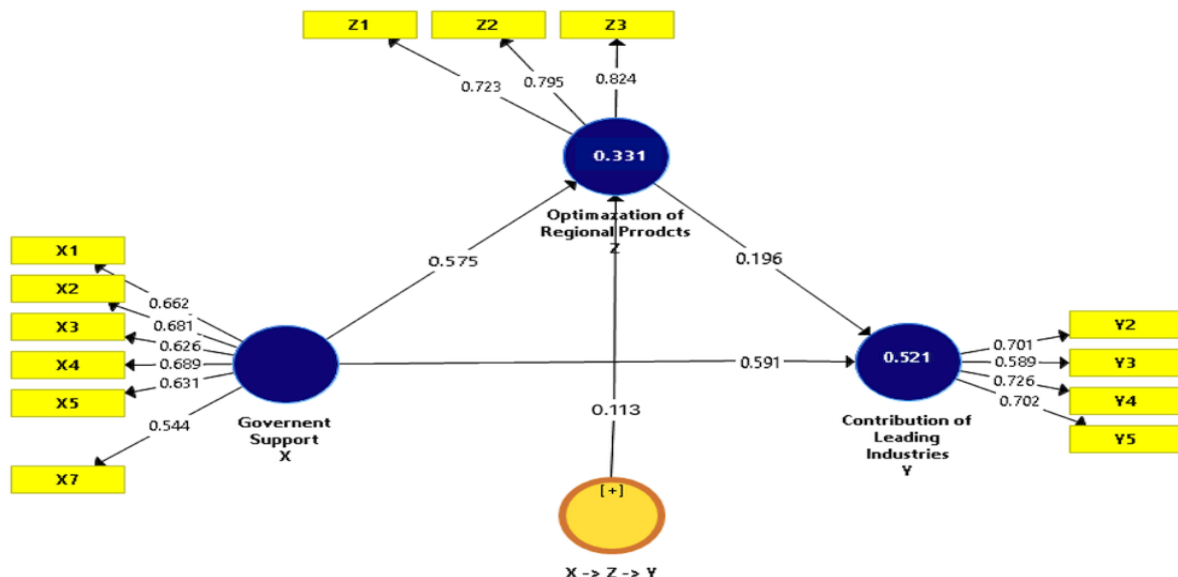
added value, competitiveness, and market linkage. Innovation, research, partnerships, and collaboration remain theoretically important but were treated as strategic recommendations rather than retained empirical indicators. After removal, all remaining indicators had loadings above 0.50, confirming satisfactory convergent validity.

Figure 2. Initial Test Model Outer Loadings



The processing results using SmartPLS show that several output indicators have met the requirements. Figure 2 shows the value of the output model or the correlation between constructs and variables that have met convergent validity because the distribution of loading factor values has a value above 0.50, indicating that all loading factors are valid.

Figure 3. Second Stage Test Model Outer Loading



As shown in Figure 3, the outer model value or the correlation between the construct and the variable initially meets convergent validity because the research model shows an output indicator that has met the requirements, with an indicator loading factor that is still above the standard ( $\geq 0.5$ ) for the latent variable being measured.

**Composite Reliability and Cronbach's Alpha**

In addition to testing construct validity, a construct reliability test is also carried out which is measured using composite reliability and Cronbach's alpha from the indicator block that measures the construct. The following are the results of the composite reliability test from SmartPLS. The reliability and convergent validity of the research constructs were further evaluated using Cronbach's Alpha, Composite Reliability, and Average Variance Extracted (AVE), as presented in Table 3.

**Table 3.** Composite Reliability dan Cronbach's Alpha

| Construct                                           | Cronbach's Alpha | Composite Reliability | AVE   |
|-----------------------------------------------------|------------------|-----------------------|-------|
| Government Support_X                                | 0,713            | 0,806                 | 0.513 |
| Optimization of Regional Products_Z                 | 0,682            | 0,825                 | 0.614 |
| Increasing the Contribution of Leading Industries_Y | 0,615            | 0,775                 | 0.539 |

Source: SmartPLS Processed Data, 2025

As shown in Table 3, all constructs met the reliability and convergent validity criteria, with Composite Reliability above 0.70 and AVE above 0.50. Although some Cronbach's Alpha values were relatively modest, they remained acceptable for exploratory research. All constructs met the reliability criteria, with Composite Reliability values above 0.70 and Cronbach's Alpha values above 0.60. Although the Cronbach's Alpha values for Optimization of Regional Products (0.682) and Contribution of Leading Industries (0.615) were relatively modest, they remained acceptable for exploratory and predictive research. Because Composite Reliability is more appropriate in PLS-SEM, the constructs were considered sufficiently reliable, although these results should be interpreted cautiously, particularly for mediation and policy implications. In addition, all Average Variance Extracted (AVE) values exceeded the recommended threshold of 0.50 (Hair et al., 2022), confirming adequate convergent validity and supporting the inclusion of all constructs in the structural model.

