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THE ROLE OF LEADING SUBSECTORS ON PROVINCIAL OWN-SOURCE REVENUE IN EASTERN INDONESIA WITH ARCHIPELAGIC CHARACTERISTICS IN 2015 – 2023

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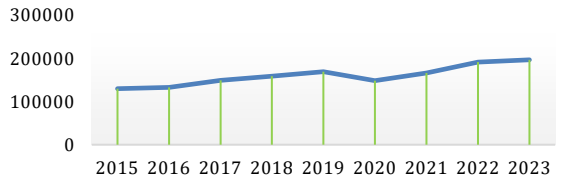
ABSTRACT

To increase regional fiscal independence and achieve regional development goals in the Eastern Indonesia (KTI) in the era of fiscal decentralization, own-source revenue (PAD) is one source of regional revenue that is important to optimize based on regional economic potential. Thus, this research aims to analyze the leading subsectors and the influence on provincial PAD in KTI with archipelagic characteristics in 2015 – 2023. By overlaying location quotient and shift share analysis, eight leading subsectors in KTI with archipelagic characteristics were obtained. Next, the seven leading subsectors outside the public administration and defence, compulsory social security subsector analyzed by panel data regression with a fixed effect model, state that the five leading subsectors including crop and animal production, hunting and related service activities; fishing and aquaculture; other mining and quarrying; construction; and education have a significant effect, while the wholesale and retail trade and repair of motor vehicles and motorcycles and the air transport do not have a significant effect on the provincial PAD in KTI with archipelagic characteristics in 2015 - 2023. Therefore, the provincial government is expected to prioritize leading subsectors that have a significant positive influence to be developed in optimizing the provincial PAD in KTI with archipelagic characteristics.

1. INTRODUCTION

In the era of the "Decade of Action", where the world is urged to accelerate the achievement of the Sustainable Development Goals (SDGs) by 2030, the role of subnational governments becomes crucial through the SDG localization strategy (ADB, 2023). This is further reinforced by the UNESCAP (2021) report, which reveals that the Asia-Pacific region is projected to achieve only about 10 percent of the SDG targets, a concerning assessment. Subnational governments, operating under the principle of decentralization, including fiscal decentralization, are responsible for supporting regional development (Kusuma, 2016). However, limitations in funding sources often hinder the optimal implementation of development and governance at the local level. As noted by Riyono (2020), fiscal decentralization aims to foster regional self-reliance because allocations from the central government cannot be fully relied upon to cover all regional expenditures. Therefore, it is necessary to enhance fiscal decentralization on the revenue side, particularly through optimizing Own-Source Revenue (PAD) from local taxes, retributions, profits from regional-owned enterprises (BUMD), and other revenue sources (Law No. 23 of 2014).

Chart 1. Aggregate PAD realization of provincial governments in 2015 – 2023 (billion rupiah)

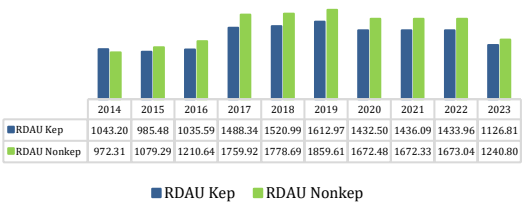


Source: DJPK Kemenkeu RI (2024)

Based on Chart 1, the aggregate PAD realization of provincial governments in Indonesia tended to increase during the period 2015 to 2019. However, PAD experienced a decline in 2020 due to the Covid-19 pandemic which paralyzed almost all economic sectors. Then, PAD rose again until the end of 2023, forming an increasing trend. This indicates an increase in the independence of provincial governments in Indonesia.

Basically, the division of government affairs between the center and regions, especially provinces, aims to implement the principle of decentralization of regional autonomy in order to equalize regional development and to achieve public welfare throughout the territory of the Unitary State of the Republic of Indonesia (NKRI). As an archipelagic country, Indonesia has 15 provinces with archipelagic characteristics or around 44 percent of the total 34 provinces according to the provisions of Law No. 23 of 2014 based on the proportion of the sea area. However, there is still inequality between regions which can be caused by the vastness of Indonesia as the largest archipelagic country in the world. In addition, the development of areas with archipelagic characteristics is often left behind due to difficult geographical conditions, insufficient DAU, and difficult education and health services (Ginting, 2013).

Chart 2. Average provincial DAU (block grant) with archipelagic and non-archipelagic characteristics 2014 – 2023 (billion rupiah)



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
RDAU Kep	1043.20	985.48	1035.59	1488.34	1520.99	1612.97	1432.50	1436.09	1433.96	1126.81
RDAU Nonkep	972.31	1079.29	1210.64	1759.92	1778.69	1859.61	1672.48	1672.33	1673.04	1240.80

Source: DJPK Kemenkeu RI (2024)

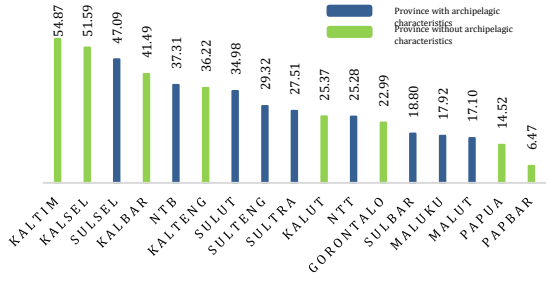
Based on Chart 2, the average of provincial DAU experienced an increasing trend during the 2014 – 2019 period, but decreased in the following period. In addition, the average allocation of provincial DAU (block grant) in 2023 was the lowest in the last six years. This is due to the reformulation of the 2023 State Budget policy based on the Regulation of the Minister of Finance No. 211/PMK.07/2022 concerning the allocation of DAU whose use is determined (specific grant/DAU earmarked), namely continuing the salaries of government employees with work agreements (P3K); improving regional public services in the fields of education, health, and public works; and supporting the public service sector in the form of funding for sub-districts. Previously, the DAU formula was only a block grant or had not been determined for its use, which was solely to accommodate flexibility for the fiscal needs of regional governments in accordance with regional autonomy (DPR RI, 2023).

Although the disparity in DAU (block grant) allocation between the two provincial characteristics appear small and maintained during the period, the provinces with archipelagic characteristics believe that the DAU allocation has not been able to overcome the backwardness of regional development so that the DAU allocation regulation needs to be reviewed. Moreover, those provinces want a separate law that regulates the archipelagic region (Iqbal, 2020; Maulana, 2017; Muryono, 2020).

