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Research Paper

Population Mobility and City Livability: An Empirical Study from Java Cities, Indonesia

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Abstract

Population mobility is one of the key factors contributing to the growth of the urban population. Consequently, cities encounter challenges related to livability, including limited access to basic services in education and healthcare, reduced safety, limited transportation accessibility, and affordability of recreational facilities. Literature on population mobility frames urban livability as a non-market good, thus requiring an approach to implicitly derive its value to quantify it into a city livability index. As quantitative research, this study aims to calculate the value of the city livability index and assess its impact on population mobility. We use secondary data, national socio-economic surveys and village potential published by the Central Bureau of Statistics. The findings of this study indicate that cities with high index values typically serve as capitals and hubs of government, commerce, industry, and services. Empirical findings found that livability substantially influences population mobility into cities, with basic services like education, healthcare, and public mass transportation playing pivotal roles. We recommend that city governments provide comprehensive and high-quality facilities to enhance the living experience for their residents.

Keywords *Population Mobility, Livability, City, Java, Indonesia*

INTRODUCTION

We have observed and experienced the phenomenon of urbanization across many countries, both developed and developing. This shift was officially acknowledged globally in 2007, when the urban population surpassed 50 percent (Duranton, 2016). Indonesia reached this milestone in 2011, as evidenced by Indonesian Census (*Sensus Penduduk*) data indicating a rising trend in urban population proportions. In 1980, only 22.4 percent of the population resided in urban areas, rising to 31.1 percent in 1990 and 41.9 percent in 2000. The urban population milestone was achieved in 2011, with the urban population percentage reaching 50.6 percent. This figure is projected to rise to 57 percent by 2021 and is anticipated to reach 67 percent by 2035 (Central Bureau of Statistics, 2010, 2020).

This study emphasizes Java Island because, while making up only 7% of Indonesia's overall surface area, the majority of the country's population, as determined by the 2020 Population Census, still resides there. Over 51 percent of Indonesia's total population, or 151.59 million people, live on Java Island. With 3.17% of Indonesia's population, the Maluku and Papua regions have the lowest percentage. With a land area of 1.92 million square kilometers in Indonesia, it is recorded that the population density on Java Island is close to 1180 people per square kilometer, or almost eight times higher than the population density of Indonesia, which is only 141 people per square kilometer (Central Bureau of Statistics, 2020).

In Indonesia, as the urban population grows, the characteristics of cities frequently lead to

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challenges in urban livability, such as limited infrastructure and basic services (e.g., drinking water, sanitation, public transportation, telecommunications, education, healthcare, and security). Indonesian cities are vulnerable to physical and social resilience, climate change, disasters, pollution, and urban poverty. Inadequate human resource quality further exacerbates these challenges, hindering the potential to capture the demographic dividend. This leads to poorly planned urban areas that are unappealing for residence and visitation (IAPI, 2021).

Therefore, this needs to be a concern in regional development policy or regional development (Niedomysl, 2004). Given the changing demographic and socio-economic environment, this is a sure thing to happen, resulting in the ability of a region to become increasingly stringent in attracting and competing for the future population. This has been proven to play a fundamental role in determining the future prospects of an area. Thus, places that are more livable for people may have greater opportunities to face challenges in the future and position themselves to become centers of competitive economic activity (McCann, 2004).

This study has two research questions: first, whether cities in Java are categorized as livable, and second, how city livability affects population mobility. Based on the research question above, our study aims to calculate the city livability index and examine whether city livability factors influence population mobility in Indonesian Java Island cities.

LITERATURE REVIEW

Population mobility is the term used to describe the movement of people inside a country, between countries, or across international borders (Ananta & Arifin, 2014). Population mobility can result from various circumstances, including natural disasters or events, political unrest, economic opportunities, amenities, and violence (Hakim et al., 2022). The livability of a place or region is one of the increasingly broad non-economic criteria included in population mobility research's choices, in addition to economic ones. Because it can capture the functional capability of its population from early to old age, a livable area or region can attract and retain people (Warner & Zhang, 2019). Livability is a physical and social element that can improve the quality of life of those who live in a place (Sheikh & Ameijde, 2022). Livability can also be explored in the form of the environment, both natural and artificial, education, health, culture, and economic opportunities; which play an important role in linking cities and their livability (Mouratidis, 2018).

Literature highlights the significance of urban livability, beyond economic factors, as a potential determinant of population mobility in cities. Urban areas become more attractive not only by offering diverse employment opportunities and higher wages but also by providing livability (Duranton 2016; Hakim et al. 2022, 2023a). The concept of city urban facilities or amenities has garnered academic attention as a proxy for urban livability, with pioneers like Rosen (1979), Roback (1982), and Blomquist et al. (1988) emphasizing their importance in enhancing city life quality. They developed a standard model of location equilibrium to incorporate livability into empirical models. This approach allows for the formulation of certain measurable value units to assess the extent of urban livability. Understanding the value of city livability can guide city governments in prioritizing livability in their urban development planning. Apart from that, this helps as a guide to identify cities that are appealing or unappealing to visit and assess their potential as desirable places to live.

