

Analysis of The Correspondence of Labor Force Status Trends By Districts/Cities in West Java 2022

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ABSTRACT

This study aims to examine the characteristics and mapping of the labor force status across regencies and cities in West Java Province in 2022 using correspondence analysis. Based on the contingency table analysis, the overall labor force status in West Java is predominantly dominated by the "employed" status, with Bogor Regency exhibiting the highest volume and greatest diversity across all labor force categories. The test of independence yields a p-value of 0,000 (which is less than the significance level $\alpha = 0.05$), indicating a statistically significant dependency between the labor force status and the regencies/cities in West Java in 2022. Furthermore, the dimensional reduction analysis shows that a two-dimensional space can be effectively reduced to one principal dimension, which accounts for 79.6% of the data variance. The biplot visualization further reveals regional tendencies: the employed status is more prevalent in Tasikmalaya Regency, Majalengka Regency, Indramayu Regency, and Tasikmalaya City; the previously employed status is more dominant in Kuningan Regency, Bandung City, Cirebon Regency, and Depok City; whereas the never-employed status is predominantly found in Bekasi Regency, Bekasi City, Karawang Regency, and Sukabumi Regency. These findings provide empirical insights to support local governments in formulating targeted labor policies and sustainable development strategies.

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1. INTRODUCTION

The labor force status in West Java in 2022 reflects the complex labor market challenges within the region. As the most populous province in Indonesia, West Java faces issues such as uneven labor distribution, high unemployment rates in certain areas, and low labor force participation in specific regions [1,2,3]. Data from Statistics Indonesia (BPS) indicate significant variations in the proportion of labor force statuses across each regency and city in West Java [4,5]. The labor force comprises individuals of working age who are physically, mentally, and legally capable of choosing and performing work, as well as those actively or passively willing and seeking employment [6,7]. This condition highlights the need for further analysis to understand the distribution patterns of labor force status, which can serve as a foundation for formulating effective employment policies [8,9,10].

To analyze this phenomenon, correspondence analysis is applied. Correspondence analysis is a multivariate graphical technique used to evaluate the relationship between two or more qualitative variables using contingency tables [11,12,13]. This method does not require strict preliminary assumptions such as normality, linearity, autocorrelation, heteroscedasticity, or multicollinearity [14,15]. It identifies associations

or interaction patterns between labor force statuses and the regencies/cities in West Java. Correspondence analysis enables visual outputs in the form of two-dimensional perceptual maps, providing a clear depiction of the proximity between labor force status categories and geographical locations [16,17,18,19,20].

This study aims to provide a detailed overview of the distribution tendencies of labor force status across regencies and cities in West Java. The findings are expected not only to enhance the understanding of regional labor dynamics but also to serve as a basis for formulating targeted strategies and policies aimed at reducing disparities and improving workforce welfare. Through this approach, the research is expected to make a positive contribution toward supporting sustainable development efforts in West Java's labor sector.

2. METHOD

2.1. Data Source

The data used in this study are secondary data obtained from the official website of Statistics Indonesia (BPS) [21]. The data collection was carried out on Saturday, November 16, 2024, in Surabaya, consisting of 27 observations for each variable corresponding to the regencies and cities in West Java.

2.2. Variables

The research variables and data scales used in this study are as follows.

Table 1. Research Variables

Variable	Name	Category	Scale
X	Labor Force Status	1: Employed	Nominal
		2: Previously Employed	
		3: Never Employed	
Y	Regency/City	regencies and cities in West Java Province	Nominal

2.3. Data Analysis Procedure

The analytical steps performed in this study are as follows [22]:

1. Describe the characteristics of the relationship between labor force status and regencies/cities in West Java in 2022 using a contingency table.
2. Perform a test of independence for the regencies and cities in West Java in 2022.
3. Conduct correspondence analysis on the relationship between labor force status and regencies/cities in West Java in 2022.
4. Interpret the results of the correspondence analysis, including row profiles, column profiles, dimensional reduction, Euclidean distances, and biplot visualization.
5. Draw conclusions and provide recommendations based on the findings

2.4. Previous Research

Research related to modeling socio-economic determinants, health status, and regional development in Indonesia has demonstrated the importance of multivariable and nonparametric statistical approaches in capturing the complexity of regional data, such as unmet need status [23],[24], nonparametric binary logistic regression inference frameworks for the status of disadvantaged areas [25], and some studies using classification models such as [26] as well as modeling of open unemployment status and public health [27],[28],[29].