**Discriminant Validity**

Discriminant validity was assessed using the Heterotrait–Monotrait Ratio (HTMT), with values below 0.90 indicating adequate discriminant validity (Henseler et al., 2015). The results of the discriminant validity assessment are presented in Table 4.

**Table 4.** Heterotrait–Monotrait Ratio (HTMT)

| Construct                                | GS    | ORP   | CLI   |
|------------------------------------------|-------|-------|-------|
| Government Support (GS)                  | -     | 0.684 | 0.721 |
| Optimization of Regional Products (ORP)  | 0.684 | -     | 0.756 |
| Contribution of Leading Industries (CLI) | 0.721 | 0.756 | -     |

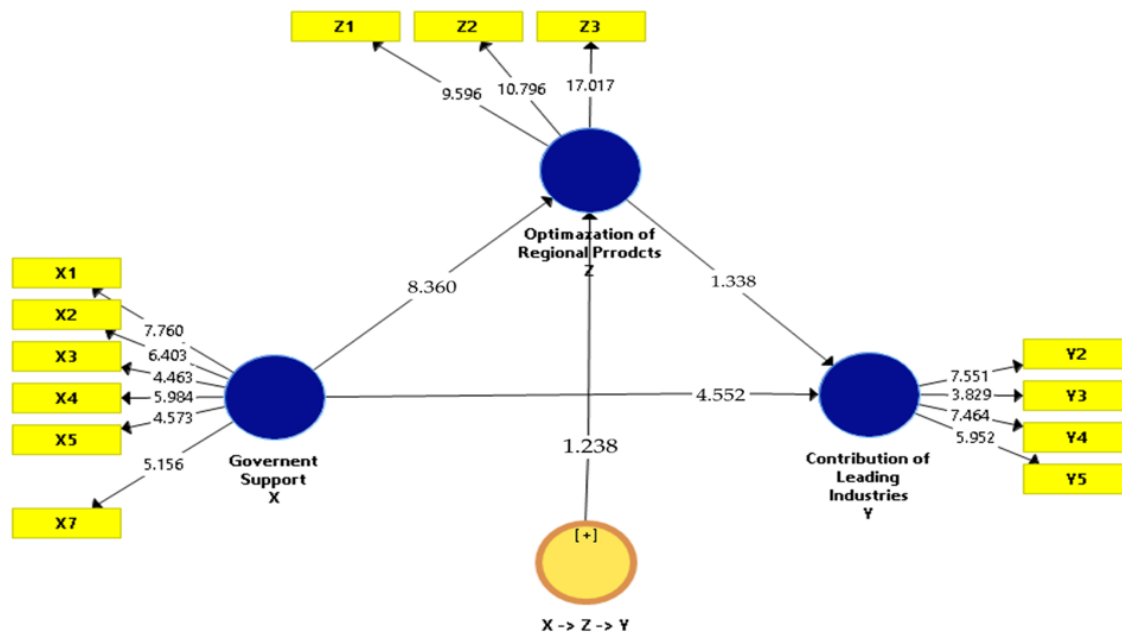
Source: SmartPLS Processed Data, 2025

All HTMT values ranged from 0.684 to 0.756, below the recommended threshold of 0.90 (Henseler et al., 2015), confirming satisfactory discriminant validity and indicating that Government Support, Optimization of Regional Products, and Contribution of Leading Industries are empirically distinct constructs.

### 4.3 Structural Model Testing (Inner Model)

Testing the Structural Model (Inner Model) Model significance tests using bootstrapping techniques with the results listed in direct effect (path coefficient) indirect effect (mediation effect) table in the SmartPLS results as shown below. The significance of the structural relationships among the constructs was assessed using the bootstrapping procedure. The results of the structural model estimation are presented in Figure 4.

