



MANUFACTURING-LED GROWTH AND EMPLOYMENT TRANSFORMATION: EVIDENCE FROM GRESIK REGENCY, INDONESIA

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Abstract

Industrialization does not necessarily translate into proportional employment expansion within the manufacturing sector. This study examines the structural transformation of Gresik Regency, East Java, Indonesia, by investigating the relationship between industrial specialization, labour-market transformation, human capital, and human development. The study employs a quantitative descriptive-explanatory regional case-study design using secondary data from Statistics Indonesia (Badan Pusat Statistik/BPS). The analysis combines indicators of regional economic structure, sectoral employment, labour-force participation, unemployment, employment formality, educational attainment, and the Human Development Index (HDI). The findings reveal a distinctive output–employment divergence. Manufacturing accounted for 51.25% of regional Gross Regional Domestic Product (GRDP) in 2024 but absorbed only 35.33% of employment, generating a 15.92-percentage-point output–employment gap. In contrast, services absorbed the largest share of employment at 52.47%. The labour market also exhibited a 68.00% labour-force participation rate, a 5.47% open unemployment rate, and a 56.16% formal-employment share. Meanwhile, the workforce remained concentrated at the senior-secondary education level, while tertiary-educated workers represented 13.60%. Despite these structural divergences, the HDI increased consistently from 76.98 in 2021 to 79.69 in 2025. The findings indicate that regional industrialization should not be evaluated solely through manufacturing output. Instead, structural transformation should be understood as a multidimensional process involving output specialization, employment reallocation, workforce capabilities, and human development. The study contributes to the literature by highlighting the distinction between output transformation and employment transformation in an emerging industrial region

PERTUMBUHAN BERBASIS MANUFAKTUR DAN TRANSFORMASI KETENAGAKERJAAN: BUKTI DARI KABUPATEN GRESIK, INDONESIA

Abstrak

Industrialisasi tidak selalu menghasilkan peningkatan kesempatan kerja yang proporsional di sektor manufaktur. Penelitian ini menganalisis transformasi struktural di Kabupaten Gresik, Jawa Timur, Indonesia, dengan mengkaji keterkaitan antara spesialisasi industri, transformasi pasar kerja, modal manusia, dan pembangunan manusia. Penelitian menggunakan desain kuantitatif deskriptif-eksplanatori dengan pendekatan studi kasus regional dan memanfaatkan data sekunder dari Badan Pusat Statistik (BPS). Analisis mencakup indikator struktur ekonomi regional, penyerapan tenaga kerja sektoral, tingkat partisipasi angkatan kerja, pengangguran, formalitas

pekerjaan, tingkat pendidikan tenaga kerja, dan Indeks Pembangunan Manusia (IPM). Hasil penelitian menunjukkan adanya divergensi output–tenaga kerja yang kuat. Sektor manufaktur menyumbang 51,25% terhadap Produk Domestik Regional Bruto (PDRB) pada tahun 2024, tetapi hanya menyerap 35,33% tenaga kerja, sehingga menghasilkan kesenjangan output–tenaga kerja sebesar 15,92 poin persentase. Sebaliknya, sektor jasa menyerap proporsi tenaga kerja terbesar, yaitu 52,47%. Pasar kerja juga menunjukkan tingkat partisipasi angkatan kerja sebesar 68,00%, tingkat pengangguran terbuka sebesar 5,47%, dan proporsi pekerja formal sebesar 56,16%. Sementara itu, struktur pendidikan tenaga kerja masih didominasi oleh lulusan pendidikan menengah atas, sedangkan pekerja berpendidikan tinggi hanya mencapai 13,60%. Di tengah divergensi struktural tersebut, IPM Gresik meningkat secara konsisten dari 76,98 pada tahun 2021 menjadi 79,69 pada tahun 2025. Temuan ini menunjukkan bahwa industrialisasi regional tidak seharusnya dievaluasi hanya berdasarkan kontribusi output manufaktur. Transformasi struktural perlu dipahami sebagai proses multidimensional yang mencakup spesialisasi output, realokasi tenaga kerja, peningkatan kapabilitas tenaga kerja, dan pembangunan manusia. Penelitian ini berkontribusi pada literatur dengan menegaskan pentingnya membedakan transformasi output dari transformasi ketenagakerjaan dalam konteks wilayah industri yang sedang berkembang.