3. RESULTS AND DISCUSSION

3.1. Characteristics of the Labor Force

The characteristics of the labor force based on regencies and cities in West Java Province in 2022 are described using a contingency table, as presented below:

Table 2. Data Characteristics

Regency / City	Employed Status				Regency / City	Employed Status			
	Employed	Previously Employed	Never Employed	Mass		Employed	Previously Employed	Never Employed	Mass

Kab. Bogor	2589167	133532	174633	289733 2	Kab. Karawang	1077939	39784	78224	1195947
Kab. Sukabumi	1211763	36015	66127	131390 5	Kab. Bekasi	1799668	69232	137607	2006507
Kab. Cianjur	1119786	47796	55007	122258 9	Kab. Bandung Barat	740639	36874	42046	819559
Kab. Bandung	1682510	41613	84676	180879 9	Kab. Pangandaran	256684	1948	2129	260761
Kab. Garut	1229218	35709	65426	133035 3	Kota Bogor	496570	29011	30960	556541
Kab. Tasikmalaya	901466	17890	21357	940713	Kota Sukabumi	145522	7176	6920	159618
Kab. Ciamis	639600	9329	15594	664523	Kota Bandung	1298537	80246	56852	1435635
Kab. Kuningan	478750	30193	21882	530825	Kota Cirebon	149860	7608	6171	163639
Kab. Cirebon	1020411	56461	33657	111052 9	Kota Bekasi	1452223	38324	101998	1592545
Kab. Majalengka	617320	11137	15671	644128	Kota Depok	1160313	51343	47083	1258739
Kab. Sumedang	562416	18159	28896	609471	Kota Cimahi	286038	9985	24551	320574
Kab. Indramayu	890992	30618	31231	952841	Kota Tasikmalaya	324099	11421	11543	347063
Kab. Subang	800701	16488	50943	868132	Kota Banjar	89588	2175	3068	94831
Kab. Purwakarta	430788	18463	22824	472075	Total	2345256 8	888530	1237076	2557817 4

Based on the contingency table, the labor force statuses of being employed, previously employed, and never employed predominantly tend to be located in Bogor Regency.

3.2. Test of Independence

To determine whether a statistical relationship exists between the labor force status and the regencies/cities in West Java in 2022, a test of independence was conducted.

Hypothesis:

H_0 : There is no relationship between the labor force status and regencies/cities in West Java in 2022 (Independent).

H_1 : There is a relationship between the labor force status and regencies/cities in West Java in 2022 (Dependent)

Significance Level (α): 5% or 0.05

Rejection Region: Reject H_0 if $X^2 > X^2_{(0.05,52)}$ or if the P -value $< \alpha$

The test statistics are summarized as follows:

Table 3. Test of Independence Result

X^2 statistics	$X^2_{(0.05,52)}$ value	P value	Decision
224.766	69.832	0.000	Reject H_0

The test results show that the chi-square value of 224.766 exceeds the critical table value of 69.832, supported by a P -value of 0.000 (which is less than 0.05). Consequently, H_0 is rejected, indicating that there is a statistically significant dependency between the labor force status and the regencies/cities in West Java Province in 2022.

3.3. Row Profile Analysis

Row profile analysis evaluates the relative frequencies of labor force categories within each regency and city.