According to Presidential Regulation No. 2 of 2015, the Eastern Indonesia including Kalimantan, Sulawesi, Nusa Tenggara, Maluku, and Papua is one of the regions of Indonesia which has the largest maritime economic potential and has become the focus of the government in efforts to accelerate equitable and strategic areas development by exploring the potential and advantages of the region accompanied by

industrial development. However, behind the great potential of the marine economy, the disparity of regional government income still occurs between the provinces with and without archipelagic characteristics in KTI through the PAD ratio.

Chart 3. Average PAD ratio of provincial governments in Eastern Indonesia in 2015 – 2023 (percent)

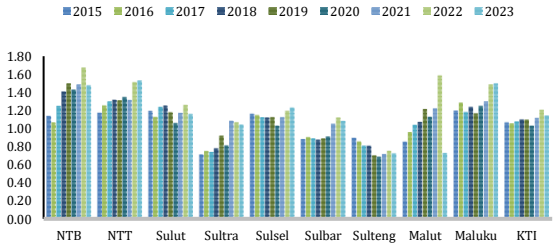


Source: DJPK Kemenkeu RI (2024)

Based on Chart 3, all KTI provinces with archipelagic characteristics have low financial capacity (25 - 50 percent) or even very low (below 25 percent) throughout 2015 - 2023. The existence of disparities in the PAD ratio between provincial governments in KTI is a problem because the role of the economic sectors had not been able to increase PAD realizing the regional fiscal independence. This also shows the provinces in KTI with archipelagic characteristics as the center of blue economic development unable to run effectively. In addition, increasing PAD for autonomous regions is an indicator of the success of implementing regional autonomy, so this is important to be discussed.

In optimizing PAD, it is necessary to know the size of the regional tax ratio or the comparison of regional taxes to the income of a regional economy or gross regional domestic product (GRDP) (DJPK Kemenkeu RI, 2011). GRDP will describe the amount of potential income that can be taxed by considering the economic activities of the community that are developing in a region. This regional tax ratio will also show what types of taxes are potential from the regional economic sector and assess the condition of a region compared to other regions.

Chart 4. Tax ratio of provincial governments in KTI with archipelagic characteristics in 2015 – 2023 (percent)



Source: DJPK Kemenkeu RI (2024)

Based on Chart 4, the regional tax ratio of each province in KTI with archipelagic characteristics did not exceed two percent or had an average of only around 1,10 percent throughout 2015 - 2023. This figure shows that provincial tax revenues in KTI with archipelagic characteristics are still low and far from the target of the Indonesian Ministry of Finance who states that the ideal regional tax ratio is three percent (Pratama, 2022). Therefore, one of the efforts needed to optimize provincial PAD in KTI with archipelagic characteristics is through identifying regional leading economic sectors which are the driving force of the regional economy and have an impact on regional income.

Studies on the identification of leading sectors in Indonesia have been widely conducted. However, most of the results of these studies only take into account comparative advantages or examine the regional economic base using location quotient analysis (Hashfi, 2023; Muljanto, 2021). According to Wibisono et al. (2019), leading sectors must not only have comparative advantages, but must also have competitive advantages. In his study, the leading sectors were captured by overlaying the location quotient and classic shift-share analysis.

Determining leading sectors is important for regional development planning because it can create policies that are in line with regional potential and accelerate regional economic growth through the opportunities and authorities it has (Nuraeni, 2019). The relationship between economic growth through the role of leading sectors and PAD which has a regional tax component can be approached by the theory of Peacock & Wiseman which states that under normal circumstances, economic growth will increase tax collection even though tax rates remain the same so that government spending also increases (Ningrum, 2020). The results of studies conducted by Adriyani (2018); Akhadi (2020); Dewinta & Asmara (2022); Valentino & Juwita (2023); and Winjaya & Taufiq (2023) indicate that leading sectors have a significant relationship with PAD.

Thus, this research seeks to explore the impact of leading sectors on the provincial PAD, using data from provinces with archipelagic characteristics in Eastern Indonesia (KTI) over a nine-year period from 2015 to 2023. Furthermore, to achieve more precise optimization, detailed economic subsector classifications are required. Therefore, this study utilizes Indonesia as the reference region, categorizing the economic sector into 29 subsectors aligned with the two-digit codes of the 2020 Indonesian Standard Industrial Classification (KBLI). The findings are anticipated to offer policymakers in valuable insights for optimizing PAD and to enhance the literature on regional financial management in the context of revenue.

2. LITERATURE REVIEW

2.1. Economic Base Theory

The economic base theory is an early concept or idea of regional economic development (Hashfi, 2023). Before this theory was formulated by economists, base activities were first observed by Pieter De La Court in 1659 who realized that the prosperity of the City of Leiden was due to exported industrial products, thus creating a flow of foreign finance to enter the city, thereby increasing overall economic activity (Kamilah, 2021; Xinhao & Hofe, 2007).

With all its developments, the economic base theory states that export-oriented goods and services or external demand are the main driving force of economic growth in the region because they can channel income from outside into the region so that it will circulate local employment and income activities. In this theory, regional economic sectors are classified into two, namely the base and non-base sectors (Fadhilah, 2023; Hashfi, 2023; Kamilah, 2021; Muljanto, 2021; Pascal, 2023; Wahyudi et al., 2022).

2.2. Peacock and Wiseman Theory

Peacock & Wiseman proposed a theory about government revenue and expenditure. Peacock & Wiseman's theory states that government spending will always increase by increasing tax revenue despite the reluctance of the public to pay taxes (Ningrum, 2020). This theory is based on three basic assumptions, namely the government always looks for profitable ways to increase the availability of funding; the public is generally reluctant to pay higher taxes; and the government must be responsive to the expectations of its people. These three basic assumptions come from a concept of tolerable burden of taxation or the level of tax tolerance of the community (Henrekson, 1990).

Peacock and Wiseman also argued that under normal conditions, economic growth in a country will lead to higher tax revenues, which will naturally coincide with increased government spending, even if tax rates remain unchanged. This is attributed to the concept of tax tolerance, which is more closely associated with tax rates or the percentage imposed on taxable items (Henrekson, 1990).

2.3. Previous Research

The optimization of PAD through leading sectors has been a focal point in several prior studies, which have examined the impact of these sectors on PAD to inform the development of more effective policies. Previous research has explored the influence of leading sectors on PAD, yielding diverse findings.

Valentino & Juwita (2023) identified agriculture, forestry, and fisheries; wholesale and retail trade, repair of motor vehicles and motorcycles; and education services as three highest leading sectors in West Nusa Tenggara Province from 2011 to 2020. The three leading sectors have a positive and significant impact on PAD.