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INTRODUCTION

Structural transformation is increasingly understood as a multifaceted evolution of production structures that transcends the historical shift from agrarian to manufacturing-based economies (Kovalchuk & Marchenko, 2025). Rather, it involves a complex realignment of labor across diverse service sub-sectors, which often decouple value-generation dynamics from traditional employment absorption patterns (Kawa, 2026; Sen, 2019). This decoupling signifies a post-sectoral gap where institutional control and capital reallocation dictate development outcomes independently of labor shifts (Kawa, 2026). This complexity is further exacerbated by "premature deindustrialization," where technological automation truncates the manufacturing-led pathways previously relied upon for mass labor absorption (Caunedo et al., 2023), (Mokri et al., 2024).

This broader perspective is particularly important because growth in manufacturing output does not necessarily generate proportional growth in manufacturing employment. Technological change, capital deepening, automation, and changes in occupational composition can allow firms to increase value added without expanding their workforce at the same rate (Caunedo et al., 2023). At the same time, employment may increasingly shift toward service-producing occupations, reflecting the broader reallocation of labour associated with structural transformation (Mokri et al., 2024; Sen, 2019). Cross-country evidence shows that this movement from goods-producing to service-producing occupations is a persistent feature of structural transformation across economies (Sen, 2019).

The changing relationship between output and employment raises a central question in contemporary development analysis: does manufacturing-led growth necessarily produce broad-based labour-market transformation and improvements in human development? Structural transformation should therefore be understood not merely as the movement of labour from agriculture to manufacturing and subsequently to services, but as a broader reconfiguration of production, employment, skills, and productivity across sectors (Kovalchuk & Marchenko, 2025; Sen, 2019). Technological change, automation,

and shifts in occupational task composition may enable manufacturing output to expand without generating a proportional increase in employment, while also altering the skills demanded by firms (Caunedo et al., 2023).

Human capital constitutes another important dimension of this process. Labour reallocation is not determined exclusively by changes in labour demand; workers' education and skills influence their ability to move into emerging occupations and productive sectors. Porzio, Rossi, and Santangelo (2022), for example, show that human capital played an important role in labour reallocation during structural transformation, demonstrating that education can operate as both a driver and a mediating factor in changes in employment structure. (Herrendorf et al., 2013; Porzio et al., 2022)

The regional context is particularly important for understanding these dynamics. National-level indicators can conceal substantial differences between regions because industrial concentration, employment structures, educational attainment, and development outcomes vary spatially. Gresik Regency in East Java provides a particularly relevant case because of its strong industrial specialization. The regional economy is dominated by manufacturing, yet the employment structure is not dominated by manufacturing. The available BPS evidence shows that manufacturing contributes more than half of regional GRDP, while services absorb the largest share of employment. At the same time, the region has experienced continuous improvement in human development.

This configuration creates an empirical puzzle that is not adequately captured by a conventional manufacturing-led growth narrative. If manufacturing is the dominant source of regional value added, why does the service sector absorb the largest share of workers? And how should this divergence be interpreted in relation to human capital and human development?

The present study addresses this puzzle by examining three interconnected dimensions of regional transformation: industrial specialization, labour-market transformation, and human development. Rather than treating labour-market transformation as a statistically established mediator, the study conceptualizes it as a potential explanatory pathway through which structural changes in production may be associated with broader development outcomes. This framing is consistent with recent structural-transformation research that views economic development as a multidimensional reallocation process involving sectors, occupations, employment arrangements, and human capital (Gollin & Kaboski, 2023).

The study makes three contributions. First, it provides subnational evidence from Gresik Regency, one of Indonesia's major industrial regions, using official statistics from Statistics Indonesia (BPS). Second, it highlights an output employment decoupling pattern, in which manufacturing dominates regional value added while services dominate employment. Third, it interprets this pattern within an integrated structural transformation framework that considers labour-market formalization, workforce education, and human development rather than evaluating industrialization solely through output growth.

Accordingly, the study asks three questions: How is industrial specialization reflected in the economic structure of Gresik Regency?; How does the regional employment structure correspond to the pattern of industrial specialization?; How do labour-market characteristics, human capital, and human development evolve alongside this structural transformation?. By addressing these questions, the study seeks to contribute to the literature on regional structural transformation by demonstrating that output transformation and employment transformation do not necessarily occur at the same pace.

