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Research Article

Economic Growth in East Java: How Significant is the Role of the Non-agricultural Sector?

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Abstract.
This study seeks to analyze the impact of the non-agricultural sector on economic growth in East Java over the last decade (2013-2023). Utilizing panel data regression analysis on 38 regencies and cities within East Java Province for the period of 2013-2023, the research identifies the leading economic sector for each district/city, distinguishing between the non-agricultural and agricultural sectors. The variables incorporated in this study include: (i) the leading economic sector of each district/city, (ii) the leading labor sector, (iii) the average years of schooling of the population, and (iv) the total labor force in each district/city. The findings indicate that districts/cities where the non-agricultural sector is dominant are more likely to experience higher rates of economic growth compared to those where agriculture constitutes the primary economic activity.

Keywords: non-agricultural sector, economic growth, East Java

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1. Introduction

In many developing countries, the agricultural sector remains a critical component of the economy, particularly in terms of employment. A significant proportion of the population relies on agriculture for their livelihoods, making it a key driver of rural development and poverty alleviation. In regions such as Sub-Saharan Africa, South Asia, and Southeast Asia, agriculture still employs a large share of the labor force. According to the Food and Agriculture Organization (FAO), agriculture employs over 60% of the population in low-income countries, underscoring its vital role in providing jobs and supporting household income [1].

However, despite its importance in employment, the contribution of the agricultural sector to economic growth is often limited when compared to the non-agricultural sector.

As countries develop, the structure of their economies typically shifts toward industrialization and the expansion of services. The non-agricultural sector, encompassing industries such as manufacturing, construction, and services, tends to drive higher levels of productivity and technological innovation, which in turn accelerates economic growth.

Several studies have highlighted this phenomenon, where the non-agricultural sector contributes more significantly to economic growth despite agriculture's dominance in employment. For instance, Timmer (2009) notes that while agriculture is indispensable for sustaining the livelihoods of a large portion of the population, its productivity gains are often slower compared to sectors like manufacturing and services. As a result, the non-agricultural sectors frequently account for a larger share of GDP growth and overall economic development in developing countries[2].

In Addition, countries in East Asia, such as South Korea, Taiwan, and China, provide prime examples of how a shift from agriculture to industrialization has propelled rapid economic growth. During the 1960s and 1970s, these nations implemented policies aimed at promoting industrialization and export-led growth, resulting in significant increases in productivity and income. Initially, agriculture played a key role in providing employment and ensuring food security.

However, as these countries advanced economically, the industrial and service sectors began to expand rapidly, reducing agriculture's share of GDP while driving overall economic growth [3][4].

For instance, South Korea's structural transformation in the 1970s saw labor shifting from agriculture to higher-productivity sectors such as manufacturing and services, leading to accelerated economic growth. Similarly, since the late 1970s, China has implemented economic reforms that emphasized industrial development, which significantly reduced agricultural employment while propelling growth in non-agricultural sectors such as manufacturing and services. These reforms contributed to high rates of sustained economic growth and significant poverty reduction in both countries[5][6].

Indonesia presents a particularly interesting case within the context of East Asia. For decades, agriculture was the backbone of Indonesia's economy, providing employment for a significant portion of the labor force and contributing substantially to rural livelihoods. Over time, however, Indonesia has experienced a gradual shift from agriculture to industrial and service sectors. Between 1990 and 2020, the share of agriculture in Indonesia's GDP dropped from about 23% to less than 13%, while the non-agricultural sectors—especially services and manufacturing—have grown rapidly [7].

This structural shift has been essential in explaining Indonesia's economic growth trajectory. The expansion of the industrial and service sectors, which are more productive than agriculture, has driven faster economic growth. Manufacturing, in particular, has become a key driver of exports, while the services sector has expanded due to rising domestic consumption and investments in infrastructure [8]. Despite the declining share of agriculture in GDP, it still employs a considerable portion of the population, especially in rural areas. The challenge for Indonesia, as with many other developing nations, is to modernize the agricultural sector to enhance productivity while simultaneously fostering growth in non-agricultural sectors to maintain overall economic development [9].