Table 4. Row Profile Analysis Results

Regency / City	Employed Status				Regency / City	Employed Status			
	Employed	Previously Employed	Never Employed	Mass		Employed	Previously Employed	Never Employed	Mass
Kab. Bogor	894	46	60	1,000	Kab. Karawang	901	33	65	1,000
Kab. Sukabumi	922	27	50	1,000	Kab. Bekasi	897	35	69	1,000
Kab. Cianjur	916	39	45	1,000	Kab. Bandung Barat	904	45	51	1,000
Kab. Bandung	930	23	47	1,000	Kab. Pangandaran	984	7	8	1,000
Kab. Garut	924	27	49	1,000	Kota Bogor	892	52	56	1,000
Kab. Tasikmalaya	958	19	23	1,000	Kota Sukabumi	912	45	43	1,000
Kab. Ciamis	962	14	23	1,000	Kota Bandung	905	56	40	1,000
Kab. Kuningan	902	57	41	1,000	Kota Cirebon	916	46	38	1,000
Kab. Cirebon	919	51	30	1,000	Kota Bekasi	912	24	64	1,000
Kab. Majalengka	958	17	24	1,000	Kota Depok	922	41	37	1,000
Kab. Sumedang	923	30	47	1,000	Kota Cimahi	892	31	77	1,000
Kab. Indramayu	935	32	33	1,000	Kota Tasikmalaya	934	33	33	1,000
Kab. Subang	922	19	59	1,000	Kota Banjar	945	23	32	1,000
Kab. Purwakarta	913	39	48	1,000	Total	917	35	48	

The row profile results indicate that for the employed status, the highest relative tendency is found in Pangandaran Regency (0.984). For the previously employed status, the highest tendency is observed in Kuningan Regency (0.057). For the never-employed status, the highest tendency is recorded in Cimahi City (0.077). Overall, the predominant labor force status across West Java Province in 2022 is the employed status (mass proportion of 0.917).

3.4. Column Profile Analysis

Column profile analysis examines the distribution of each labor force category across the various regencies and cities.

Table 5. Column Profile Analysis Results

Regency / City	Employed Status				Regency / City	Employed Status			
	Employed	Previously Employed	Never Employed	Mass		Employed	Previously Employed	Never Employed	Mass
Kab. Bogor	110	150	141	113	Kab. Karawang	46	45	63	47
Kab. Sukabumi	52	41	53	51	Kab. Bekasi	77	78	111	78

Kab. Cianjur	48	54	44	48	Kab. Bandung Barat	32	42	34	32
Kab. Bandung	72	47	68	71	Kab. Pangandaran	11	2	2	10
Kab. Garut	52	40	53	52	Kota Bogor	21	33	25	22
Kab. Tasikmalaya	38	20	17	37	Kota Sukabumi	6	8	6	6
Kab. Ciamis	27	10	13	26	Kota Bandung	55	90	46	56
Kab. Kuningan	20	34	18	21	Kota Cirebon	6	9	5	6
Kab. Cirebon	44	64	27	43	Kota Bekasi	62	43	82	62
Kab. Majalengka	26	13	13	25	Kota Depok	49	58	38	49
Kab. Sumedang	24	20	23	24	Kota Cimahi	12	11	20	13
Kab. Indramayu	38	34	25	37	Kota Tasikmalaya	14	13	9	14
Kab. Subang	34	19	41	34	Kota Banjar	4	2	2	4
Kab. Purwakarta	18	21	18	18	Total	1,000	1,000	1,000	

Based on the column profiles, each region exhibits specific labor force status tendencies:

- Previously Employed tendencies: Bogor Regency, Cianjur Regency, Kuningan Regency, Purwakarta Regency, Bandung Barat Regency, Bogor City, Sukabumi City, Bandung City, Cirebon City, and Depok City.
- Never Employed tendencies: Sukabumi Regency, Garut Regency, Subang Regency, Karawang Regency, Bekasi Regency, and Bekasi City.
- Employed tendencies: Bandung Regency, Tasikmalaya Regency, Ciamis Regency, Majalengka Regency, Sumedang Regency, Indramayu Regency, Pangandaran Regency, Cimahi City, Tasikmalaya City, and Banjar City.
- Overall, Bogor Regency demonstrates the most diverse labor force status distribution among all regions.

