



ECONOMY-EMPLOYMENT DYNAMICS IN AN INTEGRATED INDUSTRIAL ZONE: EMPIRICAL EVALUATION AND EVIDENCE-BASED POLICY RECOMMENDATIONS FOR GRESIK REGENCY, 2024–2025

Moh. Agung Surianto, Askalane Mohamed, Mahjudin
agung.surianto@umg.ac.id, askalanemohamed974@gmail.com, mahjudin@umg.ac.id

Universitas Muhammadiyah Gresik, Gresik, Indonesia^{1,3}
Sciences Techniques Comptable et Financier, Afrika²
Corresponding author: agung.surianto@umg.ac.id

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Abstract

This article analyzes the relationship between macroeconomic growth and employment conditions in Gresik Regency based on secondary data from Statistics Indonesia (BPS) for 2024–2025. Employing a descriptive-comparative approach within the frameworks of Okun's Law and structural transformation theory, the study evaluates the extent to which economic growth of 4.79% has generated inclusive employment. The findings indicate that Gross Regional Domestic Product (GRDP) at current prices reached IDR 188,604.51 billion, with the manufacturing sector accounting for the dominant share (51.25%). This economic structure is associated with a decline in the Open Unemployment Rate (OUR) to 5.47% and an increase in formal employment to 56.16% as of August 2025. However, the inclusiveness of growth remains constrained by a substantial gender gap in labor force participation, amounting to 30.84 percentage points; an educational profile of the workforce dominated by those with lower-to-middle levels of educational attainment (69.37%); and the risk of capital-labor substitution in the manufacturing sector. Based on the empirical evidence, the study recommends revitalizing industry-based vocational education, providing childcare facilities to promote women's empowerment, diversifying the economy toward productive service sectors, and implementing gradual formalization programs for informal workers to strengthen regional economic resilience amid automation and globalization..

DINAMIKA EKONOMI-KETENAGAKERJAAN DI KAWASAN INDUSTRI TERPADU: EVALUASI EMPIRIS DAN REKOMENDASI KEBIJAKAN BERBASIS BUKTI DI KABUPATEN GRESIK TAHUN 2024–2025

Abstrak

Artikel ini menganalisis keterkaitan antara pertumbuhan ekonomi makro dan kondisi ketenagakerjaan di Kabupaten Gresik berdasarkan data sekunder BPS tahun 2024–2025. Menggunakan pendekatan deskriptif-komparatif dengan kerangka Hukum Okun dan teori transformasi struktural, penelitian ini mengevaluasi sejauh mana pertumbuhan ekonomi sebesar 4,79% telah

menghasilkan penyerapan tenaga kerja yang inklusif. Temuan menunjukkan PDRB harga berlaku mencapai Rp188.604,51 miliar dengan struktur industri pengolahan dominan (51,25%), yang berkorelasi dengan penurunan Tingkat Pengangguran Terbuka menjadi 5,47% dan peningkatan pekerja formal menjadi 56,16% per Agustus 2025. Namun, inklusivitas pertumbuhan terhambat oleh kesenjangan partisipasi angkatan kerja antargender yang lebar (30,84 poin persentase), profil pendidikan tenaga kerja yang didominasi lulusan menengah ke bawah (69,37%), serta risiko capital-labor substitution di sektor manufaktur. Berdasarkan bukti empiris, disarankan kebijakan revitalisasi pendidikan vokasi berbasis industri, fasilitas childcare untuk pemberdayaan perempuan, diversifikasi ekonomi ke sektor jasa produktif, dan program formalisasi bertahap bagi pekerja informal guna memperkuat ketahanan ekonomi regional di tengah otomasi dan globalisasi.

correspondence Address
Institutional address: Universitas Muhammadiyah Gresik
E-mail: agung.surianto@umg.ac.id*

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INTRODUCTION

The global economy in 2024–2025 has been characterized by complex dynamics, marked by an uneven recovery across regions and sectors. The World Bank projects that global economic growth will slow to 2.3 percent in 2025, representing the weakest growth rate since 2008, excluding periods of global recession. This slowdown has been driven by a substantial increase in trade barriers, heightened global policy uncertainty, and escalating geopolitical conflicts, all of which have disrupted supply chains and undermined commodity price stability. Nevertheless, several indicators point to emerging signs of recovery, with global merchandise trade showing a tendency toward recovery and projected to grow by 2.7 percent in 2024. Global inflationary pressures have also shown signs of easing, with the G20 inflation rate declining to 5.4 percent in 2024. Against this backdrop, developing economies, including Indonesia, are under increasing pressure to sustain their growth momentum amid a slowdown in global headwinds.

Amid global economic turbulence, Indonesia has demonstrated relatively strong economic resilience. Statistics Indonesia (Badan Pusat Statistik/BPS) reported that Indonesia's economy grew by 5.03 percent in 2024, representing a slight deceleration from the 5.05 percent growth recorded in 2023. The manufacturing sector remained the largest contributor to national GDP, recording growth of 4.55 percent. The Organisation for Economic Co-operation and Development (OECD) projects Indonesia's real GDP growth at 4.7 percent in 2025 and 4.8 percent in 2026, supported by robust private consumption and investment. On the labor market front, the national unemployment rate declined to 4.8 percent in the first quarter of 2025, marking one of the lowest levels recorded over the past two decades.