Leading labor sectors also play a vital role in driving economic growth by enhancing productivity, income levels, and fostering innovation. Sectors such as manufacturing, services, and information technology (IT) have been critical in many countries by employing large portions of the workforce in high-value activities, facilitating technological advancements, and increasing efficiency. This results in higher GDP contributions and improved living standards, with the service sector in particular becoming a key employer in developing nations due to its ability to absorb labor from lower-productivity areas like agriculture [10]

Furthermore, manufacturing has also been crucial in countries like China and Vietnam, where manufacturing-led growth strategies have reduced poverty and driven export competitiveness. As Timmer et al. (2014) demonstrate, shifting labor from agriculture to manufacturing in East Asia significantly boosted productivity, spurring sustained economic growth. Similarly, IT sectors in developed economies, such as the U.S., have contributed to growth by automating tasks, creating new markets, and raising wage levels through technological innovation and workforce diffusion [11][12].

The average years of schooling in a population have a significant positive impact on economic growth by enhancing human capital, improving productivity, and fostering innovation. Education equips individuals with the skills and knowledge necessary to participate effectively in the workforce, leading to a more capable labor pool that drives productivity improvements [13]. As the average years of schooling increase, economies experience higher levels of innovation, better problem-solving abilities, and improved decision-making skills, all of which contribute to sustained economic development [14].

Increased schooling also promotes labor mobility, as better-educated individuals are more likely to adapt to new technologies and shifting market conditions, allowing them to transition into higher-value sectors such as manufacturing, services, or information

technology [15]. Furthermore, education has a multiplier effect on growth by fostering a healthier society, reducing income inequality, and creating a more informed populace that contributes to more stable governance and institutions [16]. Studies have shown that countries with higher average years of schooling tend to experience faster economic growth due to a more skilled and adaptable workforce [17].

The size of a country's labor force plays a crucial role in driving economic growth by increasing the productive capacity of the economy. A larger labor force leads to higher output, particularly when supported by adequate investment in education, training, and infrastructure. As more individuals enter the workforce, businesses can expand production, and the economy can achieve greater economies of scale, leading to overall growth[18]. Additionally, a growing labor force supports innovation, entrepreneurship, and new market creation, contributing to long-term economic development [19].

The total labor force also promotes growth through enhanced consumption and demand. A larger workforce generally results in increased household incomes, leading to higher demand for goods and services. This demand stimulates production, further fostering economic expansion [20]. The increase in labor supply, particularly in developing countries, has been shown to raise productivity, particularly when accompanied by investments in human capital and improved access to technology[21]. For instance, countries that have harnessed their labor force effectively, such as China and India, have demonstrated significant improvements in GDP and living standards [22]. Moreover, as economies transition from agriculture to more labor-intensive sectors such as manufacturing and services, the contribution of the labor force to growth becomes even more pronounced [23].

In Indonesia, and particularly in East Java Province, agriculture plays a vital role in employment, especially in rural areas where it provides livelihoods for a large portion of the population. However, despite its importance in job creation, the contribution of the agricultural sector to economic growth is often limited when compared to the non-agricultural sectors such as manufacturing, construction, and services [24]. As economies develop, there is a general shift from reliance on agriculture to industrialization and services, which tend to generate higher productivity and innovation, thus fostering faster economic growth.

Furthermore, in East Java, this trend is particularly evident. While agriculture still provides a significant portion of the region's employment, the province's non-agricultural sectors, including manufacturing and services, contribute far more to its GDP [25]. This

phenomenon is consistent across Indonesia, where the transition from an agricultural-based economy to one focused on industry and services has accelerated economic growth [26].