The link between population mobility and city livability can be evaluated based on the microeconomics perspective with the consumer theory. We used the expected utility approach, which assumed that every individual lived in various communities (U_1, U_2 ... U_n) against the utility in their current location (U_0) after deducting the monetary and non-monetary costs of population mobility (M). Decisions about mobility are as follows:

$$M = U_i\ (e_i,a_i,z_i,m_i)\ -U_0(e_0,a_0,z_0) \quad (1)$$

If M > 0, the individual's utility is maximized so he/she decides to move to the community i; if M <0, the individual stays in its original position. The mobility decision as described in the equation above applies to all n communities. Because mobility usually involves households, mobility decisions are a collection of individual decisions made within a household. If a household maximizes utility - which is a function of local livability and some control variables – population mobility to region i can be written as follows.

$$M_i = f\left(V_i - V_{NAT} - M_{avg}\right), f' > 0 \quad (2)$$

where V denotes the indirect utility function for region i and the national average, and M represents the average cost of moving between regions. As a result, regions with higher average utility are more likely to attract people to the city. The high costs of money and non-money transactions, on the other hand, would restrict population mobility.

RESEARCH METHOD

This study is classified as quantitative research because it employs data from Village Potential (*Potensi Desa*, also known as *Podes*) and the National Socio-Economic Survey (*Survei Sosial Ekonomi Nasional* or *Susenas*) for both individuals and households. Podes provides insights into public facilities, including the quantity and proximity of healthcare facilities and educational institutions, as well as details on security, transportation, and recreational places. Transportation data encompasses travel distances and the availability of public transit from the village chief's offices to district and regency or city offices.

As the study represents livability as a non-market good, it is imperative to determine its implicit price. The annual implicit price is determined by aggregating annual household compensation against the labour and housing markets. This figure is derived from the differential equilibrium of house prices or rent multiplied by twelve, assuming stable annual housing costs. This amount signifies household compensation for housing over a year. Similarly, the estimated value from differential wage equilibrium is multiplied by twelve, along with the average number of workers per household and the average annual wage. The outcomes yield positive or negative values, reflecting the city livability index relative to other areas, thereby indicating the estimated compensation households must incur or receive to reside in a city (Rosen, 1979; Roback, 1982; Blomquist et al., 1988; Subanti et al., 2018, 2019; Hakim et al., 2022, 2023a, 2023b).

The steps to obtain the index are as follows: First, the study employs paired data from *Susenas* and *Podes* published simultaneously, resulting in a combined *Susenas-Podes* dataset at the city level. Second, the prepared dataset is used to estimate the hedonic wage and rent equations. In these equations, i represents individuals, h represents households, j represents villages, and k represents cities. Third, we calculate the livability index for city k using the following formulation:

$$livability\_index_k = \sum_{l=1}^{n} f_l^k \overline{\left(a_l^k\right)} \quad (3)$$

The index value for city k is derived by summing the products of the implicit price I and the average livability value I. This index represents the implicit price households, or individuals must pay through the housing and labour markets to access the city's livability. We want to examine the relationship between livability and population mobility based on the previously calculated city

livability index. To achieve this, we employed an empirical model based on previous studies (Chi & Marcouiller, 2013; Hakim et al., 2023a), modifying it as necessary to suit the current study's requirements.

$$popmob = \gamma_1 + \gamma_2\, livability_i + \gamma_3\, control + e \qquad (4)$$

The variable popmob represents population mobility into cities, representing the dependent variable. Data on inbound population mobility into cities is sourced from the Migration Statistics published by Indonesian Statistics. Independent variables include livability and control variables. Livability variables encompass a city's facilities, such as education, healthcare, transportation, security, and recreation. Additionally, control variables used include population density per square kilometer.

FINDINGS AND DISCUSSION

This section presents the calculated index results for cities on Java Island, highlighting those with the highest and lowest indices. Table 1 shows that cities in DKI Jakarta dominate the top 10 categories, including Central Jakarta, South Jakarta, West Jakarta, and East Jakarta. Cities in West Java include Bandung, Depok, and Bogor. Semarang represents Central Java, and Tangerang represents Banten. From the table, the cities in the top 10 categories are typically capital cities and hubs of government, trade, and industry. Cities that support the capital, such as Bogor, Depok, and Tangerang, also rank in the top 10. Conversely, nearly all cities in the lowest 10 do not have capital or provincial capital status.