On the other hand, Adriyani (2018) sought to examine the impact of comparative leading sectors (base sectors) on PAD of Mimika Regency during the 2010–2017 period. The results revealed agriculture, forestry, and fisheries and government administration as two comparative leading sectors. The agriculture, forestry, and fisheries sector have a positive and significant impact, while the government administration sector have a significant but negative impact on PAD.

Dewinta & Asmara (2022) also studied the impact of comparative leading sectors (base sectors) on the PAD of Sidoarjo Regency during the 2011–2020 period. The results identified manufacturing industry; electricity and gas supply; construction; and transportation and warehousing as four comparative leading sectors. The electricity and gas supply sector and the construction sector have a significant negative impact, while the other two sectors do not have a significant effect on PAD.

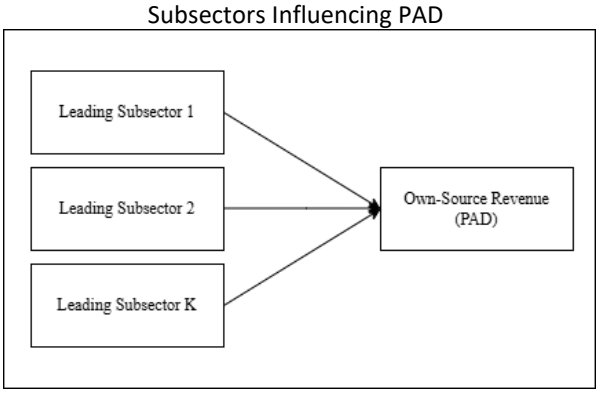
2.4. Hypothesis

The hypotheses used in this study is that the leading subsectors significantly affect provincial PAD in Eastern Indonesia with archipelagic characteristics in 2015 – 2023.

2.5. Research Framework

Grounded in the theoretical framework, the author identifies the leading subsectors as the key factors influencing the PAD of provinces with archipelagic characteristics in KTI. The theoretical foundation of this research hypothesis suggests that the leading subsectors variable, both individually and collectively, is presumed to have an impact on PAD. The research framework for this study is depicted in Image 1 below.

Image 1. Research Framework of Leading Subsectors Influencing PAD



Source: Compiled by the Author (2024)

3. METHODS

3.1. Types and Sources of Data

This study relies on secondary data sourced from authoritative channels, including official websites

and publications by the BPS-Statistics Indonesia and the Directorate General of Fiscal Balance, Ministry of Finance (DJPK Kemenkeu RI). Specifically, the GRDP at constant price data for economic subsectors is obtained from BPS-Statistics Indonesia, while PAD data for provincial governments is sourced from DJPK Kemenkeu RI.

3.2. Operational Definition of Variables

In this study, the provincial PAD (Y) serves as the response variable, whereas the leading subsectors (X) act as the predictor variables, as depicted in the following Table 1:

Table 1. Research Variables

Code	Variable	Operational Definitions	Unit	Type of Data
Y	PAD	The realization of provincial PAD obtained from Directorate General of Fiscal Balance (DJPK Kemenkeu RI).	Billion Rupiah	Ratio
X	Leading Subsectors	The value of GRDP at constant price of leading subsectors obtained from BPS-Statistics Indonesia.	Billion Rupiah	Ratio

Source: Compiled by the Author (2024)

3.3. Data Analysis Procedures

The analysis methods used in this study are descriptive and inferential analysis. Alongside employing statistical measures, tables, and graphs, the study conducted a descriptive analysis to identify leading subsector variables using location quotient (LQ) and shift-share analysis (SSA) methodologies. After that, the analysis is continued to the inferential stage to determine the influence of the leading subsector variables on the provincial PAD variable in KTI with archipelagic characteristics in 2015 - 2023 using panel data regression.

LQ analysis is used to identify subsectors that have specialization (base) or comparative advantage. A subsector is a base if the LQ value is > 1, while non-base if the LQ value is less than or equal to 1 (Stimson et al., 2006). Meanwhile, SSA examines changes in the economic structure in a region in relation to the economic structure at the national level. In the regional share, differential shift, or competitive share component (rs), any disparity in the growth of the same sector between the study area and the reference area is attributed entirely to regional factors, reflecting the relative strength or weakness of the regional economy (Xinhao & Hofe, 2007).

Following the identification of the leading subsectors, the next step involves constructing the panel data before proceeding with the regression analysis. Panel data is a combination of cross-section and time series data (Widarjono, 2005). After that, the panel data regression model can be formed in general as follows (Baltagi, 2021).

$$PAD_{it} = \alpha + \beta_1 X_{1it} + \cdots + \beta_K X_{Kit} + u_{it}\ (\mu_i + v_{it})$$

Panel data regression models can be written with natural logarithmic transformation on both sides. This effort can be caused by variables having relatively large differences in data values and is intended to facilitate interpretation. Additionally, a natural logarithmic model is selected due to its ability to provide elasticity-determining coefficients and closely approximate the scale of the data. The natural logarithmic equation employed in this study is as follows:

$$lnPAD_{it} = \alpha + \beta_1 lnX_{1it} + \cdots + \beta_K lnX_{Kit} + u_{it}$$

where:

PAD_{it} = PAD of province i at time t
$X_{1it}, \ldots, X_{Kit}$ = leading subsectors of province i at time t
$\beta_1, \ldots, \beta_K$ = coefficients
α = constant
u_{it} = combined error of province i at time t
μ_i = specific effect of province i
v_{it} = common error of province i at time t

The initial step in conducting panel data regression analysis involves selecting the best model from among the common effect model (CEM), fixed effect model (FEM), and random effect model (REM) approaches. In selecting the best model, there are several tests, such as the Chow Test, Hausman Test, and BP-LM Test.

The Chow test is used to select between CEM or FEM. If the F-statistic value is greater than the F-table or the p-value is less than the 5 percent significance level, the selected model is FEM. With this result, the test is continued to the Hausman Test. Meanwhile, the test is continued to the BP-LM Test if the Chow Test produces CEM as the best model.

The Hausman test plays a role in choosing REM or FEM. If the Hausman test value is greater than the chi-square table value or the p-value is smaller than the 5 percent significance level, this indicates a decision to reject H0 and the best model is FEM. However, if the selected model in the Hausman Test is REM, the test is continued to the BP-LM Test to select the CEM or REM model. If the BP-LM test value is greater than the chi-square table value or the p-value is smaller than the 5 percent significance level, this indicates the decision to reject H0 and the selected model is REM.