At the regional level, East Java Province serves as Indonesia's second-largest economic contributor and possesses considerable potential for capital-intensive industrial transformation, particularly in coastal areas supported by energy surpluses, natural gas resources, and port access. Gresik Regency, as one of the strategic areas along the northern coast of East Java, reflects these dynamics, with economic growth reaching 4.79 percent in 2024 and an economic structure dominated by the manufacturing sector (51.25%) and the services sector, which accounted for 52.47% of total employment. Gross Regional Domestic Product (GRDP) at current prices reached IDR 188,604.51 billion, while GRDP per capita increased to IDR 138.27 million. In terms of employment, the labor force reached 735.90 thousand people, with a Labor Force Participation Rate

(LFPR) of 68 percent and an Open Unemployment Rate (OUR) that declined to 5.47 percent as of August 2025.

The relationship between economic growth and employment has been extensively examined in the macroeconomic literature. Okun (1962) introduced an empirical law positing that an increase in output above potential GDP is associated with a reduction in the unemployment rate, with the magnitude of this relationship subsequently known as the Okun coefficient. In the Indonesian context, Huruta (2020) tested the validity of Okun's law using data covering the period 1985–2018 and identified a significant negative relationship between GDP growth and the open unemployment rate, with a coefficient of -0.322 . This finding is consistent with Lee and Huruta (2019), who demonstrated the validity of Okun's law in the Indonesian economy, whereby increases in GDP were accompanied by higher labor demand.

At the sectoral level, several studies have examined the determinants of employment absorption in the manufacturing sector. Pramusinto and Daerobi (2020) found that wages, the number of industrial firms, GRDP, investment indices, technology, and education exerted substantial effects on employment absorption. A study by Wahyuni (2024) in East Java Province demonstrated that investment in medium- and large-scale manufacturing industries, as well as GRDP, had a positive effect on employment absorption. Conversely, Nababan and Purba (2023) identified anomalous and regressive patterns in Indonesian manufacturing employment, with 21 of the 24 manufacturing subsectors exhibiting a regressive pattern, whereby employment absorption declined alongside improvements in efficiency and technology-based investment.

Within the formal–informal employment context, Suparman and Muzakir (2023) employed a panel regression approach to examine regional inequality, human capital, unemployment, and economic growth in Indonesia and found that regional disparities and human capital quality were key determinants of employment absorption. Meanwhile, the issue of skill mismatch has received increasing attention in recent literature. Recent studies indicate that the prevalence of vertical mismatch (education mismatch) in Indonesia remains relatively high, with mismatch rates exceeding 50 percent among academic/diploma and university graduates during the 2011–2020 period. This condition suggests that the education system has yet to achieve sufficient alignment between graduate competencies and labor market requirements.

Based on the foregoing literature review, several significant research gaps can be identified. First, most empirical studies on Okun's law and employment absorption in Indonesia rely on national- or provincial-level aggregate data, limiting their ability to capture the specific dynamics of districts and municipalities characterized by distinctive economic structures and industrial profiles. Second, previous studies have tended to examine economic growth and employment separately through a silo approach, despite the fact that these dimensions are endogenously interconnected within regional economic systems. Third, although Gresik Regency constitutes one of Indonesia's largest integrated industrial areas and is characterized by the dominant contribution of the manufacturing sector, no comprehensive study has yet integrated GRDP, sectoral structure, and employment indicators simultaneously to assess the extent to which regional economic growth has generated an inclusive trickle-down effect on the local labor market. Fourth, the issues of employment formalization and gender disparities in labor force participation (LFPR)—83.38% for men compared with 52.54% for women—have received limited attention in the context of capital-intensive industrial regions such as Gresik. Fifth, the educational profile of Gresik's workforce, which is dominated by upper-secondary school

graduates or equivalent qualifications (47.03%), while only 13.60% hold higher-education qualifications, raises critical questions regarding the readiness of human resources to cope with Industry 4.0 and increasingly widespread automation.

In response to these identified research gaps, this study aims to: (1) analyze the relationship between macroeconomic growth, as reflected in GRDP, sectoral structure, and expenditure components, and employment conditions, including employment absorption, employment status, and unemployment, in Gresik Regency during the 2024–2025 period; (2) identify the dynamics of Gresik’s structural economic transformation from agriculture toward manufacturing and services and examine its implications for the quality and quantity of employment absorption; (3) assess the inclusiveness of Gresik’s economic growth based on indicators of employment formalization, gender disparities, and the educational profile of the workforce; and (4) formulate evidence-based policy recommendations to improve employment quality and strengthen regional economic resilience amid the challenges posed by globalization and industrial automation.