Table 1. City Livability Index Based on the 10 Highest and 10 Lowest Ranking

10 The Highest Cities			10 The Lowest Cities		
City Code	**City Name**	**Value**	**City Code**	**City Name**	**Value**
3173	Central Jakarta	45.15	3272	Sukabumi	6.95
3171	South Jakarta	42.01	3371	Magelang	5.67
3273	Bandung	38.75	3376	Tegal	5.67
3578	Surabaya	38.01	3279	Banjar	4.15
3174	West Jakarta	37.07	3375	Pekalongan	2.35
3276	Depok	36.77	3576	Mojokerto	2.34
3271	Bogor	36.71	3574	Probolinggo	1.44
3374	Semarang	36.47	3577	Madiun	1.41
3172	East Jakarta	36.44	3575	Pasuruan	0.95
3671	Tangerang	36.40	3579	Batu	0.64

Central Jakarta records the highest livability index value. This index reflects the implicit price that households or individuals must incur through the housing and labour markets to enjoy the quality of life in Central Jakarta, which includes government-provided services such as education, health, security, transportation access, and recreational facilities. With the highest value in Central Jakarta, it can be interpreted that households are willing to pay IDR 45.15 million more to live in Central Jakarta and access better facilities on average compared to other cities. In other words, they must forego that amount of income at the initial stage of moving to afford these government-provided services such as education, health, security, transportation access, and recreational places through the housing and labour markets, thereby enhancing their utility

through consumption in Central Jakarta.

The varying index values among cities have potential implications for labour relocation and urban migration policies (Greenwood & Hunt, 1989; Zhao et al., 2010; He et al., 2016). In the following section, we will explore the potential mobility patterns between cities that serve as central cities and their surrounding cities. Table 2 compares index values between Central Jakarta and its surrounding cities, Semarang and surrounding cities, and Tangerang and surrounding cities.

The empirical results (Table 2) reveal that city livability influences population mobility in cities, aligning with theoretical predictions, with this variable showing a positive and significant impact. The positive sign suggests that an increase in these indexes correlates with higher mobility rates into cities. Urban livability has become a factor in the attractiveness of a city as part of the consideration for households or individuals to move (Greenwood & Hunt, 1989; Glaeser & Gottlieb, 2006).

Table 2. Regression Output

DEP: inmig	**Model 1.1**		**Model 1.2**		**Model 2.1**		**Model 2.2**	
INDEP	**Coef.**	**Sign.**	**Coef.**	**Sign.**	**Coef.**	**Sign.**	**Coef.**	**Sign.**
Livability	3008.50	***	2160.45	***				
Health					2546.51	***	1858.28	***
Education					3009.12	***	2275.16	***
Recreation					1179.81		504.74	
Security					2895.13	***	2075.10	***
Transportation					2718.44	***	2075.24	***
Density			3.95	*			3.50	
Constant	-7590.33		-21343.13	*	-1885.33		-15418.25	
N	34		34		34		34	
F	46.50		22.11		14.99		14.66	
Prob F	0.00		0.00		0.00		0.00	
R-Sq	0.59		0.64		0.63		0.67	

*** = sign. α=1%; ** = sign. α=5%; * = sign. α=10%

In city livability contexts, facilities such as education, health care, transportation, and security are crucial as they enhance urban livability and serve as determinants of population movement (Yang et al., 2017). Additionally, communal spaces like town squares, sports fields, and city parks play an important role in achieving a balanced urban life and enhancing the residents' quality of life (Glaeser et al., 2001). Furthermore, households often relocate with their families, potentially increasing mobility and the demand for public facilities such as education, health care, and transportation (Liu & Shen, 2014). Others factor, such as high crime rates as a proxy of security, are thought to reduce the utility of city residents (Glaeser & Shapiro, 2003) and were often the reason for individuals to move.

Government prioritization of public access to facilities such as education and healthcare is vital, as such accessibility can mitigate regional disparities, stimulate regional economies, enhance residents' quality of life, and foster more equitable inter-city development (Shen, 2012). Continuous promotion and development of public mass transportation are essential, as they profoundly impact urban residents' mobility and daily activities, including commuting patterns. Insufficient transportation options can impede activities and diminish social inclusion (Evans, 2019). Furthermore, the population density variable represents the intensity of economic activities.

Our findings underscore the pivotal role of population density in inbound city migration patterns. Denser cities often serve as economic transformation hubs that attract labour mobility into the region. Additionally, cities with high population densities reflect robust human resource bases and better economic activity (Glaeser & Shapiro, 2003; Buch et al., 2014).

CONCLUSIONS

The empirical study on city livability and population mobility reveals that cities with high index values typically hold capital status and serve as hubs for government, trade, industry, and service activities. Several cities acting as satellite capitals (provincial and national) can fall into the high-index category, thus potentially offering better livability compared to medium and small cities that do not hold capital status or serve as governmental hubs. This consideration becomes pivotal when individuals or households decide to relocate. Empirical findings underscore the influence of livability on population mobility in cities, with education, healthcare, security, and transportation playing significant roles.

LIMITATION & FURTHER RESEARCH

Our study has some limitations such as not addressing other city facilities connected to disaster mitigation, environmental pollutants have not been employed, and there must be a categorization of population movement actors based on demographic characteristics. We recommend that city governments prioritize providing comprehensive and high-quality facilities to enhance residents' living experiences and bolster city livability development.

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