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Gender Segregation in the Indonesian Labor Market: Insights from a Multigroup Analysis

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Gender Segregation in the Indonesian Labor Market: Insights from a Multigroup Analysis

Abstract

This study examines the combined effects of occupational and sectoral segregation by gender in Indonesia, analyzing both overall patterns and subgroup variations. Using the local segregation method, this research assesses gender segregation across demographic categories, including region (urban and rural), age, education level, marital status, and the presence of young children. The analysis is based on microdata from the 2023 Indonesian Labor Survey (*Sakernas*). Findings indicate that female workers face significantly higher segregation levels than males, despite their lower employment share. Segregation is particularly pronounced in urban areas, with urban females experiencing the highest levels. Among age groups, elderly females exhibit the most severe segregation. While higher education reduces segregation among females, gender disparities persist when compared to males. Additionally, family characteristics play a crucial role, as female workers with young children or those in non-widowed marital statuses encounter higher segregation than males. To overcome these challenges, targeted policies are needed to remove barriers. This includes offering incentives for employers to create workplaces that support women, such as childcare assistance and programs for elderly women, widows, and divorced women. Additionally, expanding education access and encouraging gender equality in male-dominated fields may help reduce segregation and improve women's well-being at work.

Keywords: Gender-based Segregation, Occupational and Sectoral Segregation, Local Segregation, Indonesia.
JEL Codes: J16, J24, J71

INTRODUCTION

Labor market segregation has long been studied by economists and sociologists to understand its implications for economic inequality, social mobility, and gender dynamics. Specifically, gender-based segregation in job markets refers to the unequal distribution of male and female workers, both across and within jobs, manifesting in two key dimensions: horizontal and vertical segregation. Horizontal segregation refers to the unequal distribution of men and women across industries or occupations, where certain jobs tend to be dominated by one gender. On the other hand, vertical segregation occurs when men and women are unequally distributed within job hierarchies, with roles differing in status or career advancement opportunities (Carranza et al., 2023). Studies have shown that horizontal segregation is a significant factor contributing to wage disparities and other labor market outcomes (Strawinski et al., 2018; Herrera et al., 2019; Bedaso, 2024). Additionally, women may enter the labor market due to the lower work quality and returns associated with segregation. Therefore, addressing labor market segregation, alongside improving female labor force participation, is crucial for enhancing work quality and advancing gender equality.

Previous research has explored gender-based segregation in labor market in developing economies (e.g., Khan et al., 2023; Agrawal, 2016), but there has been limited attention to this issue within the context of Indonesia. Most studies on this topic have concentrated on either specific regions (Azwardi et al., 2023; Yunisvita and Muhyiddin, 2020) or particular sectors, such as the health sector (Marwah and Putri, 2023). A notable exception is the national-level study by Yunisvita et al. (2021), which focused on a broad demographic group—males and females—without examining other specific subgroups, such as the intersection of gender with educational level or marital status (referred to as multigroup analysis). In contrast, Azwardi et al. (2023) considered a specific subgroup, focusing on gender and educational level in South Sumatera Province. Furthermore, both studies utilized one-digit occupational codes which often reduces the granularity of information related to gender segregation in employment.

Our study fills the research gap in the Indonesian context by making two key contributions. First, rather than focusing solely on occupations, we jointly analyze differences across occupations and sectors, treating each occupation as distinct based on its sector. This integrated approach provides a more nuanced understanding of gender segregation, as women may be concentrated in specific occupations within an industry or limited to particular roles across industries. Second, using Alonso-Villar & Del Río's (2010) local segregation method, we quantify the segregation of different demographic groups—specifically male and female—as well as the segregation of specific subgroups, such as gender and age, gender and educational level, gender and residential area, gender and marital status, and gender and living with young children. This approach offers a comprehensive perspective on how these demographic subgroups influence the gender-based distribution of occupations and sectors. Our focus on gender-based occupational and sectoral segregation in Indonesia from a multigroup perspective aims to provide insights that can inform more effective policies and interventions to advance gender equality.

Analyzing gender-based segregation in the labor market at the national level is especially relevant in Indonesia, a patriarchal society where women face substantial economic and social challenges. This is reflected in a female labor force participation rate of about 54% in 2023, which has stagnated for over two decades (Badan Pusat Statistik, 2023). This stagnation exacerbates the gender wage gap, with women earning 23% less than men (UN Women, 2020), despite Indonesia undergoing economic structural changes, educational advancements, declining early marriage rates, and lower fertility (World Bank, 2024). Additionally, national gender-related employment policies and programs often contain inherent biases, perpetuating occupational gender segregation and relegating women to less productive, lower-paid jobs (World Bank, 2018). This segregation not only reinforces societal perceptions of women's roles but also affects how women view themselves in the labor market. Consequently, the underutilization of highly skilled individuals leads to a significant loss of talent and hampers economic productivity (Scarborough W. J., 2020).

This study is organized as follows: the upcoming section, "Literature Review," offers a summary of pertinent research, with an emphasis on segregation metrics. The "Data and

Methodology" section describes the data and methods utilized in the study. The "Results and Discussion" section presents the findings and provides an analysis. The study concludes with the "Conclusion" section, which highlights the main results and suggests recommendations.

METHODS

Measuring segregation

This study applies the local segregation measurement developed by Alonso-Villar and Del Río (2010). This approach can measure the segregation level of any target group across different units (i.e., occupations and sectors). Let g be one of the N mutually exclusive groups of society ($g = 1, \dots, N$) and also an economy with $O \geq 1$ as occupations, $P \geq 1$ as sectors, and $T > 1$ as jobs among which the total number of workers, T, is distributed as a vector $(t_{11}, t_{12}, t_{13}, \dots, t_{op})$, in which t_{op} is the number of jobs corresponding to a specific unit, and $T = \sum_{op} t_{op}$. The target group (i.e., male or female), c^g, has following distribution among units $\left(c_{11}^g, c_{12}^g, c_{13}^g, \dots, c_{op}^g\right)$, and then $C^g = \sum_{op} c_{op}^g$ stands for total numbers of individuals belonging to this group across all units. Notably, c_{op}^g always less than or equal to t_{op}, ($c_{op}^g \leq t_{op}$), since this group represents a subset of total workers. For simplicity, let we rename that the above vectors as follows: $t \equiv (t_1, t_2, t_3, \dots, t_j)$, and $c \equiv \left(c_1, c_2, c_3, \dots, c_j\right)$, where $J = O\ x\ P$.

The target group is evenly distributed across all units when the ratio of the group size to the total population $\left(\frac{C^g}{T}\right)$ equals the ratio of the group's presence in each unit to the unit's total population $\left(\frac{c_j^g}{t_j}\right)$. For example, if women make up 30% of the total workforce $\left(\frac{C^g}{T} = 0.3\right)$ and are evenly distributed, they should represent 30% of the workers in each unit $\left(\frac{c_j^g}{t_j} = 0.3\right)$. It is equivalent if unit J, say, makes up 6% of the total population $\left(\frac{t_j}{T} = 0.06\right)$, then it would be reasonable to expect that 6% of the group would also come from this unit $\left(\frac{c_j^g}{C^g} = 0.06\right)$. If this ratio varies across units, the distribution is uneven, that is, this group is over-represented in some departments and under-represented in others (Del Río & Alonso-Villar, 2022).

The concept explained above forms the basis of the local segregation curve, which is similar to the Lorenz curve used in income or wealth inequality studies. This idea was proposed by Alonso-Villar and Del Río (2010) and the curve shows how much the group's distribution across different units deviates from an even distribution. Ideally, the group's share in each unit, $\frac{c_j^g}{t_j}$, should match its overall share in society, $\frac{C^g}{T}$, or equivalently $\frac{c_j^g}{C^g} = \frac{t_j}{T}$ (Del Río & Alonso-Villar, 2022).