To achieve these objectives, the study addresses the following research questions: (1) What are the characteristics of Gresik Regency’s economic growth in 2024, in terms of GRDP, sectoral structure, and expenditure components, and how do these characteristics compare with historical trends over the 2015–2024 period? (2) To what extent was Gresik’s economic growth in 2024 translated into employment absorption, a reduction in the unemployment rate, and an increase in the proportion of formal workers as of August 2025? (3) What structural factors—particularly sectoral composition, education, and gender—influence the quality and quantity of employment in Gresik Regency, and how do skill mismatch and digital transformation shape these dynamics? (4) Which policy measures are most relevant for enhancing the inclusiveness of economic growth and improving employment quality in Gresik Regency in the future?

METHODS

Research Type and Approach

This study employed a quantitative research design with a descriptive mixed-methods approach integrating time-series and cross-sectional analyses. From a paradigmatic perspective, the study was grounded in positivism, based on the assumption that socioeconomic realities can be measured, observed, and objectively analyzed using verified secondary data (Creswell & Creswell, 2018). The research design adopted was explanatory secondary data analysis, aimed at explaining the relationships between regional macroeconomic variables and employment indicators based on data published by official statistical institutions.

The selection of this design was based on the consideration that economic and employment data at the regency level constitute administrative census data that have been comprehensively collected by Statistics Indonesia (Badan Pusat Statistik [BPS]). Accordingly, these data provide a high degree of validity and reliability for descriptive-comparative analysis (Vartanian, 2011). A deductive–inductive approach was applied, whereby working hypotheses derived from Okun’s law and structural transformation theory were examined against empirical data patterns, while inductive findings derived from local data were used to refine or enrich theoretical understanding.

Data Sources and Types

This study relied on secondary data obtained from official publications issued by Statistics Indonesia of Gresik Regency (BPS Kabupaten Gresik). The primary data sources comprised two key publications. The first was *Berita Resmi Statistik* (Official Statistics Release) No. 05/03/3525/Th. VI, issued by BPS Gresik Regency on March 3, 2025, which contains data on economic growth, GRDP at current and 2010 constant prices, GRDP per capita, GRDP structure by industry, GRDP expenditure structure, and economic growth trends over the 2015–2024 period. The second was *Berita Resmi Statistik* (Official Statistics Release) No. 22/12/3525/Th. VI, issued by BPS Gresik Regency on December 1, 2025, which provides employment data as of August 2025, including the size of the labor force, the Labor Force Participation Rate (LFPR), the Open Unemployment Rate (OUR), employment absorption by sector, employment status (formal–informal), and the educational profile of the workforce.

The data used in this study consisted of: (a) time-series data, comprising economic growth trends in Gresik Regency from 2015 to 2024 to identify cyclical patterns and long-term trends; (b) cross-sectional data, comprising economic and employment indicators at specific points in time—2024 for economic indicators and August 2025 for employment indicators—to analyze their structure and composition; and (c) limited panel or pooled data, consisting of a combination of time-series and cross-sectional data for dynamic comparative analysis.

Operational Definitions of Variables

To ensure consistency of measurement and the replicability of the study, all variables were operationally defined as follows.

Table 1. Operational Definitions of Variables

Variable	Operational Definition	Unit/Scale	Data Source
Economic Growth	The percentage change in GRDP at 2010 constant prices from one year to the next	Percent (%)	BPS Gresik Official Statistics Release, March 2025
GRDP at Current Prices	The total value of all final goods and services produced by production units within the Gresik region, calculated at prevailing prices in 2024	Indonesian rupiah (IDR billion)	BPS Gresik Official Statistics Release, March 2025
GRDP per Capita	GRDP at current prices divided by the mid-year population	Indonesian rupiah (IDR million)	BPS Gresik Official Statistics Release, March 2025
Sectoral GRDP Structure	The proportion of each industry's contribution to total GRDP at current prices	Percent (%)	BPS Gresik Official Statistics Release, March 2025
Labor Force	The working-age population aged 15 years and above who are employed, temporarily not working but have a job, or	Thousand persons	BPS Gresik Official Statistics Release, December 2025

	actively seeking employment		
Labor Force Participation Rate (LFPR)	The percentage of the labor force relative to the total working-age population	Percent (%)	BPS Gresik Official Statistics Release, December 2025
Open Unemployment Rate (OUR)	The percentage of openly unemployed persons relative to the total labor force	Percent (%)	BPS Gresik Official Statistics Release, December 2025
Sectoral Employment Absorption	The proportion of workers employed in major sectors, namely agriculture, manufacturing, and services, relative to total employment	Percent (%)	BPS Gresik Official Statistics Release, December 2025
Employment Status	Classification of workers according to formal employment status—such as being registered, having an employment contract, and receiving social security coverage—and informal employment status	Percent (%)	BPS Gresik Official Statistics Release, December 2025
Workforce Education	The highest level of education completed by the workforce	Percent (%)	BPS Gresik Official Statistics Release, December 2025

Data Collection Techniques

Data were collected using documentation and systematic literature review methods. The data collection procedure comprised the following stages. First, primary sources were identified by accessing the official BPS Gresik Regency portal to obtain statistical publications related to economic growth and employment. Second, data verification and validation were conducted by ensuring consistency across publications through cross-checking and by verifying relevant metadata, including catalogue numbers, publication dates, conceptual definitions, and BPS data collection methodologies. Third, the extracted data were organized into an analytical matrix according to the time dimension (time-series) and variable categories (macroeconomic versus employment indicators). Finally, source triangulation was undertaken by comparing BPS data with relevant publications from other institutions, such as the Ministry of Finance, Bank Indonesia, and the OECD, to strengthen the external validity of the findings (Denzin, 2017).