LITERATURE REVIEW

Industrialization and Contemporary Structural Transformation

Structural transformation traditionally describes the movement of economic activity and labour from agriculture toward manufacturing and services. Contemporary research, however, has broadened this concept to encompass several simultaneous transformations, including movements from rural to urban areas, informal to formal employment, self-employment to wage work, and low-productivity to higher-productivity activities (Gollin & Kaboski, 2023).

This broader interpretation is particularly relevant to industrial regions. Manufacturing can remain highly important for output while employment shifts toward services. Duernecker and Herrendorf (2022) demonstrate that the increasing importance of service occupations is not simply the result of firms outsourcing service activities. Their evidence indicates a fundamental reallocation of labour toward service-producing occupations across countries and periods.

At the same time, industrialization remains relevant to productivity and development. Recent evidence from developing economies shows that structural change can contribute to productivity growth, although the source of productivity gains may arise from both within-sector improvements and labour reallocation across sectors (Duarte & Restuccia, 2010).

Erumban and de Vries (2024) further demonstrate that structural change and productivity growth are associated with poverty reduction across developing countries, although the strength of these relationships differs across sectors and regions. Their evidence emphasizes that the developmental impact of structural transformation depends not merely on changes in sectoral composition but also on whether workers move toward more productive activities (Bah, 2011). These findings suggest that manufacturing share of output should be interpreted as an indicator of industrial specialization, rather than as a direct proxy for employment generation.

Proposition 1

Greater manufacturing specialization is expected to be associated with changes in the regional employment structure, but the direction and magnitude of employment transformation need not be proportional to manufacturing's contribution to output.

Labour-Market Transformation and Employment Reallocation

Labour-market transformation encompasses changes in the allocation, quality, and institutional characteristics of employment. These include sectoral employment shifts, changes in formal and informal employment, occupational restructuring, labour-force participation, and changes in workforce skills.

Recent structural-transformation research emphasizes that these dimensions should be considered jointly. Gollin and Kaboski (2023) argue that contemporary structural transformation extends beyond sectoral reallocation to include transitions from informal to formal employment and from self-employment toward wage work. The service sector is particularly important in this context. The increasing share of employment in services does not necessarily indicate economic weakness. Rather, service employment can represent a structural feature of development when it reflects movement toward productive and complementary activities. Duernecker and Herrendorf (2022) provide evidence that the shift toward service occupations is a fundamental component of structural transformation.

However, service-led employment does not automatically imply inclusive development. The developmental consequences depend on productivity, wages, formality, skills, and working conditions. Consequently, the employment share of a sector should be interpreted together with indicators of employment quality and human capital.

Proposition 2

Labour-market transformation should be evaluated through sectoral reallocation together with employment formality, labour-force participation, unemployment, and workforce educational composition.

Human Capital and Structural Transformation

Human capital is central to the capacity of workers to participate in changing production systems. Structural transformation changes not only the number of workers demanded but also the skills and occupations required.

Porzio et al. (2022) demonstrate that human capital contributed substantially to labour reallocation during structural transformation. Their findings imply that education should not be viewed only as an outcome of development; it also affects the ability of workers to move across sectors and occupations.

This argument is particularly relevant for industrial regions exposed to technological upgrading. Workers with greater educational attainment and specialized skills may be better positioned to enter higher-productivity occupations, whereas workers with limited education may remain concentrated in lower-productivity or informal activities.

The educational composition of a regional workforce therefore provides an important indicator of the quality of structural transformation. (Gennaioli et al., 2012) A region may achieve high industrial output while still facing constraints if the supply of specialized human capital does not keep pace with technological and occupational change (McCann & Ortega-Argilés, 2013).

Proposition 3

The quality of workforce education is an important enabling condition for labour reallocation toward higher-productivity activities.

Structural Transformation and Human Development

Human development encompasses improvements in health, education, and living standards. Economic growth can create resources that support these outcomes, but growth does not automatically translate into improvements in human capabilities.

Recent evidence suggests that structural change and productivity growth can contribute to welfare improvement when workers move toward more productive activities (Erumban & de Vries, 2024). The relationship is therefore better understood as a broader development process in which economic transformation creates opportunities, while labour-market institutions, human capital, and public services influence how those opportunities are translated into human development.

In the Gresik context, continuous HDI improvement alongside manufacturing dominance and service-dominated employment provides an opportunity to examine this relationship descriptively. Importantly, the present study does not claim that industrialization statistically causes HDI improvement. Instead, it examines whether the observed pattern is consistent with a broader structural-transformation pathway.