More specifically, Del Rio and Alonso-Villar (2022) explain that to construct a local segregation curve, it is first necessary to classify the units j in ascending ratio order $\frac{c_j^g}{t_j}$. Then, the horizontal and vertical axes respectively represent the cumulative proportion of total individuals, and the cumulative proportion of individuals in the target group g. If we denote by $\tau_j \equiv \sum_{i \leq j} \frac{t_i}{T}$ the proportion of individuals who are in the first j units, the segregation curve, S^g, at point τ_j can be written as follow:

$$S^g(\tau_j) = \frac{\sum_{i \leq j} c_i^g}{C^g}$$

It portrays the share of group's *g* individuals in these units. This curve will be equal to the 45º line if, and only if, the group is evenly distributed across units. Meanwhile, more segregation of the group occurs when the group is concentrated in fewer units or areas, meaning that its distribution is more uneven compared to the total population. It is showed by the local segregation curve move outward to the horizontal axes.

Furthermore, the local segregation curve also can be used for a comparison of segregation levels between two different situations (or distributions) for a particular group. If one curve dominates another**,** meaning that for every point on the first curve, the cumulative share of the group is either equal to or greater than that on the second curve (and greater at least at some point), this indicates less segregation in the first case. The first curve lies entirely above the second curve because the group is more evenly spread across units.

However, if there is a crossing between two curves or more, it suggests that the distribution patterns are mixed**:** one group may be more segregated in some parts of the distribution, while the other may be more segregated in different parts. Therefore, Alonso-Villar and Del Río (2010) introduced various local segregation indices (D^g, G^g, Φ_1^g, Φ_α^g (with $\alpha \neq 0$)) to measure how much a local segregation curve deviates from an equal distribution of the group across units, represented by the 45-degree line (see table 1 below for formula of each local segregation index).

Table 1. Local Segregation Indices

Local Segregation Indices
$D^g = \frac{1}{2} \sum_j \left\lvert \frac{c_j^g}{C^g} - \frac{t_j}{T} \right\rvert$
$G^g = \frac{\sum_{ij} \frac{t_i t_j}{T T} \left\lvert \frac{c_i^g}{t_i} - \frac{c_j^g}{t_j} \right\rvert}{2\frac{C^g}{T}}$
$\Phi_1^g = \left\{ \sum_j \frac{c_j^g}{C^g} ln \left(\frac{\frac{c_j^g}{C^g}}{\frac{t_j}{T}} \right) \right\}$

$$\Phi_{\alpha}^{g} = \frac{1}{\alpha(\alpha-1)} \sum_j \frac{t_j}{T} \left[\left(\frac{\frac{c_j^g}{t_j}}{\frac{C^g}{T}} \right)^{\alpha} - 1 \right]$$

Source: Del Río & Alonso-Villar (2022)

In line with the interpretation from Del Río & Alonso-Villar's (2022) study, the local dissimilarity index, D^g, when multiplied by 100, represents the percentage of individuals from group g who would need to relocate between units to eliminate segregation, while keeping unit sizes unchanged. On the other hand, the local Gini index (G^g) measures the segregation level as twice the area between the local segregation curve and the equality line. Finally, the generalized entropy family, Φ_{α}^{g}, accounts for both the group's underrepresentation (lower part of the curve) and overrepresentation (upper part). A smaller (larger) value of α makes the index more sensitive to the group's underrepresentation (overrepresentation).

To determine the contribution of each group to the overall segregation, where each target group is weighted by its demographic weighting, we follow the mutual information index, derived from information theory and used by Frankle and Volij (2008) in the context of segregation, and also based on the Theil index in inequality research: Following the framework of Del Río and Alonso-Villar (2010), the index can be written as follows:

$$M = \sum_g \frac{c^g}{T} \Phi_1(c^g; t) \quad (4)$$

The two alternative measurements of overall segregation are provided to check the robustness of our estimations. The first is the overall segregation that is proposed by Silber (1992) and Reardon and Firebaugh (2002). In this context, the index suggested by the former, I_p, can be expressed as the weighted average of the local index D^g for each target group into which the economy can be divided (Del Río and Alonso-Villar, 2010):

$$I_p = \sum_g \frac{C^g}{T} D^g \quad (5)$$

Meanwhile, the Gini index G^g proposed by Alonso-Villar and Del Río (2010) is the weighted average of the conventional Gini index and matches the unrestricted version of the multigroup Gini index created by Reardon and Firebaugh (2002). The method for measuring local segregation does not require pairwise comparisons among groups. This approach to quantifying group segregation without requiring such comparisons is consistent with procedures for measuring overall segregation in multigroup contexts: Combining distinct, non-overlapping population subgroups by applying the weighted demographic proportions of each group results in an aggregate measure of segregation. (Khan et al., 2023).

Data description

This study uses the Indonesian Labor Force Survey (*Sakernas*), conducted in August 2023 by Indonesian Statistics. The dataset includes information about the individual and

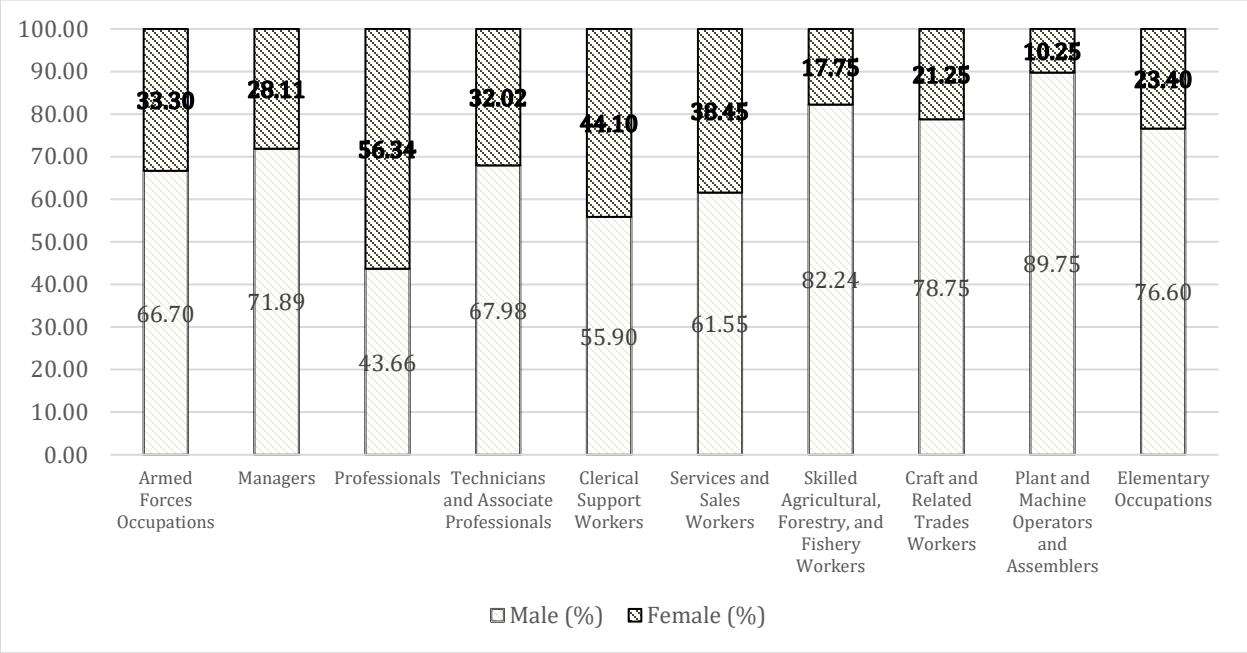
labor market characteristics of the working-age population (15 years and older). Specifically, the sample for this study was restricted to paid employees aged 15-64 years only, excluding self-employed individuals and unpaid family workers. This resulted in a total of 71,063 working individuals, comprising 24,434 females and 46,629 males.