The data were collected during the period from January to August 2025, in accordance with the availability of the most recent official publications issued by BPS Gresik Regency.

Conceptual Analytical Framework

This study was grounded in three complementary theoretical frameworks.

Okun's Law

Okun's law (Okun, 1962) postulates a stable negative relationship between economic output growth and the unemployment rate. Mathematically, the relationship can be expressed as:

$$\Delta U = -\beta (g - g^*)$$

where ΔU denotes the change in the unemployment rate, g represents the actual economic growth rate, g^* denotes the potential growth rate, and β is the Okun coefficient. In the context of this study, Okun's law serves as a theoretical lens for examining the extent to which Gresik's economic growth (4.79% in 2024) is associated with the decline in the Open Unemployment Rate (5.47% in August 2025). Although this study does not conduct econometric regression estimation due to limitations in panel data availability, the descriptive-comparative analysis remains guided by the logic of Okun's law in interpreting the direction and magnitude of the relationship between these variables (Huruta, 2020).

Structural Transformation Theory

Structural transformation theory (Kuznets, 1971; Lewis, 1954) explains the process through which an economy shifts from the dominance of the agricultural sector toward industrial and service-based activities, accompanied by changes in employment absorption, productivity, and employment status. In this study, the theory is used to analyze Gresik's economic structural transition, characterized by the dominance of the manufacturing sector, which contributed 51.25% to the regional economy, and the services sector, which accounted for 52.47% of employment absorption. The analysis further considers the implications of this transformation for employment formalization, with formal employment accounting for 56.16%, and for overall employment quality.

Data Analysis Techniques

Data analysis in this study was conducted using a qualitative–quantitative approach through the following techniques.

Descriptive-Comparative Analysis

Descriptive analysis was used to describe the profile and characteristics of economic and employment variables through measures of central tendency, including means and proportions, as well as measures of dispersion, including differences and growth ratios. Comparative analysis was applied to compare Gresik's current conditions with historical trends from 2015 to 2024, national benchmarks, and indicators for East Java Province.

Structural Analysis

This technique was used to analyze the composition and relative contribution of each economic sector to GRDP, as well as the distribution of employment absorption across sectors. The calculated indicators included an implicit Location Quotient (LQ) to identify Gresik's economic base sectors, the formal–informal employment ratio to measure the degree of labor market formalization, and a gender disparity index in labor force participation.

Trend Analysis and Simple Projections

Trend analysis was applied to time-series data on economic growth from 2015 to 2024 to identify cyclical patterns, long-term trends, and volatility. The compound annual growth rate (CAGR) method was used to calculate the average growth rate over a specified period:

$$GR = (PDRB_t / PDRB_0)^{(1/n)} - 1$$

Data Validity Assessment

Given that this study relied entirely on secondary data, data validity was assessed through several approaches. First, source triangulation was conducted by comparing data from BPS Gresik Regency with publications issued by BPS East Java Province and BPS at the national level to ensure the consistency of reported figures (Denzin, 2017). Second, metadata verification was undertaken by examining BPS documentation concerning operational definitions, survey methods—including the National Labor Force Survey (*Survei Angkatan Kerja Nasional* [Sakernas]) for employment data—and the production and expenditure approaches used in GRDP compilation, as well as data limitations. Third, institutional credibility was considered, given that BPS data constitute official government statistics collected through censuses and surveys based on nationally standardized sampling frameworks and therefore possess a high degree of credibility and methodological standardization (Vartanian, 2011). Finally, an internal audit was performed through simple arithmetic checks, including cross-multiplication, to ensure consistency between aggregate figures and their respective subcomponents; for example, the total number of employed and unemployed persons should equal the total labor force.

Research Limitations

This study has several limitations that should be acknowledged. First, with respect to panel data availability, employment data were available only for August 2025 as cross-sectional observations. Therefore, the longitudinal analysis of the relationship between economic growth in 2024 and employment conditions in 2025 is associative rather than based on pure econometric causal inference. Second, the BPS data are presented at the aggregate regency level, thereby precluding disaggregated analysis at the subdistrict or individual level. Third, publicly available National Labor Force Survey (Sakernas) microdata for Gresik Regency were unavailable, making it impossible to conduct multivariate regression analysis controlling for individual-level variables such as age, work experience, and marital status. Finally, the relationship between economic growth and employment is simultaneous and endogenous; consequently, any interpretation of the direction of causality must be made with caution.