The next step is the selection of the estimation method with the LM test and the cross-sectional correlation test (λ_{LM} test) on the residual variance-covariance structure when the best model selected is CEM or FEM. If the LM test value is smaller than the chi-square table value or has a decision fail to reject H0, the residual matrix structure of the model is homoscedastic so that the selected estimation method is ordinary least square (OLS). On the contrary, additional testing is required to examine the correlation among individuals or cross-sectional correlation, utilizing the λ_{LM} test. If the value of the λ_{LM} test is greater than the chi-square

table value, the decision taken will reject H0 so that the residuals of the selected model are not only heteroscedastic, but also have a real correlation between individuals. Thus, the method used is feasible generalized least square (FGLS) with the seemingly unrelated regression (SUR) model. However, if the residual variance-covariance structure of the selected model is heteroscedastic and uncorrelated between individuals, the estimation method that can be used is weighted least square (WLS).

To produce valid estimation results, classical assumption testing is required. This classical assumption testing step is adjusted to the selected estimation method. If the selected estimation method is OLS, the classical assumption tests that need to be carried out consist of normality, homoscedasticity, non-multicollinearity detection, and non-autocorrelation, while for the WLS or FGLS-SUR estimation methods only require normality assumption tests and non-multicollinearity detection.

Moreover, the researcher conducts statistical tests on the regression model, which encompass partial parameter tests (t-test), simultaneous parameter tests (F-test), and the evaluation of the coefficient of determination (R-Square). These statistical analyses are also utilized to evaluate the hypotheses proposed by the author. The data processing is carried out using Microsoft Excel 2021 and Eviews software.

4. RESULT AND DISCUSSION

4.1. Analysis of Leading Subsectors in Eastern Indonesia (KTI) with Archipelagic Characteristics

4.1.1 Location Quotient (LQ) Analysis Results

One widely employed analytical approach for evaluating the excellence of a business field's sub-sector is the Location Quotient (LQ) method. An LQ value greater than 1 indicates that the subsector serves as an economic foundation for the region, signifying a comparative advantage over the same subsector in a broader reference area. Thus, the subsector is not only capable of satisfying local demand but also possesses the capacity to export goods and services beyond its production area.

As indicated in Table 2 below, there are 12 fundamental subsectors identified across the average aggregate of provinces in Eastern Indonesia (KTI) that exhibit insular characteristics throughout the analysis period.

Table 2. LQ Analysis Results of Aggregate Provinces with Archipelagic Characteristics in KTI

Code	Location Quotient									Avg.
	2015	2016	2017	2018	2019	2020	2021	2022	2023	
A1	1,63	1,61	1,61	1,60	1,53	1,47	1,47	1,45	1,45	**1,54**
A2	0,67	0,67	0,67	0,68	0,65	0,63	0,60	0,58	0,55	0,63
A3	2,89	2,88	2,88	2,92	2,86	2,81	2,76	2,75	2,68	**2,83**
B1	0,19	0,25	0,27	0,26	0,28	0,28	0,29	0,31	0,30	0,27
B2	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
B3	6,36	6,31	5,65	4,62	5,82	5,44	4,65	4,59	4,64	**5,34**
B4	1,99	1,98	1,98	2,06	2,04	1,92	1,90	1,86	1,83	**1,95**
C1	0,07	0,18	0,19	0,19	0,16	0,15	0,14	0,15	0,26	0,17
C2-C16	0,47	0,47	0,47	0,47	0,56	0,61	0,64	0,72	0,78	0,58
D	0,07	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,09	0,08
E	1,61	1,60	1,59	1,57	1,47	1,43	1,38	1,35	1,31	**1,48**
F	1,11	1,10	1,09	1,09	1,09	1,07	1,09	1,07	1,05	**1,08**
G1	1,10	1,09	1,07	1,08	1,07	1,11	1,04	1,01	1,00	**1,06**
G2	0,86	0,88	0,91	0,94	0,94	0,92	0,92	0,92	0,91	0,91
H1	1,12	1,08	1,05	1,06	1,01	0,89	0,86	0,87	0,83	0,97
H2	1,50	1,49	1,51	1,49	1,43	1,31	1,32	1,21	1,11	**1,37**
H3	1,81	1,78	1,70	1,72	1,70	2,23	2,39	1,83	1,60	**1,86**
H4	0,62	0,59	0,59	0,59	0,55	0,59	0,56	0,44	0,40	0,55
I1	0,79	0,81	0,82	0,81	0,77	0,72	0,70	0,62	0,58	0,74
I2	0,27	0,28	0,28	0,30	0,29	0,27	0,27	0,28	0,27	0,28
K1	0,95	0,97	0,97	0,98	0,92	0,93	0,93	0,88	0,84	0,93
K2	0,17	0,16	0,15	0,15	0,14	0,14	0,13	0,13	0,14	0,15
K3	0,07	0,07	0,07	0,08	0,08	0,08	0,07	0,07	0,07	0,07
L	0,91	0,90	0,90	0,91	0,87	0,85	0,83	0,83	0,84	0,87
MN	0,18	0,18	0,17	0,17	0,16	0,15	0,15	0,15	0,15	0,16
O	1,92	1,89	1,92	1,92	1,88	1,87	1,87	1,82	1,81	**1,88**
P	1,50	1,50	1,53	1,56	1,51	1,49	1,49	1,49	1,50	**1,51**
Q	1,76	1,76	1,75	1,77	1,70	1,59	1,51	1,52	1,52	**1,65**
RSTU	0,88	0,85	0,83	0,83	0,79	0,74	0,73	0,70	0,68	0,78

Source: Compiled by the Author (2024)

These subsectors have a level of specialization and comparative advantage compared to the same subsectors in the national territory. Each subsector always has an LQ value > 1 every year, except for the automotive, motorcycle, and repair trade subsector which touched the LQ = 1,00 figure in 2023. Meanwhile, the other 17 subsectors had an LQ value < 1 consistently during the analysis period, except for the land transportation and pipeline/rail subsector which had basic status in 2015 - 2019 and the average LQ value also did not meet the basic status.

4.1.2 Shift-Share Analysis (SSA) Results

Shift-Share Analysis is employed to identify the competitive subsectors or industries within a region. This analysis is reflected through the regional share component, also known as the differential shift or competitive shift, denoted by the rs_i value. A positive rs_i value ($rs_i > 0$) indicates that the growth of subsector *i* within a province outpaces the growth of the same subsector at the national level, signifying that the subsector holds a competitive advantage.

As shown in Table 3, the Shift-Share Analysis (SSA) results reveal 17 competitive subsectors, identified by the competitive component (rs_i) value, within the aggregate provinces of Eastern Indonesia (KTI) with archipelagic characteristics throughout the analysis period.