The dataset provides one-digit level codes for both occupations (10 categories) and industries (17 categories), following the International Standard Classification. Although the cross between occupations and industries would lead to be 170 combinations (10 occupations multiplied by 17 industries), we identified 159 combinations due to the available data. For multigroup analysis, we categorized individuals based on various partitions such as sex and three age groups (young, middle-aged, and older); sex and two educational groups (low and high educated); sex and two residential areas (rural and urban); sex and marital status (single, married, divorce, and widowed), and sex and number of under-five children at home (one, two, and more than two). The first partition resulted in six target groups (two dimensions of sex multiplied by three age groups), the second is four target groups, and so on. The “localseg” command in Stata, created by Gradín Carlos (2011), is used to calculate various local and overall segregation indices.

RESULTS AND DISCUSSION

The Figure 1 provides a gender breakdown across various occupations. De Mel, McKenzie, and Woodruff (2009) defined that male- and female-dominated jobs, where men made up more than 75% and less than 25% of workers, respectively. Following their definition, we found in our dataset that several occupations are predominantly male-dominated: Skilled Agricultural, Forestry, and Fishery Workers (82.24%), Craft and Related Trades Workers (78.75%), Plant and Machine Operators and Assemblers (89.75%), and Elementary Occupations (76.60%). On the other hand, the only occupation with a female majority is Professionals, where females make up 56.34% of the workforce. Clerical Support Workers have a relatively balanced gender distribution, with males at 55.90% and females at 44.10%. Other occupations like Services and Sales Workers and Elementary Occupations show a higher male presence at 61.55% and 76.60%, respectively. Overall, the total workforce is composed of 67.30% males and 32.70% females, highlighting a general male majority across the most of occupational categories.

Figure 1. Share of Workers by Occupation and Gender (%)

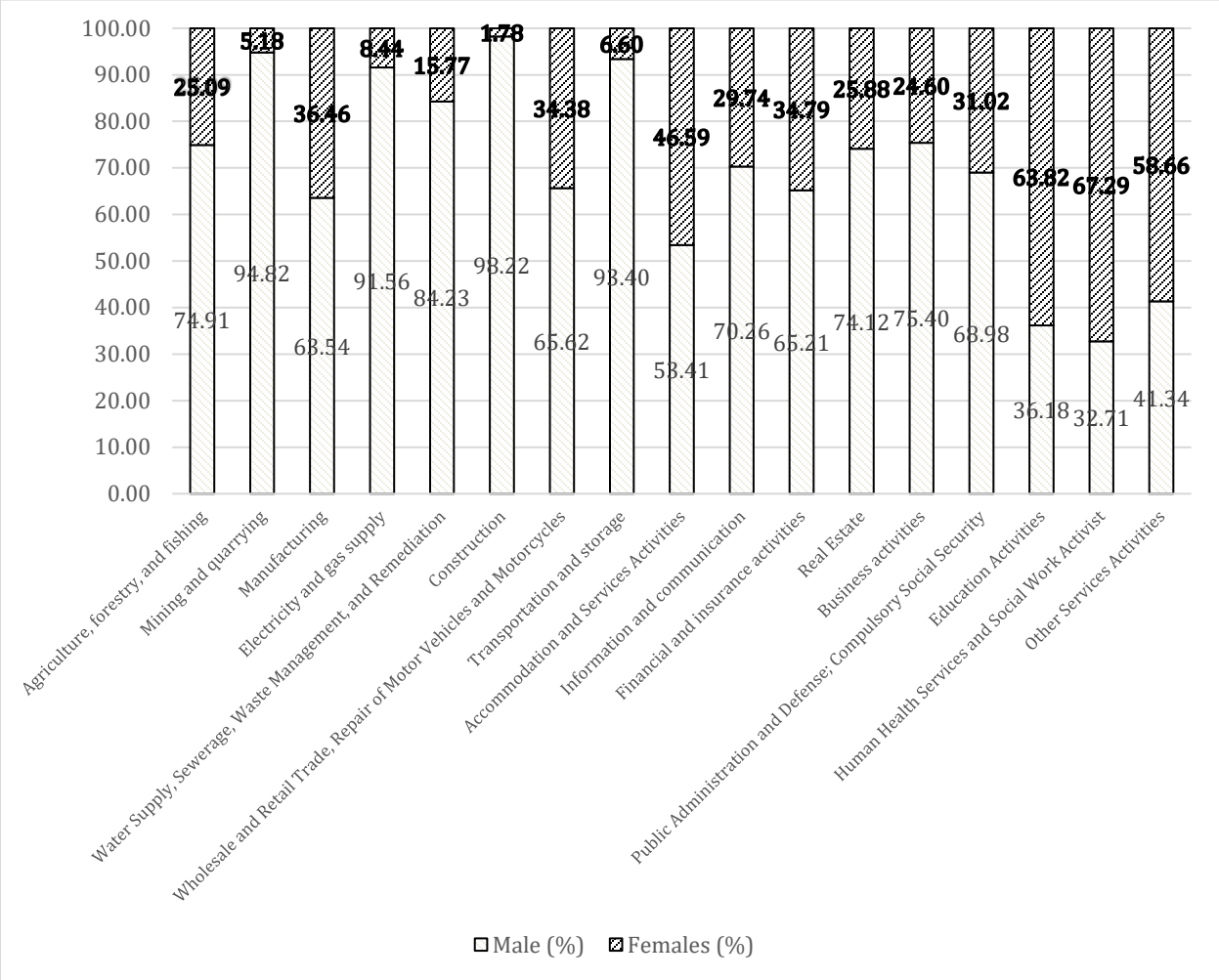


Note: The sample consists of individuals aged 15-64 years who are not self-employed or unpaid family workers. Source: Authors own work.

Moreover, examining various sectors (Figure 2), we see that in *Sakernas* 2023 there are five male-dominated sectors: mining and quarrying (94.82%), electricity and gas supply (91.56%), construction (98.22%), transportation and storage (93.40%), and Business Activities (75,40%). In contrast, women make up more in Human Health Services and Social Work Activities (67.29%) and in Education Activities (63.82%). Accommodation and Services Activities are more gender-balanced, with 53.41% males and 46.59% females. However, sectors like Agriculture, Forestry, and Fishing, and Wholesale and Retail Trade, Repair of Motor Vehicles and Motorcycles have more male workers at 74.91% and 65.6%, respectively. The Financial and Insurance Activities and Information and Communication sectors also have more males at 65.21% and 70.26%. Overall, the gender distribution across all sectors shows that males workers dominance, with males making up 67.26% and women 32.74% of the workforce.

Then, we start to measure the segregation of male and female workers across different units (combination between occupations and industries). Each point on the segregation curve represents the percentage of males (or females) employed within each decile of the total workforce. The first tenth includes units where males (or females) are least represented, making up 10% of all jobs. The second tenth includes 20% of all occupations and sectors, still with a low presence of males (or females). As you move through each tenth, the curve shows that the target group is less represented in the workforce compared to the all-units distribution. If the target group's distribution matched the overall employment distribution, there would be no segregation, and the segregation curve would follow the diagonal line.