Figure 4. Bootstrapping Structural Model (Inner Model)



As illustrated in Figure 4 and further summarized in Table 5, Government Support has a significant positive effect on both Optimization of Regional Products and the Contribution of Leading Industries. In contrast, the direct effect of Optimization of Regional Products on the Contribution of Leading Industries and its mediating effect are not statistically significant.

Table 5. Complete Mediation Analysis.

| Relationship                                                           | Effect Type   | Original Sample ( $\beta$ ) | Sample Mean | STDEV | T Statistics | 2.5% CI | 97.5% CI | P Values | Decision        |
|------------------------------------------------------------------------|---------------|-----------------------------|-------------|-------|--------------|---------|----------|----------|-----------------|
| Government Support → Optimization of Regional Products                 | Direct Effect | 0.575                       | 0.597       | 0.073 | 8.360        | 0.443   | 0.723    | 0.000    | Significant     |
| Optimization of Regional Products → Contribution of Leading Industries | Direct Effect | 0.196                       | 0.192       | 0.146 | 1.338        | -0.084  | 0.494    | 0.181    | Not Significant |

|                                                                                                    |                 |       |       |       |       |        |       |       |                 |
|----------------------------------------------------------------------------------------------------|-----------------|-------|-------|-------|-------|--------|-------|-------|-----------------|
| <b>Government Support → Contribution of Leading Industries</b>                                     | Direct Effect   | 0.591 | 0.604 | 0.130 | 4.552 | 0.326  | 0.853 | 0.000 | Significant     |
| <b>Government Support → Optimization of Regional Products → Contribution of Leading Industries</b> | Indirect Effect | 0.113 | 0.113 | 0.091 | 1.238 | -0.065 | 0.291 | 0.216 | Not Significant |

Confidence Interval Value Source: SmartPLS Processed Data, 2025

Table 5 shows that Government Support significantly affected Optimization of Regional Products ( $\beta = 0.575$ ,  $t = 8.360$ ,  $p < 0.001$ ) and the Contribution of Leading Industries ( $\beta = 0.591$ ,  $t = 4.552$ ,  $p < 0.001$ ). However, Optimization of Regional Products had no significant direct effect on the Contribution of Leading Industries ( $\beta = 0.196$ ,  $t = 1.338$ ,  $p = 0.181$ ), and its mediating effect was also non-significant ( $\beta = 0.113$ ,  $t = 1.238$ ,  $p = 0.216$ ). The model's explanatory power was assessed using the coefficient of determination ( $R^2$ ), with higher values indicating a greater proportion of explained variance, as presented in Table 6.

**Table 6.** coefficient of determination ( $R^2$ )

| Endogenous Variable                    | $R^2$ | $R^2$ Adjusted |
|----------------------------------------|-------|----------------|
| Optimization of Regional Products (Z)  | 0.116 | 0.107          |
| Contribution of Leading Industries (Y) | 0.521 | 0.510          |

Source: SmartPLS Processed Data, 2025

Government Support explained 11.6% of the variance in Optimization of Regional Products ( $R^2 = 0.116$ ), while Government Support and Optimization of Regional Products jointly explained 52.1% of the variance in the Contribution of Leading Industries ( $R^2 = 0.521$ ), indicating moderate explanatory power (Hair et al., 2022). This suggests that both constructs are important determinants of leading industry performance. The relative contribution of each predictor was further assessed using effect size ( $f^2$ ), as presented in Table 7.

**Table 7.** Effect Size ( $f^2$ )

| Relationship                                                           | $f^2$ | Effect Size     |
|------------------------------------------------------------------------|-------|-----------------|
| Government Support → Optimization of Regional Products                 | 0.131 | Small to medium |
| Government Support → Contribution of Leading Industries                | 0.286 | Medium          |
| Optimization of Regional Products → Contribution of Leading Industries | 0.314 | Medium          |

Source: SmartPLS Processed Data, 2025

The effect size ( $f^2$ ) results show that Government Support had a small-to-moderate effect on Optimization of Regional Products ( $f^2 = 0.131$ ) and a moderate effect on the Contribution of Leading Industries ( $f^2 = 0.286$ ), indicating that government policies and support mechanisms contribute meaningfully to Optimization of Regional Products and industrial performance. Optimization of Regional Products also showed a moderate effect on the Contribution of Leading Industries ( $f^2 = 0.314$ ), highlighting the strategic importance of product diversification,

quality improvement, marketing, innovation, and partnerships. Overall, Government Support remains the main significant driver of leading industry development, while Optimization of Regional Products is strategically important but has not yet demonstrated a statistically significant direct effect on the Contribution of Leading Industries. Predictive relevance was assessed using the Stone–Geisser  $Q^2$  criterion through blindfolding, where  $Q^2$  values greater than zero indicate predictive relevance. The results are presented in Table 8.