RESULT AND DISCUSSION

Macroeconomic and Employment Profile

Based on data from Statistics Indonesia (Badan Pusat Statistik [BPS]) of Gresik Regency, the main findings of this study reveal interconnected dynamics between macroeconomic performance and labor market conditions. From a macroeconomic perspective, Gresik Regency recorded economic growth of 4.79 percent in 2024, continuing the post-pandemic recovery trend from 4.62 percent in 2023. GRDP at current prices reached IDR 188,604.51 billion, representing a 7.00 percent nominal increase from IDR 176,261.00 billion in 2023, while GRDP at 2010 constant prices stood at IDR 119,274.42 billion. Population welfare, as measured by GRDP per capita, increased to

IDR 138.27 million, confirming quantitative improvements in real economic performance.

On the employment side, data for August 2025 indicate a labor force of 735.90 thousand people out of a total working-age population of 1.08 million. The Labor Force Participation Rate (LFPR) reached 68.00 percent, with 695.66 thousand employed persons and 40.24 thousand unemployed persons. The Open Unemployment Rate (OUR) declined to 5.47 percent, indicating an improvement compared with the preceding period. Structurally, Gresik's economy was dominated by the manufacturing sector, which contributed 51.25 percent of GRDP, while employment was concentrated primarily in the services sector (52.47 percent) and manufacturing sector (35.33 percent). Employment status indicated a predominance of formal employment (56.16 percent) over informal employment (43.84 percent), while the educational profile of the workforce was dominated by senior secondary school or equivalent graduates (47.03 percent), with only 13.60 percent holding higher-education qualifications.

Table 1. Economic Growth Trends in Gresik Regency, 2015–2024

Year	GRDP Growth (%)
2015	6.61
2016	5.49
2017	5.83
2018	5.81
2019	5.42
2020	–3.68
2021	3.79
2022	7.38
2023	4.62
2024	4.79

Source: BPS Gresik Regency (2025a), processed by the authors.

Table 2. GRDP Structure by Industry in Gresik Regency, 2024

Industry	Contribution (%)	Growth (%)
Manufacturing	51.25	6.32
Trade	12.89	—
Construction	8.67	4.42
Agriculture	6.55	—
Mining	6.14	–5.49
Others	10.31	—

Source: BPS Gresik Regency (2025a), processed by the authors.

Table 3. GRDP Expenditure Structure in Gresik Regency, 2024

Expenditure Component	Contribution (%)
Household Consumption	61.77
Gross Fixed Capital Formation (Investment)	23.58
Net Exports	10.06
Changes in Inventories	2.41

Government Consumption	1.91
NPISH Consumption	0.76

Source: BPS Gresik Regency (2025a), processed by the authors.

Table 4. Employment Indicators in Gresik Regency, August 2025

Indicator	Value
Working-Age Population	1.08 million people
Labor Force	735.90 thousand people
Employed	695.66 thousand people
Unemployed	40.24 thousand people
LFPR	68.00%
Male LFPR	83.38%
Female LFPR	52.54%
OUR	5.47%
Male OUR	5.67%
Female OUR	5.15%
Formal	56.16%
Informal	43.84%

Source: BPS Gresik Regency (2025b), processed by the authors.

Table 5. Employment Absorption by Sector, August 2025

Sector	Share (%)
Services	52.47
Manufacturing/Industry	35.33
Agriculture	12.20

Source: BPS Gresik Regency (2025b), processed by the authors.

Table 6. Educational Profile of the Workforce, August 2025

Educational Attainment	Share (%)
Senior Secondary School/Equivalent	47.03
Primary School or Below	22.34
Junior Secondary School/Equivalent	17.03
Higher Education	13.60

Source: BPS Gresik Regency (2025b), processed by the authors.

Regional Economic Resilience and Growth Trends

The analysis of economic growth trends in Gresik Regency over the 2015–2024 period reveals a cyclical pattern reflecting the structural resilience of the regional economy. During the pre-pandemic period (2015–2019), economic growth was relatively stable, with a Compound Annual Growth Rate (CAGR) of 5.93 percent and low volatility, as indicated by a standard deviation of 0.42 percent. This consistency suggests that

Gresik's economic fundamentals—underpinned by an integrated industrial area, port access, and energy surpluses—were capable of sustaining expansionary momentum amid fluctuations in the national economy.

The sharp contraction of 3.68 percent in 2020 was a direct consequence of the COVID-19 pandemic, which disrupted global and domestic supply chains. Nevertheless, the post-pandemic recovery was rapid and sustained, with a strong rebound of 7.38 percent in 2022, representing the highest growth rate over the preceding decade.

Although the CAGR during the recovery period of 2021–2024 was somewhat more moderate at 3.94 percent than during the pre-pandemic period, post-pandemic volatility (1.34 percent) remained contained and was significantly lower than volatility over the entire period (2.92 percent), which was largely driven by the 2020 outlier.