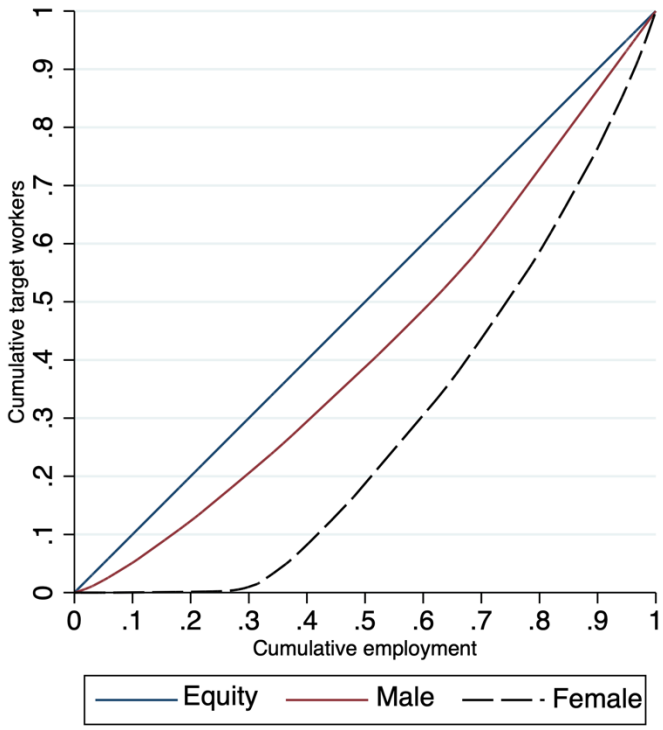
Figure 2. Share of workers by Sector and Gender (%)



Note: The sample consists of individuals aged 15-64 years who are not self-employed or unpaid family workers. Source: Authors own work.

The local segregation curves (Figure 3) indicate that female workers experience greater segregation compared to male workers, as shown by the male curve (red line) being above the female curve (black long-dash). This observation is supported by the estimated segregation indices (Table 2), which consistently show higher segregation for female workers. More specific, the overall segregation, indicated by an M-Index of 0.13, suggests a relatively low level of segregation, reflecting some degree of mixing between genders. However, the individual contributions to overall segregation highlight distinct patterns: the M-Index for males is 0.22 with their share 74% to total workforce, indicating a moderate degree of clustering in specific units, while the M-Index for females is considerably higher at 0.76 (along with share 26%), signifying that women are heavily concentrated in certain units. Both the G-Index and IP-Index for males and females are at 0.50, suggesting that the presence of each gender significantly influences overall segregation, with a balanced likelihood of proximity to one another.

Figure 3. Segregation curves for male and female.



Source: Authors own work.

Table 2. Overall and local segregation indices for male and female.

Overall Segregation	**Ip**	**M**	**G**	**Employment Share (%)**		
Overall Gender Segregation	0.17	0.13	0.23			
Contributing to overall segregation:						
Male contribution	0.50	0.22	0.50	0.74		
Female contribution	0.50	0.76	0.50	0.26		
Local Segregation	D^g	G^g	$\Phi_{0.1}$	$\Phi_{0.5}$	Φ_1	Φ_2
Male	0.11	0.15	0.04	0.04	0.04	0.04
Female	0.32	0.43	1.27	0.57	0.38	0.29

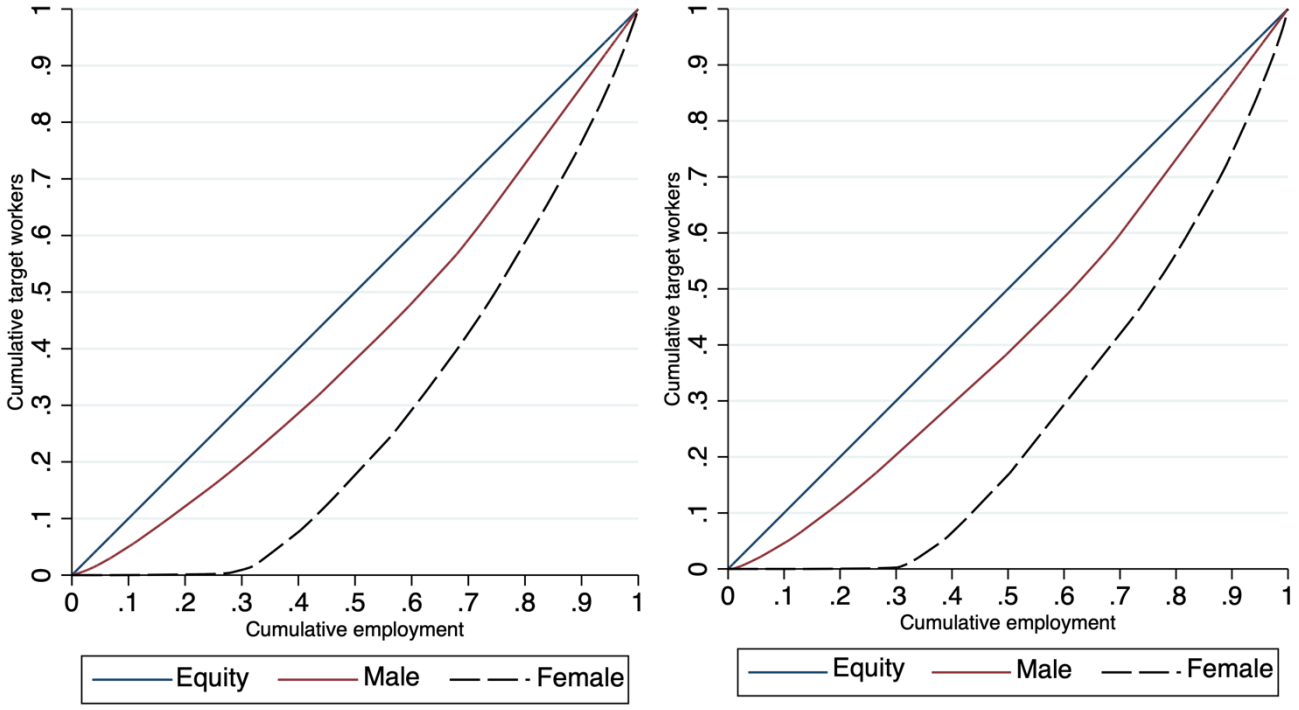
Notes: For overall segregation, Ip, M, and G are the Multi-group Index of Dissimilarity, the Mutual Information Index, and the Gini Index, respectively. For local segregation, D^g, G^g, and Φ is the Multi-group Index of Dissimilarity, the Gini Index, and the Generalized Entropy Indices, respectively.
Source: Authors own work.

When analyzing local segregation indices, a pronounced disparity is observed between female and male distributions, with some indices exhibiting notably higher values (e.g., $\Phi_{0.1}$= 1.27 for female. The index (D^g) indicates that 11% of males and 31% of females would need to relocate between units to eliminate segregation while maintaining unit sizes. The Local Gini Index (G^g) further reveals that females experience segregation at levels approximately 3 times higher than males. The Generalized Entropy Indices (Φ_α^g) consistently show that females face higher segregation across all sensitivity levels. At

$\alpha = 0.1$, where the measure is most sensitive to slight variations, the segregation value for females reaches 1.27 compared to 0.04 for males, underscoring a significant disparity. As α increases (to 0.5, 1, and 2), the values decrease only for females, showing 0.57, 0.38, and 0.29 for females and 0.04. These findings align with those reported in studies conducted in other countries (e.g., Khan et al., 2023; Del Río & Alonso-Villar, 2010) but contrast with Yunisvita et al. (2021), who did not find significant occupational gender-based segregation in Indonesia. The next section will address gender-based segregation within a multigroup context.

Gender and region

Figure 4. Segregation curves for gender groups - urban (left) and rural (right).



Source: Authors own work.