Proposition 4

Improvement in human development may occur alongside structural transformation when economic resources, employment opportunities, human capital, and public-service outcomes improve simultaneously.

Analytical Framework

Based on the literature, the study develops an analytical framework rather than a statistically estimated mediation model.

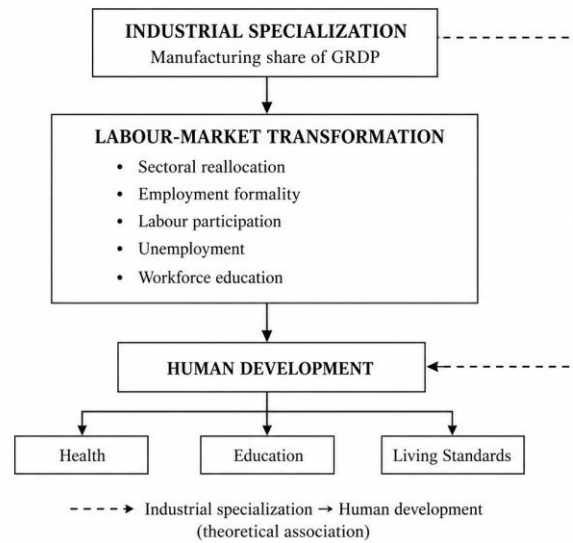


Figure 1. Analytical Framework of Regional Structural Transformation

METHODS

Research Design

This study employs a quantitative descriptive-explanatory regional case-study design to examine the relationship among industrial specialization, labour-market transformation, human capital, and human development in Gresik Regency, East Java, Indonesia. The design is appropriate because the study seeks to identify and interpret a distinctive regional structural pattern rather than estimate a causal mediation model. The central empirical issue is the divergence between the sector generating the largest share of regional value added and the sector absorbing the largest share of employment. Accordingly, the study combines descriptive statistics, sectoral comparison, and temporal trend analysis to identify the configuration of regional structural transformation.

Study Context and Data Sources

Gresik Regency was selected as the study context because of its strong manufacturing orientation and its importance within the industrial structure of East Java. The study uses secondary data published by Statistics Indonesia (Badan Pusat Statistik/BPS). The dataset consists of three principal categories: (1) Economic structure indicators, including GRDP, economic growth, and sectoral contributions to GRDP; (2) Labour-market indicators, including labour-force participation, employment, unemployment, sectoral employment distribution, and formal/informal employment; (3) Human-development indicators, including HDI and its principal dimensions.

The data are drawn from the most recent BPS publications available for each indicator. Because BPS indicators are reported according to different statistical reference periods, the study does not treat the dataset as a balanced panel. Instead, the analysis adopts a cross-temporal comparative design. This distinction is essential because the economic structure is observed for 2024, labour-market indicators primarily refer to August 2025, while HDI is examined over 2021–2025.

Variables and Operationalization

Industrial Specialization

Industrialization is operationalized primarily through the share of manufacturing in regional GRDP. This indicator captures the degree to which manufacturing constitutes the dominant source of regional value added. Economic growth is treated as contextual evidence rather than as a separate measure of industrialization.

Labour-Market Transformation

Labour-market transformation is not aggregated into a single statistical index because the available data do not provide a sufficiently consistent longitudinal basis for constructing and validating such a composite measure. Instead, labour-market transformation is examined through five empirical dimensions: Labour Force Participation Rate; Open Unemployment Rate; sectoral employment distribution; formal and informal employment; educational composition of the workforce. These indicators capture different dimensions of labour-market adjustment and are therefore interpreted separately.

Human Capital

Human capital is represented by the educational composition of employed workers, particularly the shares of workers with primary, junior-secondary, senior-secondary, and tertiary education. The analysis deliberately avoids equating formal educational attainment directly with occupational skill level.

Human Development

Human development is measured using the Human Development Index (HDI), consistent with BPS methodology. HDI captures achievements in health, education, and living standards.