Table 3. SSA Results of Aggregate Provinces with Archipelagic Characteristics in KTI

Code	ng_i		im_i		rs_i	
	Billion	%	Billion	%	Billion	%
A1	41.438,47	35,22	-16.377,27	-13,92	**3.663,13**	**3,11**
A2	1.145,96	35,22	-960,63	-29,52	-222,51	-6,84
A3	16.586,96	35,22	3.396,66	7,21	**4.390,97**	**9,32**
B1	1.653,00	35,22	-2.531,59	-53,93	**3.140,47**	**66,91**
B2	0,00	35,22	0,00	-1,46	N/A	N/A
B3	15.666,53	35,22	24.279,55	54,58	-13.643,44	-30,67
B4	7.807,67	35,22	-888,18	-4,01	**1.648,16**	**7,43**
C1	440,10	35,22	-406,11	-32,50	**3.977,12**	**318,24**
C2-C16	22.563,97	35,22	-1.428,43	-2,23	**78.060,01**	**121,83**
D	197,45	35,22	0,87	0,16	**251,37**	**44,83**
E	333,53	35,22	99,91	10,55	-89,38	-9,44
F	27.518,98	35,22	-780,30	-1,00	**9.295,85**	**11,90**
G1	7.078,14	35,22	-1.804,03	-8,98	**1.274,09**	**6,34**
G2	23.681,68	35,22	-517,62	-0,77	**19.465,45**	**28,95**
H1	6.085,66	35,22	4.389,88	25,40	-4.309,67	-24,94
H2	1.697,78	35,22	1.302,99	27,03	-1.149,30	-23,84
H3	2.939,84	35,22	-1.879,40	-22,51	**132,60**	**1,59**
H4	954,60	35,22	1.735,68	64,03	-1.404,26	-51,80
I1	1.207,82	35,22	129,27	3,77	-732,71	-21,36
I2	1.652,54	35,22	371,79	7,92	**895,52**	**19,08**
K1	7.101,40	35,22	2.046,11	10,15	**164,71**	**0,82**
K2	347,08	35,22	13,37	1,36	-63,36	-6,43
K3	16,98	35,22	-6,96	-14,44	**6,71**	**13,91**
L	6.807,50	35,22	-1.240,58	-6,42	**1.669,91**	**8,64**
MN	753,55	35,22	453,10	21,17	-165,91	-7,75

O	16.715,78	35,22	-6.162,48	-12,98	**5.018,15**	**10,57**
P	11.899,75	35,22	-2.833,90	-8,39	**6.530,39**	**19,33**
Q	4.829,42	35,22	5.225,33	38,10	-266,15	-1,94
RSTU	3.569,49	35,22	3.284,75	32,41	-1.836,09	-18,11

Source: Compiled by the Author (2024)

These subsectors demonstrate a competitive advantage over their national counterparts, as their growth outpaces that of the same subsectors at the national level. Conversely, the remaining 12 subsectors exhibit $rs_i < 0$, indicating a lack of competitiveness.

4.1.3 Overlay Analysis Results

To identify the leading subsectors, the analysis is based on two key metrics: the average Location Quotient (LQ) value and the Shift-Share Analysis (SSA) value (rs_i). These metrics are integrated through an overlay analysis, which requires aligning the values of both components with positive (+) or negative (-) indicators. In this overlay process, an economic subsector is classified as leading if both indicators are positive (++). The findings from the overlay analysis, based on the LQ and SSA (rs_i) criteria, reveal the leading subsectors for aggregate province within Eastern Indonesia (KTI) with archipelagic characteristics, and are summarized in Table 4 below.

Table 4. Overlay Analysis Results of Aggregate Provinces with Archipelagic Characteristics in KTI

Code	Subsector	LQ	rs_i	Result
A1	Crop and animal production, hunting and related service activities	+	+	**Leading Subsector**
A2	Forestry and logging	-	-	Non-leading Subsector
A3	Fishing and aquaculture	+	+	**Leading Subsector**
B1	Extraction of crude petroleum and natural gas	-	+	Non-leading Subsector
B2	Mining of coal and lignite	-	-	Non-leading Subsector
B3	Mining of metal ores	+	-	Non-leading Subsector
B4	Other mining and quarrying	+	+	**Leading Subsector**
C1	Coal industry and oil and gas refinery	-	+	Non-leading Subsector
C2-C16	Non-oil and gas processing industry	-	+	Non-leading Subsector
D	Electricity and gas supply	-	+	Non-leading Subsector
E	Water supply	+	-	Non-leading Subsector
F	Construction	+	+	**Leading Subsector**
G1	Wholesale and retail trade and repair of motor vehicles and motorcycles	+	+	**Leading Subsector**
G2	Wholesale and retail trade	-	+	Non-leading Subsector
H1	Land transport and transport via pipelines	-	-	Non-leading Subsector
H2	Water transport	+	-	Non-leading Subsector
H3	Air transport	+	+	**Leading Subsector**
H4	Warehousing and support activities for transportation, postal and courier activities	-	-	Non-leading Subsector
I1	Accommodation	-	-	Non-leading Subsector
I2	Food and beverage service activities	-	+	Non-leading Subsector
K1	Financial service activities, except insurance and pension funding	-	+	Non-leading Subsector
K2	Insurance, reinsurance and pension funding, except compulsory social security	-	-	Non-leading Subsector
K3	Activities auxiliary to financial service and insurance activities	-	+	Non-leading Subsector
L	Real estate	-	+	Non-leading Subsector
MN	Company services	-	-	Non-leading Subsector
O	Public administration and defence, compulsory social security	+	+	**Leading Subsector**
P	Education	+	+	**Leading Subsector**
Q	Human health and residential care activities	+	-	Non-leading Subsector
RSTU	Other Services	-	-	Non-leading Subsector

Source: Compiled by the Author (2024)

According to Table 4, the subsectors that meet the criteria for being classified as leading subsectors, based on the overlay analysis with positive coefficients (++) from both analytical tools, are as follows: 1) Crop and animal production, hunting and related service activities; 2) Fishing and aquaculture; 3) Other mining and quarrying; 4) Construction; 5) Wholesale and retail trade and repair of motor vehicles and motorcycles; 6) Air Transport; 7) Public administration and defence, compulsory social security; and 8) Education. However, the remaining 21 subsectors do not meet the leading criteria and are thus considered non-leading subsector.

Consequently, only these leading subsectors are included as predictor variables for analyzing their respective impacts on the provincial PAD in Eastern Indonesia (KTI) with archipelagic characteristics. However, the public administration and defence, compulsory social security subsector is excluded from the model, as these economic activities are closely tied to the response variable itself. Therefore, only seven leading subsectors are selected for further analysis.