**Table 8.** Predictive Relevance ( $Q^2$ )

| Endogenous Variable                    | $Q^2$ |
|----------------------------------------|-------|
| Optimization of Regional Products (Z)  | 0.058 |
| Contribution of Leading Industries (Y) | 0.312 |

Source: SmartPLS Processed Data, 2025

The predictive relevance of the structural model was assessed using the Stone–Geisser  $Q^2$  criterion obtained through the blindfolding procedure. The results revealed  $Q^2$  values of 0.058 for Optimization of Regional Products and 0.312 for Contribution of Leading Industries. Since all  $Q^2$  values were greater than zero, the model demonstrates adequate predictive relevance.

The relatively higher  $Q^2$  value for Contribution of Leading Industries indicates that the model possesses satisfactory predictive capability in explaining future observations related to leading industries. These findings suggest that the proposed model not only explains the relationships among the constructs but also provides meaningful predictive insights regarding the role of government support and Optimization of Regional Products in strengthening leading industries within Nunukan Regency.

#### **4.4 Analysis of Informant Interview Results**

The following are the results of research obtained through observation and in-depth interviews with informants related to the development of leading industries in Nunukan Regency. This study reveals various factors that influence government support for the MSME sector, optimization of regional products, and the contribution of leading industries to regional progress. Through interviews with the Regional Government and MSME Actors, valuable information was found regarding policies, training programs, fiscal incentives, and challenges faced in increasing the competitiveness of local products and expanding markets. These findings provide important insights for analyzing the role of government support and leading industry development strategies in improving regional economic welfare.

Table 9 summarizes the core results of interviews with the Regional Government and MSME Actors regarding support for leading industries, optimization of regional products, and challenges faced in Nunukan Regency.

**Table 9.** Conclusion of Interview Answers from all Informants

| Informant        | Question                                                                                                                                              | Summary of Interview Responses from All Informants                                                                                                                                                                     |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Local Government | How does the local government support leading industries in Nunukan Regency, particularly through business regulations and infrastructure investment? | "The local government has implemented policies to simplify licensing regulations and build infrastructure such as roads. However, the biggest challenges are budget constraints and difficult access to border areas." |

|                    |                                                                                                                                          |                                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | What forms of fiscal incentives and workforce training programs are provided to support MSMEs?                                           | "Fiscal incentives include tax reductions for MSMEs. Entrepreneurship, digital marketing, and financial management training programs are organized in various districts. The challenge lies in MSMEs' lack of awareness about these incentives."         |
|                    | How does the local government promote research, innovation, and partnerships to optimize regional products?                              | "The local government promotes research and innovation through collaboration with universities and research institutions. They also encourage partnerships between MSMEs and large companies to facilitate broader market access."                       |
|                    | What are the main challenges faced by the local government in increasing the contribution of leading industries to regional development? | "The main challenges are limited access to financing for MSMEs and the low skill level of the workforce. Equal infrastructure distribution to remote areas is also a significant obstacle."                                                              |
|                    | How do local government support policies contribute to increasing the role of leading industries?                                        | "Policies focus on facilitating market access, business regulations, and building basic infrastructure. The local government also provides incentives for business actors based on local potential."                                                     |
|                    | Can government support optimize regional products in Nunukan Regency?                                                                    | "Government support is highly beneficial in optimizing regional products, including subsidies for agriculture and fisheries, as well as encouraging product diversification. The main challenges are market access and practical research applications." |
| <b>MSME Actors</b> | How do you assess the local government's support for developing your business?                                                           | "The training provided is very helpful, but the biggest difficulty is accessing financing. Strict administrative procedures and requirements make it hard for business actors to obtain capital assistance."                                             |
|                    | What are the main challenges you face in developing your business?                                                                       | "The main challenges are limited market access and a lack of product promotion. Although there is government support, business actors' markets are still restricted to the local level."                                                                 |
|                    | What challenges do you face in optimizing regional products, such as diversification and marketing?                                      | "Product diversification is essential but hindered by limited access to quality raw materials and unstable prices. Marketing local products is difficult without government support for promotion and online marketing."                                 |
|                    | What is your opinion on the contribution of leading industries to job creation and regional development?                                 | "Leading industries such as fishery and agricultural processing significantly contribute to job creation. However, MSME actors need more support in infrastructure, such as transportation and distribution facilities."                                 |
|                    | What should the local government do to support the                                                                                       | "The government should focus more on empowering research and innovation, as well                                                                                                                                                                         |