Table 3. Overall segregation indices by gender and regions.

Overall Segregation	Rural			Urban		
	Ip	M	G	Ip	M	G
Overall Segregation	0.17	0.14	0.23	0.18	0.14	0.24
Contribution to overall segregation:						
Male	0.50	0.24	0.50	0.50	0.23	0.50
Female	0.50	0.77	0.50	0.50	0.77	0.50

Note: Similar with table 2.
Source: Authors own work.

Table 3 presents the overall segregation indices for gender groups across rural and urban areas. According to all indices, labor market segregation is more pronounced among

urban workers than in rural areas. This finding in line with results from Agrawal (2016) in India and Azwardi et al. (2023) in South Sumatera Province, which indicate that occupational segregation tends to be more significant in urban sectors than in rural ones. Our study reveals a relatively high level of gender segregation compared to other countries. For instance, Agrawal (2016) observed that in rural India, the overall segregation indices were 0.08 (Ip), 0.04 (M), and 0.22 (G), while in urban areas, the indices were 0.12 (Ip), 0.08 (M), and 0.16 (G). However, it is important to note that these comparisons are not fully equivalent due to differences in the units of analysis.

Figure 4 presents the local segregation curves for females and males as the two target groups across rural and urban areas. In both regions, the curves clearly indicate that female workers suffer higher segregation than males. This is illustrated by the both local segregation curves for male workers (red line) being closer to the 45° line compared to that for female workers (black dashed line). This suggests that women may face more limited opportunities in the labor market, particularly in rural areas.

Aligned with Figure 4, the local segregation indices are summarized in Table 4. These indices indicate that segregation levels are higher for both male and female workers in urban areas compared to rural areas. Our analysis reveals that male workers constitute approximately 73% of the workforce in both rural and urban settings, whereas female workers account for slightly over 26% of employment in both areas. Given the significant share of total employment held by males, their segregation levels are expected to be relatively lower. Across all localities, the findings consistently demonstrate that female workers experience significantly higher segregation than their male counterparts. These results contrast with those of Khan et al. (2023), who reported greater segregation among male workers in urban areas than in rural areas in Pakistan. Similarly, Agrawal (2016) found that segregation levels for both male and female workers in India were higher in urban areas. For Indonesia, there is a limited of comparable studies on this topic. The closest research available, conducted by Azwardi et al. (2023), examines rural-urban segregation but does not address gender differences.

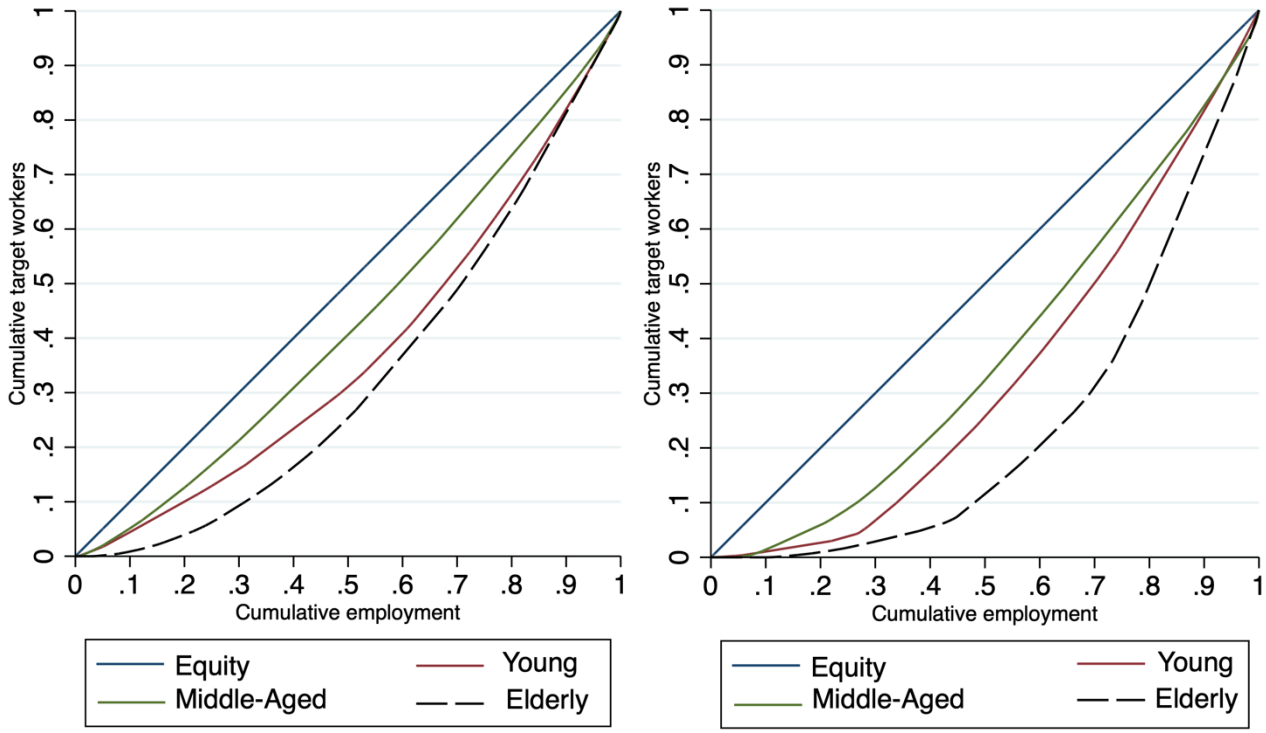
Table 4. Local segregation indices by gender and regions.

Local Segregation	D^g	G^g	$\Phi_{0.1}$	$\Phi_{0.5}$	Φ_1	Φ_2	**% of distribution**
Urban							100
Male	0.12	0.17	0.09	0.05	0.05	0.04	74
Female	0.34	0.45	1.98	0.66	0.43	0.34	26
Rural							100
Male	0.12	0.16	0.05	0.05	0.04	0.04	73
Female	0.33	0.44	1.34	0.58	0.39	0.30	27

Note: Similar with table 2.
Source: Authors own work.

Gender and age

Figure 5. Segregation curves for male (left) and female (right) by age groups.



Source: Authors own work.

Figure 5 presents the patterns of local segregation within occupations and sectors, segmented by gender and age groups: 15–30 years (Young), 31–44 years (Middle-Aged), and over 45 years (Elderly). The separate graphs for male and female workers reveal comparable segregation trends across age groups, with the lowest segregation levels observed among middle-aged workers, followed by the young and elderly groups. However, the figure highlights that across genders, the curves representing female workers for all age groups deviate significantly further from the equity line compared to those of male workers.

These findings align with the overall and local segregation metrics presented in Tables 5 and 6, respectively. Across all overall segregation indices, female workers consistently face higher segregation levels than their male counterparts. The elderly population accounts for about half of the total segregation, based on the M index, for both males and females. During the study period, employment was concentrated among young workers, particularly females (51%), though this proportion declined among middle-aged workers, with a relatively greater drop for females than males. The local segregation indices reveal that middle-aged workers experience the least segregation, followed by young workers of both genders, whereas elderly workers encounter the highest levels of segregation. Notably, younger workers tend to cluster in similar occupations and industries, which reduces their segregation levels compared to elderly workers. These findings are consistent with Agrawal (2016) in India and Del Río & Alonso-Villar (2010) in the Spanish

labor market for female workers. However, in Pakistan, Khan et al. (2021) observed the lowest segregation among young female workers.

Table 5. Overall segregation indices by gender and age groups.