4.2. Testing Leading Subsectors Affecting Own-Source Revenue (PAD)

4.2.1 Descriptive Statistical Analysis Results

The study initiates with a descriptive statistical analysis to provide a detailed statistical summary of each variable. This analysis includes the number of observations, minimum and maximum values, mean, and standard deviation for each variable from 2015 to 2023. Table 5 presents the descriptive statistical outcomes for the variables across 9 provinces in Eastern Indonesia (KTI) over a 9-year period, yielding a total of 81 data points.

Table 5. Results of Descriptive Statistical Analysis of Variables

Variable	n	Minimum	Maximum	Mean	Std. Deviation
PAD	81	248,65	5189,11	1315,098	1119,531
A1	81	2546,82	43713,94	14874,63	11019,66
A3	81	1363,4	29096,44	6648,046	6639,901
B4	81	12	9205,05	3015,809	2900,881
F	81	1329,5	46608,53	10823,9	11067,17
G1	81	133,7	10803,26	2604,482	2567,706
H3	81	24,95	4320,82	987,1977	991,3342
P	81	706,5	21329,67	4723,752	5002,716
T					9
N					9

Source: Compiled by the Author (2024)

PAD variable has an average value of Rp1.315,10 billion. The highest PAD was in South Sulawesi in 2023, amounting to Rp5.189,11 billion, while the lowest was in North Maluku in 2015, amounting to Rp248,65 billion. Descriptive statistical results also show that the highest GRDP of leading subsector was in South Sulawesi for A1 in 2022, A3 in 2023, F in 2023, G1 in 2023, H3 in 2018, and P in 2023, while the highest GRDP of leading subsector B4 was in South East Sulawesi in 2019. Meanwhile, the lowest GRDP of leading subsector was in North Maluku for A3 in 2015, B4 in 2015, F in 2015, G1 in 2020, and P in 2015, while the lowest GRDP of leading subsector A1 was in Maluku in 2019 and H3 was in West Sulawesi in 2015.

The results of the descriptive statistical analysis indicate that South Sulawesi exhibits the highest values for most research variables, including PAD, A1, A3, F, G1, H3, and P, relative to other provinces. This can be attributed to South Sulawesi's role as the economic hub of Eastern Indonesia and its function as

the gateway to the region. Consequently, South Sulawesi demonstrates a robust GRDP in leading subsectors and substantial fiscal capacity.

4.2.2 Model Selection Results

Choosing the appropriate model in panel data regression is vital, as it addresses the potential dependency between unobserved independent variables and the dependent variable, thereby mitigating biases that may arise in conventional linear regression models (Widarjono, 2005). Table 6 presents the tests conducted to identify the best panel model for regression analysis.

Table 6. Panel Data Regression Model Testing

Comparison of Panel Data Models	Testing Method	Prob.	Chosen Model
CEM and FEM	Chow Test	0,0000	FEM
REM and FEM	Hausman Test	0,0000	FEM

Source: Compiled by the Author (2024)

Model selection was performed using the Chow test to determine whether the CEM or the FEM should be employed, and the Hausman test to choose between the REM and the FEM. The results of these tests indicate that the FEM is the best model.

4.2.3 Residual Variance-Covariance Matrix Structure Testing Results

After obtaining FEM as the best model, testing is continued by examining the residual variance-covariance structure to determine the appropriate estimation method based on the existence of heteroscedasticity and cross-sectional correlation. Table 7 presents the tests conducted to identify the best panel estimation method for regression analysis.

Table 7. Residual Variance-Covariance Matrix Structure Testing

Testing Method	χ_{stat}	$\chi_{(0,05;\,df)}$	Decision	Conclusion
LM Test	28,8119	15,5073	Reject H_0	Heteroskedastic
λ_{LM} Test	32,1867	50,9985	Failed to Reject H_0	Have no cross-sectional correlation

Source: Compiled by the Author (2024)

Estimation method selection was performed using the LM test to determine whether the residual variance-covariance matrix has a heteroscedastic or homoscedastic structure. Meanwhile, the λ_{LM} test to find out whether the residual variance-covariance matrix has a cross-sectional correlation or not. The results of these tests indicate that the Weighted Least Squares (WLS) method is preferred for estimation.

4.2.4 Classical Assumption Testing Results

After the best model has been determined, the next step that must be taken is testing the classical assumptions on the regression model. Since the assumptions of heteroscedasticity and cross-sectional correlation have been resolved through the FEM model with WLS estimation, the classical assumption that must be carried out next are the normality test and non-multicollinearity detection. Table 8 presents the tests conducted to examine the normality assumptions.

Table 8. Normality Test

Testing Method	Prob.	Conclusion
Jarque-Bera	0,2530	Normally distributed error

Source: Compiled by the Author (2024)

Meanwhile, the results of non-multicollinearity detection can be seen in Table 9 below.

Table 9. Non-Multicollinearity Detection

Variable	Centered VIF	Conclusion
A1	8,6470	Non-multicollinearity
A3	13,7448	Multicollinearity
B4	9,0828	Non-multicollinearity
F	11,7783	Multicollinearity
G1	5,8832	Non-multicollinearity
H3	1,4884	Non-multicollinearity
P	13,8933	Multicollinearity

Source: Compiled by the Author (2024)

The detection results indicate that the centered Variance Inflation Factor (VIF) values for four predictor variables are below 10, while the remaining three predictor variables exhibit centered VIF values exceeding 10. This suggests the presence of multicollinearity within the model. Nevertheless, Gujarati & Porter (2009) stated that multicollinearity can be caused by model limitations and often occurs in economic data so it is God's will. The multicollinearity that must be avoided is perfect multicollinearity, while imperfect multicollinearity can be improved or do nothing because it does not violate the regression assumptions (Gujarati & Porter, 2009).

4.2.5 Hypothesis Testing Results

Statistical tests are employed to conduct hypothesis testing based on the outcomes of panel data regression analysis. Table 10 presents the results of panel data regression analysis for the response variable, which is the provincial own-source revenue (PAD), and the seven leading subsectors as predictor variables, including A1 (X1), A3 (X2), B4 (X3), F (X4), G1 (X5), H3 (X6), and P (X7).