3.4. Dimensional Reduction

Dimensional reduction analysis evaluates how well the lower-dimensional space captures the total inertia (data variance).

Table 6. Dimensional Reduction Results

<i>Dimension</i>	<i>df</i>	<i>φ</i>
1	0.796	0.796
2	0.204	1.000
Total	1.000	1.000

The results indicate that the total data variance across dimensions can be effectively represented, with Dimension 1 alone accounting for 79.6% of the inertia, while the two dimensions combined account for 100% of the total data variability.

3.5. Euclidean Distance

The Euclidean distances between each region and the labor force status categories are presented below, where bold values indicate the shortest distance (strongest association) for each observational unit:

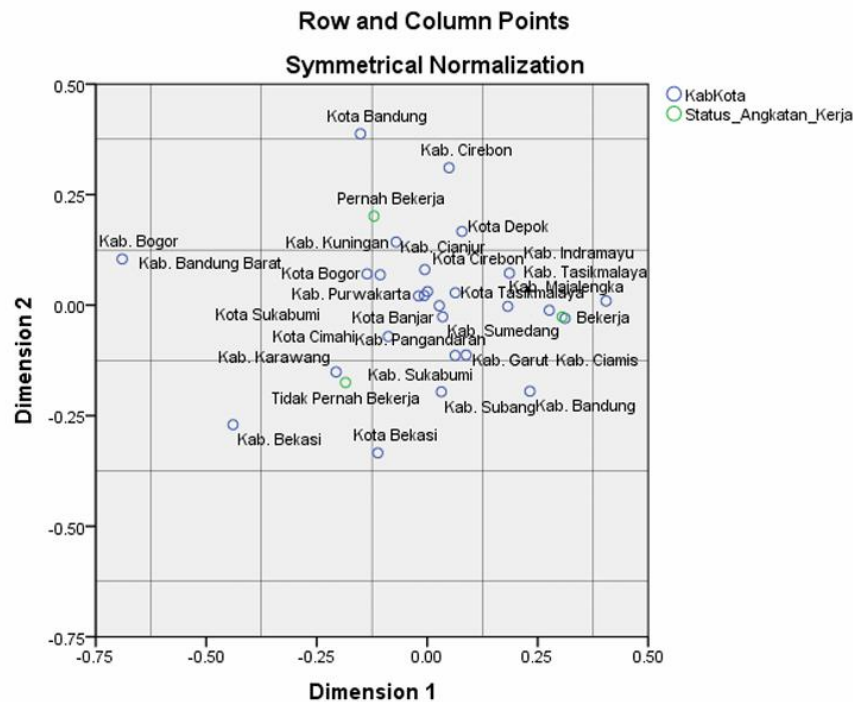
Table 7. Euclidean Distance Results

Regency / City	Employed Status				Regency / City	Employed Status			
	Employed	Previously Employed	Never Employed	Mass		Employed	Previously Employed	Never Employed	Mass