|  |                                                       |                                                                                                                                                                              |
|--|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | optimization of regional products in Nunukan Regency? | as providing deeper training on developing innovative products that meet global market demands. Partnerships with large companies for technology access are also important." |
|--|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Source: Primary data processed by the researchers from interviews with local government representatives and MSME actors in Nunukan Regency, 2025.

Analysis of interview results with the Regional Government and MSMEs in Nunukan Regency shows various views regarding support for leading industries and the challenges faced in optimizing regional products. The local government actively provides various policies and incentives, such as facilitating licensing, infrastructure development, and training programs for MSMEs. However, the local government also acknowledges that there are obstacles, such as budget constraints, the lack of understanding of MSMEs about existing incentives, and challenges in improving the skills of the workforce (MSME business actors). On the other hand, MSME actors appreciate the training provided by the government, but MSME actors face obstacles in terms of financing and limited market access. In addition, challenges in product diversification and marketing of local products are also significant issues. Therefore, even though there is sufficient support from the government, there is still a need to improve partnerships, research, innovation, and access to wider markets in order to optimize regional products and support the development of leading industries in Nunukan Regency.

#### **4.5 Discussion**

##### **The Influence of Government Support on Increasing the Contribution of Leading Industries in Nunukan Regency**

The results indicate that Government Support has a positive and significant effect on the Contribution of Leading Industries in Nunukan Regency ( $\beta = 0.591$ ;  $t = 4.552$ ;  $p < 0.001$ ). This finding suggests that government intervention plays a crucial role in strengthening the competitiveness and economic contribution of leading industries within the region. The relatively high path coefficient demonstrates that policy support remains one of the primary drivers of industrial development in Nunukan Regency.

The interview findings further reinforce this result. Local government representatives highlighted several forms of support that have been implemented, including licensing facilitation, infrastructure development, fiscal incentives, entrepreneurship training, and market access facilitation. MSME actors also acknowledged that government training programs have improved managerial and business capabilities, although challenges related to financing access and market expansion remain. These findings indicate that government support contributes not only through regulatory measures but also through capacity building and business development initiatives.

Among the dimensions of Government Support, indicators related to business-supportive regulations, infrastructure investment, workforce training, government service quality, fiscal incentives, and financing access appear to be particularly important in explaining the positive relationship with leading industries. These forms of support directly reduce operational barriers faced by MSMEs and local industries, enabling them to increase productivity, expand market reach, and improve business sustainability. In the context of Nunukan Regency, where geographical conditions and border-region characteristics often create logistical and

institutional constraints, government intervention becomes even more critical in facilitating economic activities and industrial growth.

The findings are consistent with Lall (2004), who emphasized that industrial competitiveness in developing regions depends heavily on government policies that strengthen industrial capabilities, provide incentives, and improve institutional support. Similarly, Hsu and Chiang (2001) argued that government support can enhance industrial performance through investments in research, development, and technological upgrading. The present study confirms these arguments by demonstrating that government support contributes directly to strengthening leading industries, particularly in a border-region economy characterized by infrastructure limitations, financing constraints, and market access challenges. Therefore, policy priorities should focus on strengthening regulatory support, expanding infrastructure development, improving financing access, and enhancing training and innovation facilitation to ensure that local industries can achieve sustainable growth and provide greater economic contribution to the region.

### **The Influence Optimization of Regional Product on Increasing the Contribution of Leading Industries in Nunukan Regency**

The results indicate that Optimization of Regional Products has a positive but statistically non-significant effect on the Contribution of Leading Industries in Nunukan Regency ( $\beta = 0.196$ ;  $t = 1.338$ ;  $p = 0.181$ ). Although the coefficient shows a positive direction, the p-value is greater than 0.05, indicating that the effect is not statistically significant. Therefore, Optimization of Regional Products cannot yet be concluded as a significant determinant of the contribution of leading industries in Nunukan Regency.