Table 10. Summary of Regression Results with FE Model and WLS Estimation

Predictor Variables	Coefficients	Std. Error	t_{stat}	p-value
C	-8,2198*	1,3604	-6,0423	0,0000
Ln(A1)	0,6427*	0,3048	2,1087	0,0388
Ln(A3)	1,2208*	0,2458	4,9676	0,0000
Ln(B4)	-0,7062*	0,2214	-3,1897	0,0022
Ln(F)	1,6237*	0,2432	6,6760	0,0000
Ln(G1)	-0,4244	0,2411	-1,7601	0,0831
Ln(H3)	-0,0119	0,0481	-0,2478	0,8050
Ln(P)	-0,9182*	0,2595	-3,5387	0,0007
Statistical Summary				
R-square		0,9916	F-statistic	511,1679
Adjusted R-square		0,9897	Prob (F-stat)	0,0000

*significant at the 5% significance level (α)
Response Variable: Ln(PAD)

Source: Compiled by the Author (2024)

The regression equation obtained from the analysis is as follows:

$$\widehat{lnPAD}_{it} = (-8{,}2198 + \hat{\mu}_i) + 0{,}6427lnA1_{it} + 1{,}2208lnA3_{it} - 0{,}7062lnB4_{it} + 1{,}6237lnF_{it} - 0{,}4244lnG1_{it} - 0{,}0119lnH3_{it} - 0{,}9182lnP_{it}$$

The first stage that will be carried out is to test how capable the model is in explaining the influence of predictor variables on response variables by testing

the coefficient of determination or adjusted R-square. Based on the results of the selected model output, the adjusted R-square value is 0,9897. This value shows that 98.97 percent of the variation in the diversity of provincial PAD in KTI with archipelagic characteristics can be explained by the seven predictor variables arranged in the model, while the remaining 1,03 percent is explained by other variables outside the model.

Furthermore, the simultaneous regression coefficient test (F test) is used to determine whether the predictor variables have a significant effect on the response variables together. In Table 10, the F-statistic value is 511,1679 and the F-table value is 1,8231. With these results, the F-statistic value is greater than the F-table value and is followed by a p-value or F-statistic probability of 0,0000 or less than the significance level of 0,05 so that the decision obtained is to reject the null hypothesis. Thus, it can be concluded that at least one predictor variable in the model has an effect on the provincial government PAD variable at a significance level of 5 percent.

Meanwhile, the partial regression coefficient test (t-test) is used to determine whether the predictor variable has a significant effect on the response variable partially. Based on Table 10, the absolute value of the each t-statistics of the variables 1) Crop and animal production, hunting and related service activities; 2) Fishing and aquaculture; 3) Other mining and quarrying; 4) Construction; 5) Education subsector is more than the t-table value = 1,997 and is followed by a p-value less than the 0,05 significance level so that the decision obtained is to reject the null hypothesis. Thus, it can be concluded that these variables have a significant effect on the provincial PAD partially at a significance level of 5 percent. However, the predictor variables of wholesale and retail trade and repair of motor vehicles and motorcycles and the air transport subsector have an absolute value of t-statistics smaller than the t-table value = 1,997 and are followed by a p-value of more than the 0,05 significance level so that the decision obtained is to fail to reject the null hypothesis. Therefore, it can be concluded that those variables do not have a significant effect on the provincial PAD at a 95 percent confidence level.

4.3. Analysis of Leading Subsectors Affecting Own-Source Revenue (PAD)

4.3.1 Influence of Crop and Animal Production, Hunting and Related Service Activities Subsector Variable on PAD

According to the regression analysis summarized in Table 10, the A1 subsector variable exhibits a positive and statistically significant impact on the provincial PAD in archipelagic regions of KTI, with a regression coefficient of 0,6427. This coefficient indicates that a 1% growth in the crop and animal production, hunting and related service activities subsector corresponds to a 0,64% increase in the provincial PAD, assuming all other factors remain constant (ceteris paribus). These findings align with the research by Valentino & Juwita (2023), which also identifies the agriculture, forestry, and fishing as a leading sector with a significant positive effect on PAD.

Moreover, this influence may also stem from the disproportionate ratio between the number of agricultural companies and smallholder farms in the archipelagic provinces of KTI. Given the predominance of smallholder agriculture, which is primarily focused on subsistence and operates within the informal sector, this subsector contributes minimally to own-source revenue (Wulandari & Wijaya, 2023). Additionally, the impact of this subsector on provincial PAD is partly due to the tax base being limited to the use of surface water. As stipulated in Law No. 28 of 2009 on Regional Taxes and Regional Retributions, provincial governments are authorized to levy a surface water tax on individuals or entities that extract and/or utilize surface water, with the exception of basic household needs and water used for agricultural and fisheries irrigation by the populace.

4.3.2 Influence of Fishing and Aquaculture Subsector Variable on PAD

According to the regression results summarized in Table 10, the A3 subsector variable demonstrates a positive and significant effect on the provincial PAD in the archipelagic regions of KTI, with a regression coefficient of 1,2208. This coefficient indicates that a 1% increase in the fishing and aquaculture subsector leads to a 1,22% rise in the provincial PAD in these regions, assuming all other factors remain constant (ceteris paribus). This finding is consistent with the research by Valentino & Juwita (2023), which also identifies the agriculture, forestry, and fishing sector as key contributors with a significant positive impact on PAD.

The positive impact of this subsector on the provincial PAD is further attributed to its direct contribution to regional tax bases (surface water utilization) and fisheries business permit levies, as outlined in Law No. 28 of 2009 concerning Regional Taxes and Levies. Additionally, the specifics of fisheries business permit levies are governed by provincial regulations, which establish the structure and rates of these levies.

4.3.3 Influence of Other Mining and Quarrying Subsector Variable on PAD

The regression analysis summarized in Table 10 reveals that the B4 subsector variable exerts a negative and statistically significant impact on the provincial PAD in the archipelagic regions of KTI, with a regression coefficient of -0,7062. This coefficient suggests that a 1% increase in the other mining and

quarrying subsector results in a 0,71% decrease in provincial PAD in these regions, assuming all other variables remain constant (ceteris paribus). Several factors can account for this negative and significant influence of the subsector.

One contributing factor is that the provincial government lacks the authority to levy regional taxes on mining activities and the extraction of non-metallic minerals and rock materials from this subsector, as stipulated in Law No. 28 of 2009. Although the authority to issue permits can be delegated to the provincial government under Law No. 4 of 2009, as amended by Law No. 3 of 2020 (Article 35), this limitation prevents the subsector from making any contribution to the provincial PAD in KTI with archipelagic characteristics.

Another factor is the heightened demand for this subsector, driven by the extensive infrastructure development undertaken in the region during the analysis period. This includes the construction of provincial government office buildings, mosques, hospitals, and sports facilities (Ari, 2022; Biro Humas dan Protokol Provinsi Sulawesi Tengah, 2020; Harianto, 2023; iNews Sulsel, 2020; SultengTerkini, 2024; Yunus, 2022). This underscores the role of provincial PAD as a critical source of capital expenditure, alongside balancing funds and other revenue streams. This assertion is reinforced by the Decree of the Minister of Energy and Mineral Resources of the Republic of Indonesia No. 110.K/HK.02/MEM.B/2021, which mandates that non-metallic mineral and rock mining companies operating in areas exceeding 100 hectares are required to allocate their production output to development projects funded by the central and/or regional governments, national strategic projects, and the cement industry.