Analytical Procedure

The analysis consists of four stages. First, the study examines the structure of regional output to identify the extent of manufacturing specialization. Second, labour-market indicators are examined to identify participation, unemployment, employment formality, and sectoral employment patterns. Third, sectoral output and employment shares are compared to identify whether the distribution of regional value added corresponds to the distribution of employment. Fourth, workforce educational composition and HDI trends are examined to assess the human-capital and human-development dimensions of regional structural transformation. The central comparison is the output–employment gap, calculated as:

$$[\text{Output} - \text{Employment}] \text{Gap}_i = \text{GRDP} \text{Share}_i - \text{Employment} \text{Share}_i$$

A positive value indicates that a sector's contribution to output exceeds its share of employment, while a negative value indicates that the sector absorbs a larger share of employment than its contribution to regional output. This indicator is descriptive and should not be interpreted as a measure of causal productivity effects.

Validity and Limitations

The use of BPS data provides several advantages, including standardized definitions, official statistical procedures, and consistency with national statistical frameworks. Nevertheless, three limitations should be recognized. First, the indicators

refer to different statistical periods. Second, the study focuses on a single regional case and therefore does not claim national generalizability. Third, the available data do not provide sufficient observations to estimate a causal mediation model.

Consequently, the findings should be interpreted as descriptive-explanatory evidence of regional structural transformation, rather than definitive evidence of causal effects.

RESULT

Economic Growth and Structural Transformation

Gresik Regency recorded economic growth of 4.79% in 2024, increasing from 4.62% in the previous year. GRDP at current prices reached IDR 188.60 trillion, while GRDP at constant prices reached IDR 119.27 trillion. Manufacturing was the dominant contributor to regional output, accounting for 51.25% of total GRDP. Other major contributors were wholesale and retail trade (12.89%), construction (8.67%), agriculture (6.55%), and mining (6.14%).

Table 1. Economic Structure of Gresik Regency, 2024

Economic Sector	Contribution to GRDP (%)
Manufacturing	51.25
Wholesale and retail trade	12.89
Construction	8.67
Agriculture	6.55
Mining	6.14
Other sectors	10.31

Source: Statistics Indonesia (BPS), Gresik Regency.

The data establish Gresik as a strongly manufacturing-specialized regional economy. However, the output structure alone does not indicate how economic activity is distributed across the labour market.

Labour-Market Dynamics

In August 2025, the labour force reached 735.90 thousand persons, comprising 695.66 thousand employed persons and 40.24 thousand unemployed persons. The Labour Force Participation Rate was 68.00%, while the Open Unemployment Rate was 5.47%.

Table 2. Labour-Market Indicators in Gresik Regency, August 2025

Labour Market Indicator	Value
Labour force (thousand persons)	735.9
Employed population (thousand persons)	695.66
Unemployed population (thousand persons)	40.24
Labour Force Participation Rate (%)	68
Open Unemployment Rate (%)	5.47

Source: Statistics Indonesia (BPS), Gresik Regency.

Formal employment accounted for 56.16% of employed workers, while informal employment accounted for 43.84%. The labour-market structure therefore exhibits a substantial formal-employment component, while informal employment remains significant.

Output–Employment Decoupling

The comparison between sectoral output and employment reveals the most distinctive finding of the study. Manufacturing contributed 51.25% of GRDP, but accounted for only 35.33% of employment. The resulting output–employment gap is:

$$[51.25-35.33=15.92\text{\%points}]$$

By contrast, services absorbed 52.47% of employment, making them the largest employment sector. Agriculture contributed 6.55% of GRDP but absorbed 12.20% of employment, producing a negative output–employment gap of 5.65 percentage points.

Table 3. Sectoral Output and Employment Structure

Sector	GRDP Share (%)	Employment Share (%)	Output–Employment Gap (pp)
Manufacturing	51.25	35.33	+15.92
Services	N/A*	52.47	N/A
Agriculture	6.55	12.20	–5.65

Note: The available dataset used in this study does not provide a directly comparable aggregate services GRDP share for the same reference period. The employment share is therefore reported without constructing a gap.

Source: Statistics Indonesia (BPS), Gresik Regency.

The evidence indicates that the sector with the largest contribution to regional value added is not the largest employer. Manufacturing therefore exhibits a substantial degree of output–employment decoupling.

This finding should not be interpreted as evidence that manufacturing is unproductive or unsuccessful. Rather, it indicates that manufacturing output and employment absorption do not move proportionally.

Workforce Educational Composition

The educational composition of employed workers shows that senior-secondary education constitutes the largest educational category.

Table 4. Educational Composition of the Workforce

Educational Attainment	Share (%)
Primary school or below	22.34
Junior secondary school	17.03
Senior secondary school	47.03
Tertiary education	13.6

Source: Statistics Indonesia (BPS), Gresik Regency.