Building on the insights discussed, this study aims to specifically examine the impact of the non-agricultural sector on economic growth in East Java over the past decade (2013-2023). By analyzing the roles of non-agricultural sectors such as manufacturing and services, alongside key factors like education and labor force dynamics, this research seeks to offer a comprehensive understanding of the drivers of regional development in East Java.

2. Methods

This study employs panel data regression analysis on 38 regencies and cities in East Java Province for the period 2013-2023. The dataset comprises panel data spanning 10 years (2013-2022), obtained from the Central Bureau of Statistics (BPS) of East Java Province. The dependent variable (YL) in this analysis is economic growth, while the independent variables include the leading economic sector (X1) along with three control variables: the leading labor sector (X2), average years of schooling (X3), and total labor force (X4). The model specification for this study is expressed as follows:

$$lnY_{it} + \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 lnX_{1it} + \beta_4 lnX_{4it} + \varepsilon_{it} \ldots\ldots\ldots\ldots (1)$$

Equation 1 -- Standard or basic equation for the model

The leading economic sector (X1) is a dummy variable, assigned a value of 1 if the leading economic sector in a district or city is non-agricultural, and 0 if the leading sector is agricultural. The leading labor sector (X2) is similarly treated as a dummy variable, where 1 denotes a non-agricultural leading labor sector and 0 denotes an agricultural labor sector. The third control variable, average years of schooling (X3), is a discrete variable representing the mean years of education for the population in each district/city per year. Lastly, the total labor force (X4) is also a discrete variable, reflecting the total number of workers in each district/city in East Java annually.

Panel data regression analysis commonly employs three models: the Common Effect Model (CEM), the Fixed Effect Model (FEM), and the Random Effect Model (REM) [27]. The CEM assumes homogeneity across units, ignoring individual-specific differences, while the FEM accounts for heterogeneity by including unit-specific intercepts, thereby capturing the constant characteristics of each entity [28]. On the other hand, the REM

assumes that individual effects are random and uncorrelated with the regressors, making it more efficient than the FEM when these assumptions hold [29].

To choose the most appropriate model, several diagnostic tests are applied. The Chow test is used to determine whether the CEM or FEM is a better fit, based on an F-test that compares the restricted (CEM) and unrestricted (FEM) models. A significant Chow test result favors the FEM, indicating that unobserved heterogeneity across units is relevant [30]. In contrast, the Hausman test assesses whether the FEM or REM should be applied by examining the correlation between the random effects and the explanatory variables. If the test reveals correlation, the FEM is preferred for its consistency, whereas the REM is favored if no correlation is found, due to its efficiency[31][32].

Lastly, the Lagrange Multiplier (LM) test is used to distinguish between the CEM and REM. This test checks whether the variance of the random effects is statistically significant, with a significant result favoring the REM over the CEM[32]. By applying these diagnostic tests, researchers can select the model that best captures the data structure, ensuring that the chosen model provides accurate and consistent estimates while aligning with the underlying characteristics of the panel data.

3. Results & Discussions

This section presents the results of the panel data regression analysis, followed by a discussion of the findings, investigating the relationship between economic growth (Y) and the independent variables: the leading economic sector (X1), the leading labor sector (X2), average years of schooling (X3), and the total labor force (X4). The model used is as mentioned in **Equation 1.**

The estimation results of the three types of panel data regression models are as follows:

Next, the results of the diagnostic tests used to select the most appropriate type of panel data regression are presented. As discussed in the previous section, the Chow test is applied to determine whether the CEM or FEM is a better fit, with a significant Chow test result favoring the FEM. Furthermore, the Hausman test is used to assess whether the FEM or REM should be applied; if the test reveals a correlation between the random effects and the explanatory variables, the FEM is chosen. Conversely, if no correlation is found, the REM is preferred. Lastly, the Lagrange Multiplier (LM) test is used to distinguish between the CEM and REM. If the variance of the random effects is

Table 1: Estimation Results of Panel Data Regression.