Kab. Bogor	1.003	0.578	0.577	1.003	Kab. Karawang	0.526	0.362	0.032	0.526
Kab. Sukabumi	0.258	0.364	0.255	0.258	Kab. Bekasi	0.783	0.569	0.271	0.783
Kab. Cianjur	0.329	0.166	0.312	0.329	Kab. Bandung Barat	0.422	0.133	0.256	0.422
Kab. Bandung	0.184	0.53	0.417	0.184	Kab. Pangandaran	0.125	0.364	0.405	0.125
Kab. Garut	0.234	0.377	0.28	0.234	Kota Bogor	0.452	0.131	0.251	0.452
Kab. Tasikmalaya	0.106	0.559	0.618	0.106	Kota Sukabumi	0.316	0.212	0.266	0.316
Kab. Ciamis	0.008	0.49	0.518	0.008	Kota Bandung	0.615	0.189	0.563	0.615
Kab. Kuningan	0.411	0.077	0.338	0.411	Kota Cirebon	0.309	0.209	0.278	0.309
Kab. Cirebon	0.423	0.202	0.539	0.423	Kota Bekasi	0.518	0.535	0.175	0.518
Kab. Majalengka	0.032	0.45	0.489	0.032	Kota Depok	0.297	0.202	0.432	0.297
Kab. Sumedang	0.27	0.275	0.266	0.27	Kota Cimahi	0.396	0.274	0.142	0.396
Kab. Indramayu	0.154	0.332	0.446	0.154	Kota Tasikmalaya	0.248	0.252	0.32	0.248
Kab. Subang	0.322	0.425	0.218	0.322	Kota Banjar	0.279	0.25	0.274	0.279
Kab. Purwakarta	0.328	0.206	0.256	0.328					

3.6. Biplot Analysis (Symmetrical Normalization)

The perceptual map generated via correspondence analysis biplot visualizes the proximity and association between regencies/cities and labor force statuses:



Based on the biplot visualization and symmetric normalization:

- Employed Status: Shows a stronger association and higher tendency in Tasikmalaya Regency, Majalengka Regency, Indramayu Regency, and Tasikmalaya City.
- Previously Employed Status: Is more dominant in Kuningan Regency, Bandung City, Cirebon Regency, and Depok City. Never Employed Status: Is predominantly found in Bekasi Regency, Bekasi City, Karawang Regency, and Sukabumi Regency.
- These spatial patterns reflect distinct socioeconomic characteristics and regional variations in labor market dynamics across West Java Province.

4. CONCLUSION

Based on the analysis and discussion regarding the correspondence analysis of labor force status across regencies and cities in West Java Province in 2022, the following conclusions are drawn:

1. Contingency Characteristics: Based on the contingency table, the labor force statuses of being employed, previously employed, and never employed predominantly tend to be located in Bogor Regency.
2. Test of Independence: There is a statistically significant relationship (dependency) between the labor force status and the regencies and cities in West Java Province in 2022, as confirmed by the chi-square test where the test statistic exceeds the critical table value and the P -value is less than the 0.05 significance level.
3. Dominant Labor Force Status: The predominant labor force status across West Java Province in 2022 is the employed status.
4. Regional Diversity: Overall, Bogor Regency exhibits the most diverse labor force status distribution among all regions.
5. Dimensional Reduction: The dimensional reduction analysis effectively reduces the total data variability into one principal dimension that accounts for 79.6% of the total inertia.
6. Biplot and Regional Tendencies: Based on the biplot visualization and Euclidean distances:
 - The employed status shows a higher tendency and stronger association in Tasikmalaya Regency, Majalengka Regency, Indramayu Regency, and Tasikmalaya City.
 - The previously employed status is more dominant in Kuningan Regency, Bandung City, Cirebon Regency, and Depok City.
 - The never-employed status is predominantly found in Bekasi Regency, Bekasi City, Karawang Regency, and Sukabumi Regency.

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Muhammad Zulfadhli		✓				✓		✓	✓	✓	✓	✓		
Anindya Putri Noliza	✓		✓	✓			✓			✓	✓		✓	✓
Dentina Dewi A		✓				✓		✓	✓	✓	✓			

C : Conceptualization

M : Methodology

So : Software

Va : Validation

Fo : Formal analysis

I : Investigation

R : Resources

D : Data Curation

O : Writing - Original Draft

E : Writing - Review & Editing

Vi : Visualization

Su : Supervision

P : Project administration

Fu : Funding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

DATA AVAILABILITY

Data availability is not applicable to this paper as no new data were created or analyzed in this study.

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