This finding is consistent with the OECD's (2025) argument that the Indonesian economy has demonstrated strong post-pandemic resilience, supported by private consumption and investment. In Gresik, this recovery was supported by the dominance of the manufacturing sector, which grew by 6.32 percent in 2024, exceeding the overall economic growth rate. Nominal GRDP growth of 7.00 percent also suggests a favorable price effect, particularly in the manufacturing and trade sectors, which are sensitive to commodity and energy price dynamics.

From a business-cycle perspective, Gresik's growth pattern follows a classical V-shaped recovery trajectory, characterized by a deep contraction, rapid recovery, and stabilization around the potential growth rate. This differs from L-shaped or W-shaped patterns frequently observed in regions with low economic diversification. The presence of capital-intensive industrial areas and modern logistics infrastructure has positioned Gresik as a region with relatively high economic complexity, contributing to its resilience to external shocks (Hidalgo & Hausmann, 2009).

The findings of this study confirm the structural transformation hypothesis (Kuznets, 1971; Lewis, 1954), indicating that Gresik's economy has moved beyond the agrarian stage and entered a phase dominated by industry and services. The 2024 GRDP structure by industry shows that manufacturing accounted for more than half of total regional economic output (51.25 percent), followed by trade (12.89 percent) and construction (8.67 percent). Collectively, these three sectors accounted for 72.81 percent of total GRDP, indicating a high concentration of economic activity in industrial activities and their supporting sectors.

Notably, agriculture accounted for only 6.55 percent of GRDP, substantially below the historical contribution of primary-sector activities to regional economies in East Java more generally. This finding indicates that Gresik has completed a structural transition from an agrarian-based economy toward an economy based on industry and services. This finding is consistent with the characteristics of a region featuring bonded zones, international port facilities, and an integrated manufacturing ecosystem that attracts the reallocation of resources—including labor, capital, and technology—from agriculture toward industry (Timmer & Akkus, 2008).

From the expenditure perspective, the GRDP structure was dominated by household consumption, which accounted for 61.77 percent, indicating that domestic demand was the principal driver of Gresik's economic growth. Gross Fixed Capital Formation (GFCF), or investment, contributed 23.58 percent, demonstrating that growth was also supported by strong capital accumulation. Net exports accounted for 10.06 percent, confirming Gresik's open-economy orientation, consistent with the presence of ports and export-oriented industrial areas.

However, the findings also reveal structural vulnerabilities. First, the extreme dependence on manufacturing, which accounts for 51.25 percent of GRDP, creates a risk of a disguised Dutch Disease, whereby other sectors may become less competitive as productive factors become concentrated in industry. Second, the contraction of the mining sector by 5.49 percent was the only negative sectoral growth recorded, indicating potential resource-based deindustrialization or the emerging effects of energy-transition policies on extractive activities.

Sectoral growth dynamics also warrant attention. The sectors recording the highest growth rates in 2024 were Public Administration (8.88 percent), Transportation and Storage (8.71 percent), and Business Services (7.91 percent). This pattern reflects economic maturation, whereby productive services grow faster than traditional manufacturing, consistent with the structural transformation theory predicted by Chenery et al. (1986). The 6.95 percent growth of the Information and Communication sector also indicates that digitalization has begun to penetrate various segments of the economy, although its contribution to GRDP remains relatively small.

The Relationship between Economic Growth and Employment: An Okun's Law Perspective

One of the most significant findings of this study is the empirical validity of Okun's law at the regional level in Gresik Regency. Okun's law (1962) posits that an increase in real output above its potential level is accompanied by a proportional decline in the unemployment rate. Although this study does not perform econometric regression estimation due to limitations in panel-data frequency, the descriptive-comparative analysis indicates a strong negative association between economic growth in 2024 (4.79 percent) and the decline in the OUR in August 2025 (5.47 percent).

With a labor force of 735.90 thousand people and an OUR of 5.47 percent, the number of openly unemployed persons in Gresik was recorded at 40.24 thousand. Compared with the previous year, the OUR exhibited a consistent downward trend alongside positive economic growth.

This finding is consistent with Huruta (2020), who demonstrated the validity of Okun's law in the Indonesian economy, reporting a coefficient of -0.322 . This implies that a 1 percent increase in output above its potential level would reduce the unemployment rate by approximately 0.32 percent.

Nevertheless, interpreting Okun's law at the regional level requires additional nuance. First, economic growth in Gresik driven by manufacturing, which accounts for 51.25 percent of GRDP, does not automatically translate into proportional employment absorption. The findings of Nababan and Purba (2023) concerning anomalous and regressive patterns in Indonesian manufacturing employment are particularly relevant: capital- and technology-intensive manufacturing tends to generate output growth that is disproportionate to employment creation. In Gresik, manufacturing contributes 51.25 percent of GRDP but absorbs only 35.33 percent of the workforce, indicating relatively low employment elasticity.

Second, the largest share of employment absorption occurs in the services sector (52.47 percent), which, despite contributing less to GRDP than manufacturing, has higher labor intensity. This phenomenon is referred to in the literature as the tertiarization of employment, whereby services become the primary source of employment even as industry remains the principal driver of production (Timmer et al., 2014). In Gresik, this suggests that although economic growth is generated primarily by manufacturing, its

trickle-down effect on employment is absorbed to a greater extent by supporting service activities, including logistics, trade, and business services.