Workers with senior-secondary education represented 47.03% of the employed workforce, while tertiary-educated workers accounted for 13.60%.

The finding indicates that the regional workforce has a substantial secondary-education base but a comparatively smaller proportion of tertiary-educated workers.

Human Development Performance

Gresik's HDI increased continuously between 2021 and 2025, rising from 76.98 to 79.69.

Table 5. Human Development Index of Gresik Regency, 2021–2025

Year	HDI
2021	76.98
2022	77.75
2023	78.38
2024	79.08
2025	79.69

Source: Statistics Indonesia (BPS), Gresik Regency.

In 2025, life expectancy reached 74.90 years, expected years of schooling reached 13.99 years, and real expenditure per capita reached approximately IDR 14.89 million per year. The HDI trajectory therefore indicates continuous improvement across the dimensions captured by the index.

DISCUSSION

Manufacturing Dominance Does Not Imply Manufacturing-Dominated Employment

The first major finding is the strong manufacturing specialization of Gresik's economy. Manufacturing generated 51.25% of GRDP in 2024, making it the dominant source of regional value added. However, this dominance is not reproduced in the employment structure. Manufacturing absorbed 35.33% of employment, while services absorbed 52.47%.

This divergence is important because it demonstrates that output transformation and employment transformation can occur at different speeds. Contemporary structural-transformation literature increasingly recognizes that economic development involves multiple simultaneous reallocations rather than a simple transition from agriculture to manufacturing (Gollin & Kaboski, 2023). The Gresik case is also consistent with Duernecker and Herrendorf's (2022) evidence that structural transformation involves a fundamental reallocation toward service-producing occupations.

Thus, the high manufacturing share in Gresik should be interpreted as evidence of industrial specialization, not as evidence that manufacturing must be the principal employment generator.

The Output–Employment Gap as the Central Empirical Finding

The 15.92-percentage-point positive gap between manufacturing's GRDP share and employment share constitutes the central empirical finding of this study. The gap indicates that manufacturing produces substantially more regional value added per employment share than would be implied by its employment contribution alone. However, because the present study does not have sector-specific productivity and wage data, this result should not be interpreted as a direct estimate of labour productivity. Instead, the finding reveals a structural divergence: the sector that dominates regional production is not the sector that dominates employment. This distinction challenges a linear model of industrialization in which manufacturing expansion is assumed to generate proportional employment expansion.

Recent research supports the broader interpretation that structural transformation involves the movement of labour across sectors and occupations, including increasing service employment (Duernecker & Herrendorf, 2022). At the same time, the service sector should not automatically be considered a higher-quality employment destination. The developmental implications of service-sector expansion depend on productivity, wages, formality, and skills.

Therefore, the key policy question is not whether services have become the largest employer, but what type of service employment is being created and whether it represents movement toward higher-productivity activities.

Labour-Market Transformation as a Plausible Development Pathway

The labour-market indicators reveal several simultaneous changes: relatively high labour-force participation, a 5.47% unemployment rate, formal employment representing 56.16% of employment, and services absorbing the largest share of workers.

These characteristics suggest that structural transformation in Gresik is occurring across both sectoral and institutional dimensions. This interpretation corresponds with the contemporary view that structural transformation includes movements from informal to formal employment and from self-employment to wage employment (Gollin & Kaboski, 2023).

However, the available data do not permit the claim that industrialization caused formalization. The evidence only establishes that manufacturing specialization and a relatively substantial formal-employment share coexist within the same regional development configuration. This distinction is essential for methodological validity. The appropriate interpretation is therefore that labour-market transformation represents a plausible explanatory pathway through which structural economic change may be connected with development outcomes, rather than a statistically demonstrated mediating effect.

Human Capital and the Capacity for Industrial Upgrading

The workforce composition provides an important qualification to the positive industrialization narrative. Nearly half of employed workers have senior-secondary education, while only 13.60% have tertiary education. This does not mean that the majority of workers are necessarily semi-skilled or low-skilled, because educational attainment and occupational skill classification are distinct concepts. Rather, the finding indicates that tertiary educational attainment is relatively limited within the employed population.

This issue becomes important as production systems become more technologically intensive. Porzio et al. (2022) demonstrate that human capital plays a substantial role in labour reallocation during structural transformation. Consequently, the future developmental trajectory of Gresik may depend not only on the expansion of industrial output but also on whether the workforce can acquire the skills required by changing production technologies and occupational structures. This interpretation is consistent with evidence that productivity improvements may arise within sectors rather than simply through the movement of workers between sectors (Konte et al., 2022).