This finding suggests that efforts to improve product quality, diversification, marketing, promotion, innovation, and strategic partnerships may have a positive tendency in strengthening local product competitiveness, but these efforts have not yet produced a measurable and significant impact on the contribution of leading industries. In other words, Optimization of Regional Products remains important, but its implementation in Nunukan Regency may still be insufficient to significantly transform local product potential into stronger leading industries.

The interview findings help explain this non-significant result. Both local government representatives and MSME actors emphasized the importance of product diversification, quality improvement, and market expansion in enhancing the competitiveness of local products. However, several constraints remain, including limited access to financing, inadequate product promotion, unstable raw material availability, and restricted access to broader markets. These constraints indicate that Optimization of Regional Products has not yet operated effectively as a strong mechanism for increasing the contribution of leading industries. Its effectiveness still depends on the capacity of business actors to transform local resources into competitive products with higher added value.

The non-significant effect can also be understood from the economic characteristics of Nunukan Regency as a border region with abundant natural resources and distinctive local commodities, including fisheries, agriculture, plantations, and food-processing products. These resources provide strong potential for industrial development. However, potential alone is not sufficient to increase leading industries. Industrial competitiveness depends on

the ability of local producers to consistently improve product quality, diversify production, strengthen branding, obtain certification, and access wider domestic and international markets. Without these supporting factors, the optimization of regional products may remain limited to product development and promotion, but may not yet significantly increase leading industries.

This finding is partly consistent with Setiajatnika and Astuti (2022), who argue that regional products can become a major source of local economic strength when supported by product quality improvement, infrastructure development, promotion, and community participation. However, the present study shows that in Nunukan Regency, these supporting factors have not yet been strong enough to make Optimization of Regional Products significantly affect the contribution of leading industries. Similarly, Letelay et al. (2022) found that superior regional products can contribute to regional economic development because they possess unique characteristics, competitive advantages, and the potential to generate financial benefits. Nevertheless, the current findings indicate that such potential does not automatically translate into a significant leading industries unless it is supported by stronger market access, innovation capacity, production continuity, institutional collaboration, and business competitiveness.

Thus, the results of this study do not reject the importance of Optimization of Regional Products. Rather, they show that Optimization of Regional Products in Nunukan Regency is still in a strengthening stage and has not yet become an effective direct driver of leading industries. From a policy perspective, development programs should not only focus on identifying and promoting local products, but also on strengthening product quality, certification, innovation, branding, market access, financing support, and collaboration among MSMEs, research institutions, government, and the private sector. These efforts are necessary to ensure that local products generate greater value-added and contribute more substantially to regional economic development.

### **The Influence of Government Support on Increasing the Contribution of Leading Industries through Optimization of Regional Products in Nunukan Regency**

The results show that Optimization of Regional Products does not significantly mediate the relationship between Government Support and the Contribution of Leading Industries in Nunukan Regency. The indirect effect is positive but non-significant ( $\beta = 0.113$ ;  $t = 1.238$ ;  $p = 0.216$ ), indicating that the mediating pathway remains empirically weak.

This result is explained by the direct effects. Government Support significantly influences both the Contribution of Leading Industries ( $\beta = 0.591$ ;  $t = 4.552$ ;  $p = 0.000$ ) and Optimization of Regional Products ( $\beta = 0.575$ ;  $t = 8.360$ ;  $p = 0.000$ ), whereas Optimization of Regional Products has a positive but non-significant effect on the Contribution of Leading Industries ( $\beta = 0.196$ ;  $t = 1.338$ ;  $p = 0.181$ ). Thus, government support contributes more directly to leading industry development, while Optimization of Regional Products has not yet become an effective mechanism for translating policy support into stronger leading industries.

The interview findings reinforce this interpretation and indicate an implementation gap between policy support and product-based industrial transformation. Government support mainly operates through licensing facilitation, infrastructure provision, training, fiscal incentives, market access, and MSME assistance, which strengthen operational capacity.

However, these interventions have not yet been fully translated into stronger product standardization, certification, branding, innovation, financing access, production continuity, market expansion, and institutional partnerships. Limited financing, unstable raw materials, inadequate promotion, weak branding, and restricted market access further constrain the ability of Optimization of Regional Products to generate a significant indirect effect.