Estimation results of the common effect model (CEM)						
Growth	=	16.125	+ 0.579 $x_{1\,it\,it}$	+ 0.140 X_{2it}	+ 1.093 X_{3it}	+ 1.1029 X_{4it}
		(0.603) ***	(0.062) ***	(0.068) **	(0.166) ***	(0.033) ***
Estimation results of the fixed effect model (FEM)						
Growth	=	28.249	+ 0.106 $x_{1\,it\,it}$	+ 0.009 X_{2it}	+ 1.683 X_{3it}	+ 0.104 X_{4it}
		(0.384) ***	(0.034) ***	(0.016)	(0.075) ***	(0.031) ***
Estimation results of the random effect model (REM)						
Growth	=	27.206	+ 0.114 $x_{1\,it\,it}$	+ 0.009 X_{2it}	+ 1.561 X_{3it}	+ 0.202 X_{4it}
		(0.376) ***	(0.034) ***	(0.016)	(0.073) ***	(0.029) ***

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

significant, the REM is selected over the CEM. However, if the results of the Chow test indicate that the FEM should be chosen then the Lagrange Multiplier test is no longer necessary.

Table 2: Chow Test Results.

Effect Test	Statistic	d.f	Prob
Cross-selction F	339.211530	(37,338)	0.0000
Cross-selction Chi-square	1383.606663	37	0.0000

Table 3: Hausman Test Results.

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f	Prob
Cross-selction random	100.266671	4	0.0000

The results of the Chow test indicate that the fixed effect model (FEM) is the more appropriate panel data regression model. Additionally, the Hausman test confirms that the FEM is better suited than the random effect model (REM). Since the Chow test suggests that the FEM is superior to the common effect model (CEM), it eliminates the need for the Hausman test to choose between the CEM and REM. Therefore, the fixed effect model (FEM) is concluded to be the most suitable model for panel data regression estimation in this research.

Based on the estimation results using the fixed effect model (FEM), the main independent variable, the leading economic sector (X1), is significant, as are the control

variables, the leading labor sector (X2) and the total labor force (X4). However, the control variable, average years of schooling (X3), is not significant.

The main independent variable, the leading economic sector (X1), has a coefficient value of 0.106. Since this variable is a dummy variable, and the non-agricultural economic sector is represented by the value 1, this indicates that regencies or cities in East Java with the non-agricultural sector as the leading sector have, on average, 10.6% higher economic growth compared to other regencies or cities in East Java where the agricultural sector is the leading economic sector.

This finding is consistent with the broader literature on structural transformation in developing economies, where the shift from agriculture to more productive sectors, such as manufacturing and services, is a key determinant of economic growth [33][34]. Moreover, according to Herrendorf et al. (2014), the productivity gains from non-agricultural sectors provide a more robust platform for economic expansion compared to agriculture, which often faces diminishing returns due to land constraints and limited technological inputs [35].

From a theoretical perspective, the Lewis dual-sector model (Lewis, 1954) aligns with this finding, positing that as economies develop, labor gradually shifts from the agricultural sector, characterized by low productivity, to the industrial and service sectors, which exhibit higher productivity. The results in East Java reflect this transition, as regencies with non-agricultural leading sectors demonstrate higher economic performance due to their ability to leverage technological advancements, economies of scale, and higher value-added activities [36].

Furthermore, the theoretical framework provided by neoclassical growth theory also supports these findings. According to Solow's model, long-term economic growth is driven by factors such as technological progress and capital accumulation, both of which are more prevalent in non-agricultural sectors [37]. In regions where agriculture is dominant, capital accumulation is often limited, and technological adoption is slower, resulting in lower growth rates. The results from East Java reflect this dynamic, as non-agricultural sectors are typically more capital-intensive and benefit from greater technological diffusion, thereby contributing to faster growth.