Third, the formal-to-informal employment ratio of 1.28 (56.16 percent formal versus 43.84 percent informal) indicates that Gresik's economic growth has generated substantial labor market formalization. This is important because formal employment is generally associated with higher productivity and wages, thereby contributing to the quality of economic growth (Doeringer & Piore, 1971). The predominance of formal employment also has implications for expanded social protection and income stability for more than half of Gresik's workforce.

Sectoral Employment Dynamics and Labor Market Formalization

The findings concerning the structure of employment absorption in Gresik reveal complex labor market dualism. In aggregate terms, the services sector absorbs 52.47 percent of the workforce, followed by manufacturing (35.33 percent) and agriculture (12.20 percent). The agricultural share of only 12.20 percent—well below its contribution to GDP at the national level in Indonesia (approximately 13–14 percent)—confirms that Gresik has completed the Lewisian transition from a labor-surplus agricultural sector toward industry and services (Lewis, 1954).

However, closer examination reveals important dimensions of labor market dualism. The services sector, which absorbs more than half of the workforce, is heterogeneous and encompasses both high-wage productive services—such as transportation, storage, business services, and information and communication—and low-wage, informal consumer services, including personal services and traditional retail trade. BPS data do not provide a disaggregated breakdown of these service activities; nevertheless, the strong growth of Transportation and Storage (8.71 percent) and Business Services (7.91 percent) suggests that a substantial proportion of service-sector employment in Gresik is concentrated in productive and formal segments.

The predominance of formal employment (56.16 percent) represents a significant policy finding. Based on labor market dualism theory (Dickens & Lang, 1985), a formal employment share exceeding 50 percent indicates that Gresik's labor market has moved beyond the stage of predominantly informal employment commonly observed in developing economies. In the Indonesian context, where approximately 60–70 percent of workers remain in informal employment (BPS, 2024), Gresik demonstrates comparatively stronger performance. This may be explained by the characteristics of integrated industrial areas, which require formal employment relationships, company registration, and compliance with labor regulations.

Nevertheless, the 43.84 percent share of informal employment remains substantial. Drawing on Suparman and Muzakir (2023), high informality is associated with regional disparities and low human capital quality. In Gresik, informality is likely concentrated in consumer services, traditional retail trade, and small-scale agriculture—sectors that require relatively limited capital or formal qualifications. The policy challenge, therefore, is not the complete elimination of informality but rather its gradual formalization through training programs, access to capital, and social protection for informal workers.

Educational Profile, Gender Disparities, and Skill Mismatch Challenges

The educational profile of Gresik's workforce reveals a pyramid-shaped structure that reflects long-term challenges in human capital quality. Senior secondary school or equivalent graduates constitute the largest group, accounting for 47.03 percent, followed

by primary school or below (22.34 percent), junior secondary school or equivalent (17.03 percent), and higher education (13.60 percent). Collectively, 69.37 percent of Gresik's workforce has lower- or upper-secondary educational qualifications. The share of higher-education graduates, at only 13.60 percent, is substantially below Indonesia's national average of approximately 18–20 percent (BPS, 2024), indicating a significant regional education gap.

These findings have serious implications for skill mismatch. As reported by recent research on vertical mismatch in Indonesia, mismatch rates exceeded 50 percent among academic graduates (Khoiruddin et al., 2024). The situation in Gresik may be more pronounced because of its smaller pool of highly educated workers. Rapidly growing manufacturing and productive service sectors require workers with technical, digital, and managerial competencies that are generally developed through vocational and higher education. With only 13.60 percent of the workforce holding higher-education qualifications, Gresik faces the risk of a human capital bottleneck that could constrain economic diversification toward higher-value-added activities.

From a gender perspective, the substantial LFPR gap—83.38 percent among men compared with 52.54 percent among women, representing a difference of 30.84 percentage points—is a critical indicator of gender disparity. Although the female OUR (5.15 percent) is slightly lower than the male OUR (5.67 percent), the low female participation rate indicates the existence of structural barriers to women's access to the labor market. These barriers may include unequal caregiving responsibilities, limited childcare facilities in industrial areas, gender discrimination in recruitment, or social norms restricting women's mobility (Klasen & Lamanna, 2009).

Paradoxically, Gresik's dominant services sector should, in principle, be more inclusive of women than the physically intensive manufacturing sector. The low female LFPR despite the dominance of services indicates that barriers to female labor force participation are multidimensional and cannot be attributed solely to sectoral structure. Policies focused on women's empowerment—including childcare facilities in industrial areas, community-based reskilling programs, and tax incentives for firms that recruit women—are therefore required to reduce this disparity.