This finding is consistent with Setiajatri and Astuti (2022), who emphasize that regional products require improvements in product quality, infrastructure, promotion, and community participation, and with Letelay et al. (2022), who highlight the economic potential of competitive regional products. However, the present results show that this potential does not automatically translate into stronger leading industries without more integrated market access, innovation, certification, production capacity, and institutional collaboration. Therefore, the non-significant mediation should not be interpreted as evidence that Optimization of Regional Products is unimportant; rather, it indicates that local government support must be more systematically linked to product standardization, certification, branding, innovation, financing, market expansion, supply-chain integration, and collaboration among government, MSMEs, research institutions, and the private sector.

## **5. Conclusion and Suggestion**

This study provides strong empirical evidence that Government Support is a key driver of leading industry development in Nunukan Regency. Government Support has a positive and significant effect on the Contribution of Leading Industries ( $\beta = 0.591$ ;  $t = 4.552$ ;  $p = 0.000$ ) and also significantly strengthens Optimization of Regional Products ( $\beta = 0.575$ ;  $t = 8.360$ ;  $p = 0.000$ ). However, Optimization of Regional Products has a positive but non-significant effect on the Contribution of Leading Industries ( $\beta = 0.196$ ;  $t = 1.338$ ;  $p = 0.181$ ) and does not significantly mediate the relationship between Government Support and the Contribution of Leading Industries ( $\beta = 0.113$ ;  $t = 1.238$ ;  $p = 0.216$ ). These findings indicate that government support currently contributes more directly to leading industry development, while Optimization of Regional Products has not yet become an effective transmission mechanism. Therefore, product optimization still needs stronger standardization, certification, innovation, branding, financing access, production continuity, market expansion, supply-chain integration, and institutional collaboration to transform local product potential into stronger and more sustainable leading industries.

The Suggestion based on these findings, the local government of Nunukan Regency should strengthen direct support for MSMEs and leading industries through licensing facilitation, infrastructure development, fiscal incentives, training, mentoring, and market access. This recommendation is supported by the quantitative results showing that Government Support significantly affects the Contribution of Leading Industries. Government support should also be linked to Optimization of Regional Products through product diversification, product quality improvement, marketing and promotion, product standardization, certification, packaging improvement, branding, digital marketing, financing access, supply-chain strengthening, and market expansion. These strategies are consistent with the retained quantitative indicators of Optimization of Regional Products, namely product diversification, product quality, and marketing/promotion. Recommendations related to innovation, research collaboration, partnerships, certification, and wider market integration should be understood as practical policy directions mainly supported by the qualitative interview findings.

Therefore, stronger collaboration among local government, MSMEs, universities, research institutions, private actors, financial institutions, distributors, and market intermediaries is needed to transform local products into competitive and high-value products that contribute more strongly to leading industry development in Nunukan Regency.

This study has several limitations. The research was conducted only in Nunukan Regency, a border region with specific economic, institutional, and market characteristics, so the findings may not be fully generalizable to other regions. The use of cross-sectional data also limits the ability to capture the long-term effects of government support and Optimization of Regional Products, especially because product standardization, certification, branding, innovation, and market expansion may require time before producing measurable industrial outcomes. In addition, several indicators were removed due to low loading values, which may affect the empirical representation of Optimization of Regional Products, particularly aspects related to innovation and partnerships. Although this study used a mixed-methods approach, the qualitative findings were mainly used to support and contextualize the quantitative results, so future studies should involve more diverse informants and deeper qualitative analysis. Future research should also include other relevant variables, such as entrepreneurial capability, access to finance, infrastructure readiness, technology adoption, market competition, export orientation, human resource capacity, institutional coordination, and value-chain integration, to develop a more comprehensive model of leading industry development in border regions.

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### **Declaration of AI and AI-assisted Technologies in the Writing Process**

During the preparation of this manuscript, the authors used ChatGPT by OpenAI to assist in improving language clarity, sentence structure, grammar, and academic writing style. The tool was used only to support the writing and editing process, without replacing the authors' intellectual contribution, data analysis, interpretation of results, or final conclusions.

After using this AI-assisted tool, the authors carefully reviewed, revised, and edited the content to ensure its accuracy, originality, and suitability for academic publication. The authors take full responsibility for all content, findings, interpretations, and conclusions presented in this manuscript.

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