4.3.4 Influence of Construction Subsector Variable on PAD

According to the regression results summarized in Table 10, the F subsector variable demonstrates a positive and significant effect on the provincial PAD in the archipelagic regions of KTI, with a regression coefficient of 1,6237. This coefficient indicates that a 1% increase in the construction sector leads to a 1,62% rise in the provincial PAD in these regions, assuming all other factors remain constant (ceteris paribus).

According to BPS (2022), construction is defined as an activity that results in the creation of a structure or building permanently integrated with the land on which it stands, such as buildings, roads, bridges, railway lines, tunnels, water and drainage systems, sanitation facilities, airports, and electricity and communication networks. Under the 2020 KBLI classification, construction activities falling under code F encompass three primary areas: building construction, civil engineering, and specialized construction (BPS, 2020). The growth in construction activities correlates directly with an increased demand for both domestic and foreign labor. The rise in foreign workers has positively contributed to the provincial PAD through levies on the renewal of permits to employ foreign workers (IMTA) in archipelagic provinces within KTI.

4.3.5 Influence of Wholesale and Retail Trade and Repair of Motor Vehicles and Motorcycle Subsector Variable on PAD

The regression analysis summarized in Table 10 reveals that the G1 subsector, representing the automotive trade, does not have a significant impact on the provincial PAD in the archipelagic regions of KTI. Several factors could explain this outcome. One key factor is the absence of a direct contribution from this subsector to the provincial PAD components. Additionally, the value added by the automotive trade subsector falls under the jurisdiction of central taxation, as governed by Law No. 42 of 2009 on Value Added Tax on Goods and Services and Sales Tax on Luxury Goods, as most recently amended by Law No. 7 of 2021 on the Harmonization of Tax Regulations.

Moreover, BPS (2024) observed that, despite the increase in the number of motorized vehicles across the archipelagic provinces of KTI from 2015 to 2022, there was no corresponding rise in provincial regional tax revenues. The key revenue components—motor vehicle tax, motor vehicle transfer fees, and motor vehicle fuel tax—remained stagnant. This issue is partly attributable to the low level of tax awareness among the Indonesian population, leading to significant arrears in motor vehicle taxes, which amounted to 100 trillion rupiah between 2016 and 2021 (Fauzan, 2022).

4.3.6 Influence of Air Transport Subsector Variable on PAD

The regression analysis summarized in Table 10 indicates that the H3 sector variable does not exert a significant impact on the provincial PAD in the archipelagic regions of KTI. Similar to the automotive trade subsector, air transport do not directly contribute to the provincial PAD, as they fall under central taxation. Although public transportation services, including air transportation, are exempt from value-added tax (VAT) as specified in Article 4A of Law No. 42 of 2009 and Article 10 of Government Regulation No. 49 of 2022, the value added by these services is subject to income tax (PPh), as outlined in the Decree of the Minister of Finance No. 475/KMK.04/1996 and Law No. 36 of 2008 on Income Tax (Handayani, 2023; Pajak.io, 2024).

4.3.7 Influence of Education Subsector Variable on PAD

According to the regression results summarized in Table 10, the P subsector variable demonstrates a negative and significant effect on the provincial PAD in the archipelagic regions of KTI, with a regression coefficient of -0,9182. This coefficient indicates that a 1% increase in the education sector leads to a 1,62% decrease in the provincial PAD, assuming all other factors remain constant (ceteris paribus). The negative and significant influence of this subsector can be caused by several factors.

One contributing factor is that the provincial government lacks the authority to levy regional taxes and charges on the education sector, as outlined in Law No. 28 of 2009 concerning Regional Taxes and Regional Levies. Additionally, education is classified as a mandatory government responsibility related to basic services under Law No. 23 of 2014. Consequently, the provincial government is tasked with managing secondary and special education. Furthermore, Article 31 of the 1945 Constitution of the Republic of Indonesia stipulates that at least 20 percent of both the APBN (State Budget) and APBD (Regional Budget) must be allocated for national education. This education budget enables regional governments to enhance access, distribution, and quality of secondary education. An example of the provincial government's efforts to improve educational access is the development of secondary education infrastructure, such as the construction of state senior high school buildings. BPS (2024) observed an upward trend in the construction of these buildings in the archipelagic provinces of KTI from 2016 to 2022.

Another factor elucidating the negative impact of this sector on the provincial PAD in the archipelagic regions of KTI is the predominance of public secondary schools over private institutions in each province, with the exception of West Nusa Tenggara. This observation is corroborated by BPS (2024), which indicates that the ratio of public to private senior high schools under the Ministry of Education, Culture, Research, and Technology in KTI's archipelagic regions in 2023 is 1,68:1. This also underscores that PAD serves as a critical funding source for the provincial government's educational initiatives.

5. CONCLUSION

Overall, provincial governments in the Eastern Indonesia Region with archipelagic characteristics, generally experienced an increase in PAD values between 2015 and 2023. The regional tax component remains the predominant element in the revenue structure of these provincial governments. Among these provinces, South Sulawesi exhibits the highest ratio of PAD to total revenue, whereas North Maluku holds the lowest provincial PAD ratio compared to the other provinces.

Examining the distribution of leading subsectors across provinces, it is evident that the crop and animal production, hunting and related service activities subsector is predominantly present in the archipelagic provinces of Eastern Indonesia (KTI), with the exceptions of West Nusa Tenggara and South Sulawesi, excluding the public administration and defence, compulsory social security subsector. Collectively, there are eight leading subsectors identified in the archipelagic provinces of Eastern Indonesia (KTI): 1) Crop and animal production, hunting and related service activities; 2) Fishing and aquaculture; 3) Other mining and quarrying; 4) Construction; 5) Wholesale and retail trade and repair of motor vehicles and motorcycles; 6) Air Transport; 7) Public administration and defence, compulsory social security; and 8) Education.

The subsectors of crop and animal production, hunting and related service activities; fishing and aquaculture; other mining and quarrying; construction; and education exert a significant impact on the provincial PAD in the archipelagic region of Eastern Indonesia (KTI) from 2015 to 2023. Conversely, the wholesale and retail trade and repair of motor vehicles and motorcycles as well as the air transport subsector, do not significantly influence the provincial PAD in KTI with archipelagic characteristics in the same period.

6. LIMITATIONS OF THE RESEARCH

The study's limitations and shortcomings include its narrow focus on the subsector level of economic activities, which provides an insufficient representation of the detailed economic potential. Future research could benefit from examining economic conditions at the commodity level.

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