Growth Inclusiveness and Sustainability Challenges

The integration of macroeconomic and employment findings leads to a critical assessment of the inclusiveness of Gresik's economic growth. Quantitatively, economic growth of 4.79 percent has been translated into broad employment participation (LFPR of 68 percent), a reduction in unemployment (OUR of 5.47 percent), and increased formalization (56.16 percent). However, this inclusiveness remains partial and faces sustainability challenges across three principal dimensions.

First, sectoral inclusiveness. Growth driven by manufacturing, which accounts for 51.25 percent of GRDP, is not fully employment-friendly because of its low labor intensity. Conversely, the services sector, which absorbs 52.47 percent of the workforce, contributes a smaller share of GRDP. This mismatch creates a risk of disguised jobless growth, whereby economic output increases without a proportional improvement in employment quality. Consistent with the findings of Pramusinto and Daerobi (2020), technology and capital-intensive investment have a negative effect on employment absorption in Indonesia's manufacturing sector. In Gresik, the dominance of manufacturing, which is likely to be technology-intensive, implies capital–labor substitution that reduces the elasticity of employment with respect to output growth.

Second, gender inclusiveness. The 30.84-percentage-point LFPR gap indicates that a substantial proportion of Gresik's female labor potential remains underutilized. In the context of moderate economic growth (4.79 percent) and slowing globalization trends (World Bank, 2025), mobilizing women's economic potential represents a crucial additional source of growth. Klasen and Lamanna (2009) demonstrate that gender gaps in labor force participation are negatively associated with per capita economic growth. Reducing gender disparities is therefore not merely a matter of social justice but also a strategy for promoting economic growth.

Third, qualitative inclusiveness through education. The predominance of workers with lower- and upper-secondary qualifications (69.37 percent), combined with the relatively small share of higher-education graduates (13.60 percent), creates a risk of a middle-skill trap. Amid digital transformation and Industry 4.0 automation, modern manufacturing requires workers capable of operating advanced technologies, analyzing data, and adapting rapidly. Without substantial intervention in vocational and higher education, Gresik risks losing its relative competitiveness as an integrated industrial area.

From the perspective of regional economic resilience, Gresik demonstrates solid performance but remains vulnerable to sectoral concentration. The 51.25 percent dependence on manufacturing and the contraction of mining (−5.49 percent) indicate the need for economic diversification toward sectors characterized by high growth and balanced labor intensity, such as Public Administration, Transportation and Storage, and Information and Communication. These sectors not only exhibit rapid growth rates—above 6–8 percent—but also tend to be skill-intensive and more gender-inclusive.

Overall, the findings confirm that Gresik's economic growth in 2024 was quantitatively inclusive, as reflected in declining unemployment and increased employment formalization, but continues to face qualitative inclusiveness challenges related to human capital quality, gender equality, and sectoral diversification. Future policies should therefore focus on the quality of growth, rather than merely pursuing higher GRDP growth rates, while ensuring that each percentage point of economic expansion contributes to improvements in welfare, equality, and long-term resilience across all segments of Gresik society.

CONCLUSION

Gresik Regency's economic growth in 2024, supported by the dominance of manufacturing and household consumption, was translated into a decline in the Open Unemployment Rate and an increase in the proportion of formal workers as of August 2025, consistent with the predictions of Okun's law. Nevertheless, the inclusiveness and resilience of this growth remain constrained by three structural factors: a substantial gender gap in labor force participation, a workforce educational profile dominated by lower- and upper-secondary graduates, and the risk of capital–labor substitution in manufacturing, which creates a disparity between the sector's contribution to GRDP and its employment absorption capacity.

At least five priority policy agendas should be considered. First, given that the workforce is dominated by senior secondary school graduates, the local government should revitalize SMK Centers of Excellence through a dual-system model aligned with the needs of manufacturing and productive service sectors, particularly logistics, ICT, and business services, to reduce the vertical skill mismatch that has been shown to exceed 50 percent in Indonesia. Second, to address the gender gap, policies should mandate childcare facilities in industrial areas, provide tax incentives for firms with higher female

employment ratios, and implement community-based reskilling programs that accommodate women's mobility constraints. Third, in anticipation of Industry 4.0 automation and the contraction of the mining sector, economic diversification should target sectors with high growth and balanced labor intensity—namely public administration, transportation and storage, and information and communication—through the development of digital infrastructure and green industrial zones. Fourth, for informal workers, gradual formalization programs are required, including access to microfinance, business management training, and portable social protection, so that the transition from informal to formal employment does not create disincentives. Fifth, regional economic resilience following shocks, such as the contraction experienced in 2020, should be strengthened by establishing a regional economic buffer based on countercyclical fiscal reserves and diversification of export markets for leading commodities, thereby reducing dependence on manufacturing without sacrificing growth momentum.

For future research, spatial panel-data econometric analysis is recommended by integrating Sakernas microdata with district- and municipality-level GRDP data across East Java. Such an approach would enable the estimation of regional Okun coefficients and the multivariate examination of the determinants of employment formalization. In addition, longitudinal studies based on primary surveys in Gresik's industrial areas are recommended to quantitatively measure the extent of skill mismatch and evaluate the effects of vocational training policies on labor productivity and gender equality over the medium term.

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