Overall Segregation	Male			Female		
	Ip	M	G	Ip	M	G
Overall Segregation	0.17	0.10	0.23	0.27	0.26	0.36
Contribution to overall segregation:						
< 31	0.46	0.40	0.45	0.46	0.42	0.47
31-44	0.20	0.14	0.22	0.15	0.12	0.16
> 44	0.34	0.46	0.34	0.38	0.46	0.37

Note: Similar with table 2.
Source: Authors own work.

Table 6. Local segregation indices by gender and age groups.

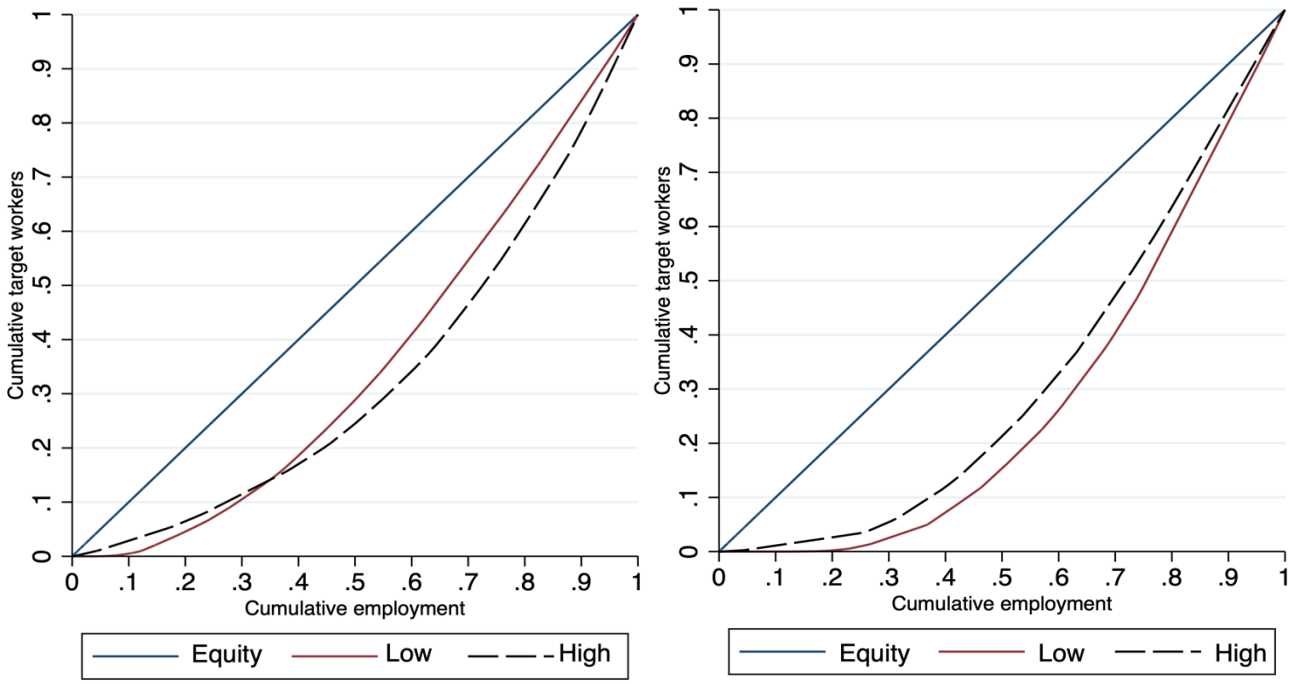
Local Segregation	D^g	G^g	$\Phi_{0.1}$	$\Phi_{0.5}$	Φ_1	Φ_2	% of distribution
Male							100
< 31	0.19	0.25	0.13	0.10	0.10	0.10	41
31-44	0.10	0.14	0.08	0.04	0.04	0.04	36
> 44	0.25	0.33	0.52	0.25	0.20	0.17	23
Female							100
< 31	0.24	0.33	0.38	0.26	0.21	0.17	51
31-44	0.18	0.25	0.55	0.19	0.14	0.12	23
> 44	0.39	0.51	1.47	0.60	0.47	0.44	26

Note: Similar with table 2.
Source: Authors own work.

Gender and level of education

Figure 6 highlights differences in educational attainment and its relationship to segregation among male and female workers. Highly educated female workers exhibit significantly lower segregation levels compared to their less-educated counterparts, whereas the pattern for male workers is less distinct due to overlapping curves. Overall segregation indices confirm that females face higher segregation levels than males. As shown in Table 7, the M-index indicates that low-educated individuals contribute the most to overall segregation for both genders.

Figure 6. Segregation curves for male (left) and female (right) by level of education.



Source: Authors own work.

Table 7. Overall segregation indices by gender and level of education.

Overall Segregation	Male			Female		
	Ip	M	G	Ip	M	G
Overall Segregation	0.23	0.17	0.30	0.31	0.31	0.40
Contribution to overall segregation:						
Low-educated	0.50	0.52	0.50	0.50	0.56	0.50
High-educated	0.50	0.48	0.50	0.50	0.44	0.50

Note: Similar with table 2.
Source: Authors own work.

Table 8. Local segregation indices by gender and level of education.

Local Segregation	D^g	G^g	$\Phi_{0.1}$	$\Phi_{0.5}$	Φ_1	Φ_2	% of distribution
Male							100
Low-educated	0.22	0.28	0.59	0.23	0.16	0.12	55
High-educated	0.26	0.34	0.20	0.19	0.18	0.18	45
Female							100
Low-educated	0.35	0.44	1.63	0.55	0.38	0.30	45
High-educated	0.29	0.37	0.39	0.30	0.25	0.21	55

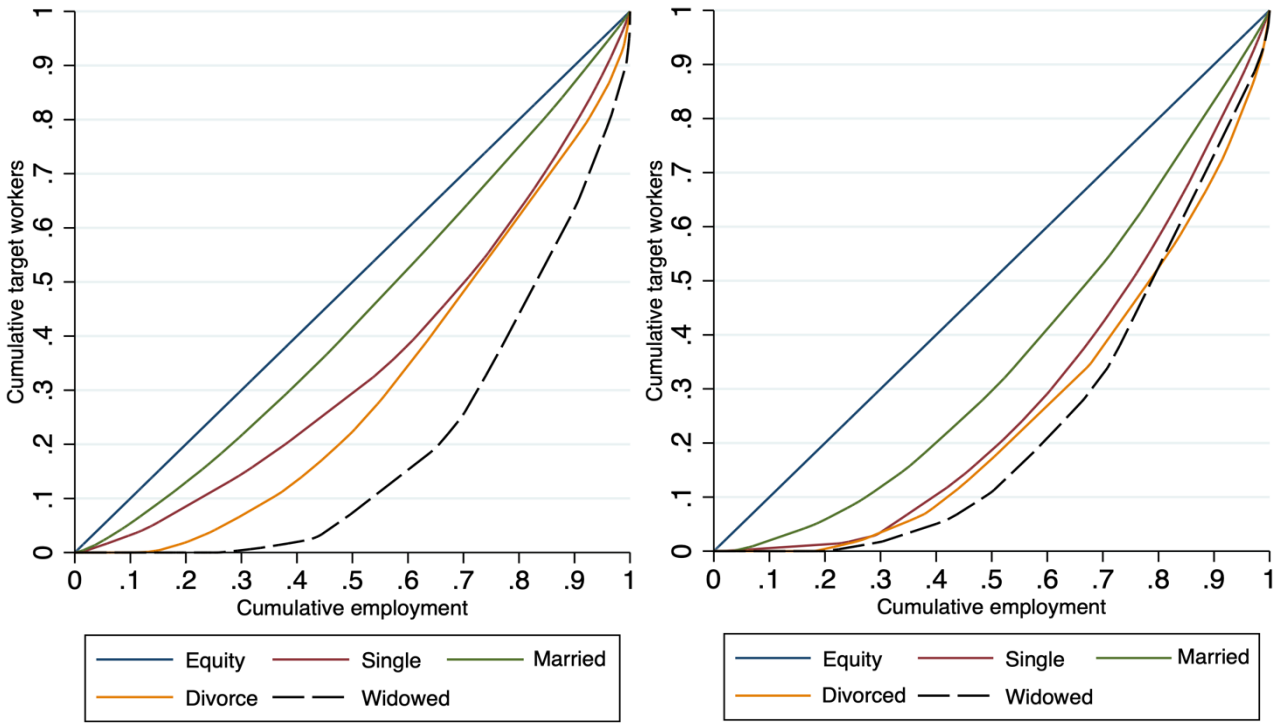
Note: Similar with table 2.
Source: Authors own work.