For Gresik, this means that industrial upgrading and workforce upgrading should be treated as complementary rather than separate development agendas.

Human Development Has Improved Alongside Structural Divergence

The HDI increased from 76.98 in 2021 to 79.69 in 2025. This improvement occurred despite the fact that manufacturing did not absorb the largest share of employment. The finding demonstrates that improvement in human development does not require manufacturing to be the dominant employment sector. However, the data do not establish that industrialization caused HDI improvement. HDI is influenced by

multiple factors, including health services, education, household expenditure, public investment, and demographic conditions.

Therefore, the most defensible interpretation is that industrial specialization, labour-market transformation, and human-development improvement have occurred concurrently. This interpretation is consistent with recent evidence that structural change and productivity growth can be associated with improvements in welfare outcomes, although the mechanisms differ across countries and sectors (Erumban & de Vries, 2024). The Gresik case therefore supports a multidimensional interpretation of development in which economic output, employment structure, human capital, and human development must be considered jointly.

An Integrated Interpretation of Regional Structural Transformation

Overall, the findings of this study indicate that economic transformation in Gresik unfolds through four main characteristics that occur simultaneously. First, the manufacturing sector serves as the primary pillar of regional output and dominates the structure of the economy. Second, although industry is the main driver of value added, the service sector absorbs the largest share of the workforce, indicating a significant shift in the employment structure. Third, the educational composition of the workforce is still dominated by secondary school graduates, suggesting that improvements in human capital continue to face constraints at the tertiary education level. Fourth, amid these dynamics, human development indicators show a consistent upward trend over time.

These four findings can be understood as a single interconnected transformation process, namely manufacturing specialization followed by labour-market restructuring, human capital adjustment, and ultimately contributing to improvements in human development. However, this relationship is not intended to represent a statistically tested causal linkage, but rather a theoretical interpretation derived from the observed empirical configuration in the study area.

This interpretation broadens the perspective in structural transformation studies by emphasizing that the success of industrialization cannot be measured solely by the magnitude of manufacturing's contribution to regional output. A region may exhibit a high degree of industrialization, while at the same time experiencing a shift of labour toward the service sector, and still facing challenges in expanding higher education attainment and reducing informal employment.

Therefore, the quality of structural transformation is as important as its speed, because what ultimately determines its development impact is not only how rapidly the economic structure changes, but also how inclusive and sustainable that change is for the workforce and the overall quality of life of the population.

CONCLUSION

The findings of this study lead to three integrated conclusions. First, regional structural transformation in Gresik demonstrates a clear decoupling between output and employment, where manufacturing dominates value added while services dominate employment. This indicates that industrialization does not automatically translate into proportional job creation in the industrial sector. Second, the results highlight that human capital is a critical enabling condition in shaping how workers adjust to structural change, particularly in determining their ability to move across sectors and benefit from industrial upgrading. Third, the improvement in human development alongside this structural

divergence confirms that development outcomes are multidimensional and cannot be reduced to manufacturing performance alone.

From a theoretical perspective, the study strengthens contemporary structural-transformation theory by emphasizing that economic development must be understood as a simultaneous transformation of output structures, employment structures, and human capabilities. The Gresik case supports the view that industrialization is not a linear process of sectoral substitution, but a complex reallocation process in which services play an increasingly dominant role in employment absorption. It also reinforces the argument that human capital is not merely an outcome of development, but an active mechanism that shapes labour reallocation and determines the quality of structural transformation. In addition, the findings extend the understanding of human development by showing that improvements in HDI can occur even when employment shifts away from manufacturing, as long as broader economic and institutional conditions support welfare gains.

From a policy perspective, the results imply that industrial policy must move beyond a narrow focus on increasing manufacturing output and instead prioritize the strengthening of linkages between industrial growth and employment creation across sectors. This includes supporting complementary service sectors that enhance industrial ecosystems, such as logistics, trade, and business services. At the same time, the findings underscore the urgency of human capital development policies, particularly through vocational and higher education systems that are aligned with industrial and technological change. Finally, the significant share of informal employment highlights the need for policies that promote labour-market formalization and job quality improvement, while ensuring that services are recognized as a strategic employment sector rather than a residual component of the economy.

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