Empirical evidence from other regions supports these findings. In China, for example, rapid industrialization and the shift away from agriculture were key drivers of its sustained economic growth over the last few decades [38]. Similarly, South Korea's

transformation from an agriculture-based economy in the 1960s to a global manufacturing powerhouse demonstrates the significant growth potential of non-agricultural sectors [39]. In both cases, regions that successfully transitioned from agriculture to manufacturing and services experienced substantial gains in productivity and economic growth, akin to the trends observed in East Java.

Moreover, within Indonesia itself, the importance of non-agricultural sectors in driving regional growth has been observed in other provinces, such as West Java and Jakarta, where industrial and service sectors dominate the economic landscape [40]. These regions have outpaced agriculturally focused provinces, highlighting the necessity of supporting structural transformation to stimulate growth. The experience of East Java underscores the need for investments in infrastructure, education, and technology to further strengthen the performance of non-agricultural sectors, thereby contributing to sustained regional development.

The positive and significant coefficient for the leading economic sector in this study highlights the critical role of non-agricultural sectors in driving regional economic growth in East Java. This is consistent with both theoretical expectations and empirical findings from other regions and countries. To sustain and amplify this growth, policymakers in East Java and similar regions should prioritize structural transformation by facilitating the expansion of non-agricultural sectors through investments in human capital, infrastructure, and innovation.

The regression results show that the coefficient for average years of schooling (X3) is 1.683 and statistically significant, indicating that a 1% increase in average schooling in a district or city in East Java is associated with a 1.683% increase in economic growth, holding other factors constant. This finding underscores the positive impact of education on economic development, highlighting its role in improving labor productivity and fostering growth within the region. These results are consistent with the human capital theory, which links education to enhanced labor productivity, innovation, and long-term economic development [41].

This result also aligns with global evidence emphasizing the role of education in regional development. Psacharopoulos and Patrinos (2018) demonstrate that returns on investment in education are particularly high in developing regions, where increased schooling leads to improved economic outcomes. In East Java, where labor markets are transitioning from agriculture to more skill-intensive sectors, higher educational attainment equips the workforce with the skills needed to participate in more productive,

non-agricultural sectors. Consequently, improving access to education and enhancing its quality are critical to sustaining economic growth in the region [42].

As one of the control variables, the regression results indicate that the total labor force (X4) has a statistically significant coefficient of 0.104, suggesting that a 1% increase in the total labor force in a district or city in East Java is associated with a 0.104% increase in economic growth, holding other variables constant. This finding aligns with labor market theories that emphasize the positive contribution of an expanding labor force to economic output, as a larger workforce increases productive capacity and supports higher levels of economic activity. In developing regions like East Java, where labor remains a critical input for both agricultural and non-agricultural sectors, the total labor force plays a pivotal role in driving regional growth [43].

Moreover, the significance of this coefficient reflects the region's reliance on human capital to fuel its economic expansion. As East Java transitions toward more industrial and service-oriented sectors, the growing labor force provides the necessary manpower to support these industries. However, it also highlights the importance of complementing this growth with investments in education and skills development to ensure that the labor force can effectively contribute to higher productivity sectors. Without such investments, the growth potential of the labor force may be constrained by low productivity and underemployment [44]. Thus, this result underscores the importance of strategic policies aimed at improving labor force quality alongside quantity to sustain long-term economic growth in the region.

4. Conclusion

In conclusion, the findings from this study underscore the critical role of the non-agricultural sector in driving economic growth in East Java over the past decade. The fixed effect model (FEM) results show that districts with non-agricultural sectors as the leading economic sector experience higher economic growth compared to those reliant on agriculture. Furthermore, the total labor force and average years of schooling both exhibit significant positive impacts on growth, highlighting the importance of human capital and labor market expansion. To sustain this growth, policymakers should focus on facilitating the structural transformation toward non-agricultural sectors by investing in education, infrastructure, and labor force development to enhance productivity and innovation within the region.

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