Table 8 provides local segregation measurements and population proportions, revealing notable differences. Low-educated individuals make up a larger share among males (55%) but a smaller share among females (45%), which likely influences how segregation affects these groups. Low-educated females experience the highest segregation, as indicated by their elevated $\Phi_{0.1}$ index, reflecting severe underrepresentation in certain categories. In contrast, highly educated females exhibit lower segregation ($\Phi_{0.1}$), though Φ-values suggest some segregation persists. Similarly, low-educated males have higher $\Phi_{0.1}$ values than their highly educated counterparts, signifying greater underrepresentation, although their overall segregation remains lower than that of females. These trends highlight that underrepresentation contributes more significantly to segregation among less-educated groups, particularly females. Conversely, high-educated males and females experience less segregation, likely due to broader access to diverse occupations and industries.

These findings emphasize the critical role of human capital development, particularly education, in reducing segregation, especially among females. This is consistent with the study by Alonso-Villar and Del Río (2016), which found that African-American female workers with lower levels of education experienced higher levels of segregation than those with higher levels of education. In contrast, Khan et al. (2023) reported that low-educated individuals of both genders experienced the lowest segregation levels. In Indonesia, Azwardi et al. (2023) observed that higher education, especially among female university graduates, facilitated greater occupational integration.

Gender and marital status

Figure 7. Segregation curves for male (left) and female (right) by marital status.



Source: Authors own work.

The Indonesian labor market exhibits clear patterns of occupational and sectoral segregation based on gender and marital status, as evidenced by both overall and local segregation indices. Women consistently experience higher levels of segregation across all categories compared to men. The segregation curves (Figure 7) show that male workers are relatively moderate, with married men showing the least segregation. However, single and divorced men exhibit slightly higher levels of occupational and sectoral concentration. In contrast, the segregation curves for female workers are more pronounced, indicating greater occupational and sectoral clustering. Widowed and divorced women, in particular, show the highest levels of segregation, suggesting they are more likely to be concentrated in specific low-opportunity sectors. The overall segregation index in table 9 show that for women (0.27 for Ip index) surpasses that of men (0.14 for Ip index), highlighting greater disparities in occupational distribution. Married and single individuals contribute most significantly to overall segregation for both genders, though single women display the highest indices, suggesting that marital status plays a complex role in shaping labor market outcomes.

In table 10, local segregation indices further reveal nuanced patterns, indicating that divorced and widowed individuals, particularly women, face the most pronounced segregation. Divorced women show a local segregation index of 0.33, which escalates to 2.03 in certain occupational sectors, while their male counterparts report lower indices. Widowed women experience even higher local segregation indices (up to 2.28), underscoring the compounded disadvantage they face. These figures indicate that vulnerable marital statuses intensify gender disparities, placing women at a greater risk of occupational isolation.

The distribution of individuals by marital status also reflects these trends, with a higher proportion of married men (66%) and women (39%) in the workforce. However, the higher segregation scores among divorced and widowed individuals, who constitute a smaller percentage of the labor force, highlight critical areas where policy interventions are necessary. Addressing these disparities requires targeted initiatives that consider both gender and marital status, ensuring greater inclusivity and reducing barriers to equitable labor market participation for all demographic groups.

Table 9. Overall segregation indices by gender and marital status.

Overall Segregation	**Male**			**Female**		
	Ip	**M**	**G**	**Ip**	**M**	**G**
Overall Segregation	0.14	0.07	0.18	0.27	0.25	0.36
Contribution to overall segregation:						
Single	0.47	0.51	0.46	0.45	0.48	0.44
Married	0.42	0.23	0.43	0.37	0.27	0.37
Divorce	0.06	0.11	0.06	0.07	0.10	0.09
Widowed	0.05	0.15	0.05	0.11	0.15	0.10

Note: Similar with table 2.
Source: Authors own work.

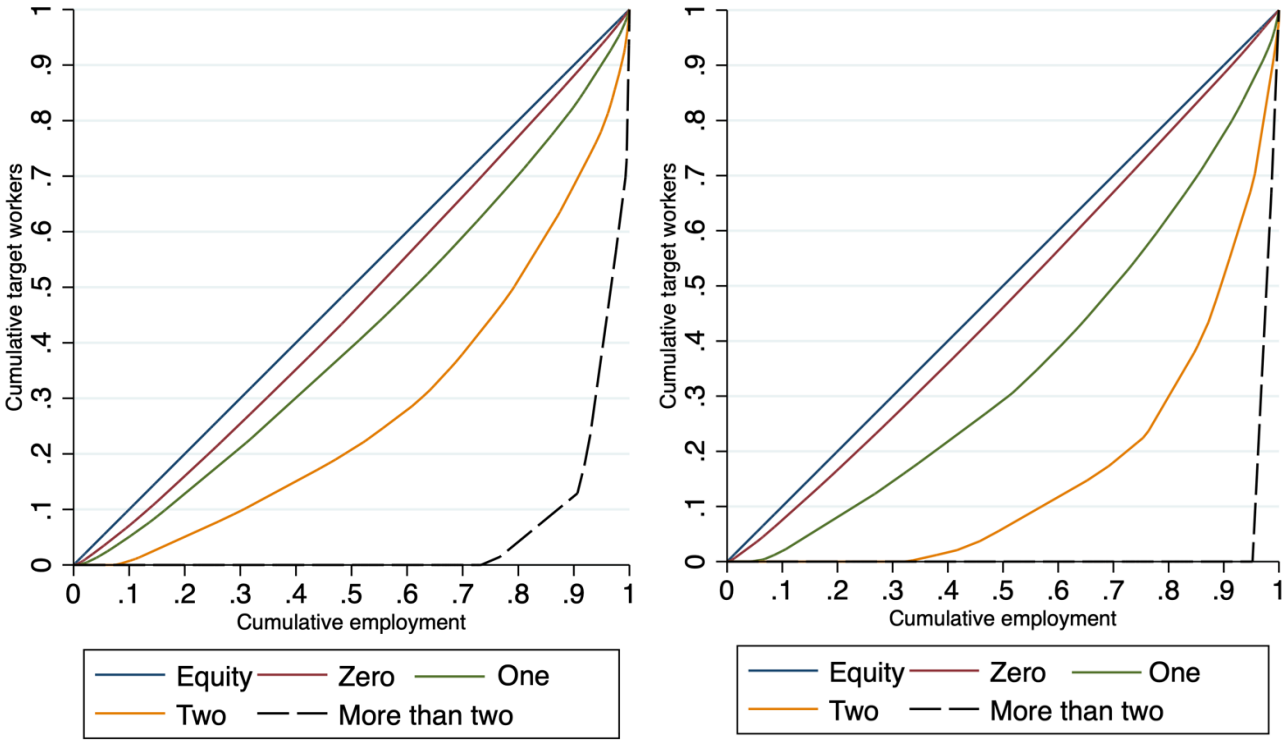
Table 10. Local segregation indices by gender and marital status.

Local Segregation	D^g	G^g	$\Phi_{0.1}$	$\Phi_{0.5}$	Φ_1	Φ_2	% of distribution
Male							100
Single	0.22	0.29	0.20	0.14	0.13	0.14	29
Married	0.09	0.12	0.04	0.03	0.03	0.02	66
Divorce	0.28	0.38	1.28	0.40	0.30	0.31	3
Widowed	0.46	0.59	2.95	0.91	0.73	1.63	2
Female							100
Single	0.31	0.42	0.58	0.40	0.32	0.27	38
Married	0.20	0.27	0.38	0.17	0.14	0.12	49
Divorce	0.33	0.48	2.03	0.59	0.43	0.46	6
Widowed	0.39	0.51	2.28	0.68	0.50	0.54	7

Note: Similar with table 2.
Source: Authors own work.

Gender and under-five children at home

Figure 8. Segregation curves for male (left) and female (right) by gender and under-five children at home.



Source: Authors own work.

Table 11. Overall segregation indices by gender and under-five (U5) child at home

Overall Segregation	Male			Female		
	Ip	M	G	Ip	M	G
Overall Segregation	0.07	0.04	0.10	0.07	0.04	0.10
Contribution to overall segregation:						
No U5 Child	0.45	0.20	0.44	0.46	0.14	0.47
One U5 Child	0.39	0.38	0.41	0.44	0.57	0.44
Two U5 Child	0.13	0.29	0.13	0.10	0.27	0.09
More than two	0.03	0.13	0.02	0.00	0.02	0.00

Note: Similar with table 2.
Source: Authors own work.

Table 12. Local segregation indices by gender and under-five (U5) child at home

Local Segregation	D^g	G^g	$\Phi_{0.1}$	$\Phi_{0.5}$	Φ_1	Φ_2	% of distribution
Male							100
No U5 Child	0.05	0.07	0.02	0.01	0.01	0.01	70
One U5 Child	0.11	0.17	0.11	0.06	0.06	0.06	26
Two U5 Child	0.32	0.44	0.97	0.40	0.37	0.57	3
More than two	0.77	0.90	7.97	2.34	2.21	9.11	1
Female							100
No U5 Child	0.04	0.06	0.02	0.01	0.01	0.01	83
One U5 Child	0.21	0.30	0.54	0.21	0.17	0.18	15
Two U5 Child	0.53	0.68	3.63	1.10	0.91	1.76	1
More than two	0.95	0.95	10.40	3.13	3.04	10.04	1

Note: Similar with table 2.
Source: Authors own work.

The data presented in the figures and tables highlight the relationship between gender, the presence of young children (under-five), and occupational and sectoral segregation. The graphical representation in Figure 8 visually illustrates that the male curve showing a more gradual increase in segregation as the number of children rises, while the female curve displays steeper growth, particularly after the transition from one to two children. This reflects the compounding effect of multiple young children on women's occupational and sectoral choices and constraints. Meanwhile, the overall segregation indices (Ip, M, and G) show no significant difference between men and women, with identical values (0.07 for Ip, 0.04 for M, and 0.10 for G). This suggests that while occupational and sectoral segregation exists, gender differences are less pronounced at a macro level. However, a more detailed breakdown reveals notable disparities when the presence of young children is considered.

The contribution to overall segregation varies depending on the number of children. For both genders, individuals without young children contribute the most to segregation (45% for men and 46% for women). However, for those with one child under five, women's contribution to overall segregation (44%) surpasses that of men (39%), indicating that the presence of one young child heightens segregation more for women. The impact diminishes as the number of children increases, with men contributing slightly more when two children are present (13% compared to 10% for women). Interestingly, for families with more than two young children, segregation is minimal for men (3%) and negligible for women (0%). This suggests that having one child is the critical point where segregation for women increases significantly, reflecting the disproportionate caregiving responsibilities they bear.

Local segregation results further reinforce these patterns. The largest share of individuals (70% of men and 83% of women) fall into the category without young children, where segregation indices remain low (0.05 for men and 0.04 for women). However, as the number of young children rises, so do the segregation indices. Men and women with one child experience an increase in local segregation (0.11 and 0.21, respectively), and this effect intensifies for those with two or more children. For instance, with two under-five children, the segregation index for men jumps to 0.32, while for women, it reaches 0.53, despite this category representing only a small portion of the population (3% of men and 1% of women). Segregation peaks for individuals with more than two young children, with indices reaching 0.77 for men and 0.95 for women, although this group accounts for just 1% of the population.

Overall, the results emphasize the gendered impact of childcare on occupational segregation. Even one child under five significantly influences women's segregation patterns, highlighting the need for policies that support working mothers. Interventions such as subsidized childcare, flexible work arrangements, and parental leave policies that actively engage fathers could mitigate these disparities and promote greater gender equality in the workforce.

CONCLUSION

This study examines the extent of gender-based segregation in the Indonesian labor market, offering key contributions to the discourse on gender inequality in developing economies. Using the local segregation method proposed by Alonso-Villar and Del Río (2010) and data from the 2023 Indonesian labor force survey, the study quantifies segregation across broad demographic groups—male and female—as well as within sub-demographic groups (referred to as multigroup analysis), including gender and residential area, gender and age, gender and educational level, gender and marital status, and gender and living with young children. Additionally, by incorporating the combined effects

of occupations and industries, treating each occupation as distinct based on its sector, the study provides a nuanced and comprehensive understanding of segregation patterns.

The findings reveal that female workers experience significantly higher levels of segregation than male workers across all segregation indices, despite their relatively lower share of employment. Multigroup analysis highlights that segregation is more pronounced in urban areas than in rural areas, with urban females facing the highest levels of segregation followed by rural female, male rural, and then male urban. Age-specific analysis indicates that elderly females exhibit the highest segregation levels among all female age groups, as well as compared to males across all age categories. While advancements in education reduce segregation among females, disparities relative to males persist. Family characteristics further influence segregation, as female workers with marital statuses other than widowed or with young children face greater segregation than their male counterparts. Notably, the data shows an absence of feminized occupations or sectors; however, compared to males, a majority of female workers are concentrated in service sectors such as education and health.

These findings underscore the persistent structural barriers that perpetuate segregation and inequality in Indonesia's labor market, even as female labor force participation has stagnated at around 54% for over two decades (Badan Pusat Statistik, 2023). Occupational and sectoral segregation among female workers in formal sectors likely contributes to unequal labor market outcomes, such as wage gaps. Addressing these challenges requires targeted policies to dismantle these barriers, including providing various incentives for employers to create female-friendly work environments, such as additional childcare support and programs to assist elderly females, widows, and divorced women. Furthermore, improving access to education and promoting gender equality in traditionally male-dominated sectors can reduce segregation and enhance women's overall well-being in the workforce.

The main limitation of this study is the incomplete data on occupations. However, to the best of our knowledge, the Indonesian labor force statistics remains the only up-to-date national dataset that provides comprehensive information on labor market characteristics. Addressing this issue should be a significant priority for the government, particularly the Indonesian Statistics Bureau (*Badan Pusat Statistik*), to reduce data gaps and potentially provide more detailed categories for occupations or sectors, such as two-digit codes or more granular classifications. This additional information can significantly increase the accuracy of labor market segregation measurements for future studies.

Moreover, future studies could extend the analysis by considering other relevant sub-demographic groups, such as religion. Additionally, researchers might explore

segregation in greater depth by employing econometric methods, such as experiments, to investigate its underlying causes—whether driven by labor market discrimination, individual preferences, or educational stream choices—and their implications for labor market outcomes.

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