



**LPEM-FEBUI Working Paper - 054**  
**August 2020**

**ISSN 2356-4008**

**EXPLORING THE CHANGES OF  
COMMUTING PATTERNS, COMMUTING  
FLOWS, AND TRAVEL-TO-WORK  
BEHAVIOUR IN THE JAKARTA  
METROPOLITAN AREA FROM 2014 TO 2019:  
A COMPARATIVE ANALYSIS OF TWO  
CROSS-SECTIONAL COMMUTING SURVEYS**

**Yusuf Sofiyandi**  
**Atiqah Amanda Siregar**

Chief Editor : Riatu M. Qibthiyah  
Editors : Kiki Verico  
Setting : Rini Budiastuti

© 2020, August  
Institute for Economic and Social Research  
Faculty of Economics and Business  
Universitas Indonesia (LPEM-FEB UI)

Salemba Raya 4, Salemba UI Campus Jakarta, Indonesia 10430  
Phone : +62-21-3143177  
Fax : +62-21-31934310  
Email : [lpem@lpem-feui.org](mailto:lpem@lpem-feui.org)  
Web : [www.lpem.org](http://www.lpem.org)

# Exploring the Changes of Commuting Patterns, Commuting Flows, and Travel-to-work Behaviour in the Jakarta Metropolitan Area from 2014 to 2019: A Comparative Analysis of Two Cross-sectional Commuting Surveys

Yusuf Sofiyandi<sup>1,★</sup> and Atiqah Amanda Siregar<sup>1</sup>

## Abstract

The main purpose of this study is to provide and to compare a detailed statistical overview of commuting patterns, spatial commuting flows, and travel-to-work behavior of workers who work and live reside within the Jakarta Metropolitan Area (JMA). The descriptive analysis is based on the results of two cross-sectional JMA Commuting Surveys, which conducted by the Indonesia Central Statistics Agency (BPS) in 2014 and 2019. By comparing the results of two surveys, we find that the commuting indicators have been decreased, except for the travel cost. The average commuting distance and the commuting time decrease by 5,16 percent and 11,6 percent, respectively. Meanwhile, the average travel cost rises by 21,6 percent. Among 169 possible origin-destination sets, a commute route from Depok to South Jakarta has been consistently become the largest commuting flows during the last five years. Respondents who live in Jakarta subregions and commute by private vehicles tend to have a lower willingness to shift to public transport than those from other cities. In terms of the use of non-privately owned vehicles, most of the commuter respondents switch from non-dedicated lane buses to the online-ride hailing services as the travel reliability of certain public transport services within the JMA has been reduced during the period of 2014-2019. Our findings also emphasize the important role of online-ride hailing services in providing better opportunities, particularly for female commuters, to access job locations.

**JEL Classification:** R40; R41; R49

## Keywords

commuting — transport mode — travel to work — travel behaviour — Jakarta metropolitan area

<sup>1</sup> *Institute for Economic and Social Research, Faculty of Economics and Business, Universitas Indonesia (LPEM FEB UI)*

**★Corresponding address:** Institute for Economic and Social Research (LPEM) Universitas Indonesia Building, Campus UI Salemba, Salemba Raya St., No. 4, Jakarta, 10430, Indonesia. Email: yusuf.sofiyandi@lpem-feui.org.

## 1. Introduction

Commuting has been a vital aspect of urban daily lives which takes plenty of people's valuable time and spending a lot of time to commute has been an excess burden, particularly for workers. From the perspective of economics, the burden of commuting is compensated with the marginal benefit either on the labor or housing market in order to equalize an individual's utility (Stutzer & Frey, 2008). Nevertheless, the burden of commuting also can be reduced by enhancing an individual's commuting satisfaction, which in turn affect subjective well-being such as happiness, leisure, income, and health (Lorenz, 2018)

Using the lens of urban and regional perspectives, commuting is a common mobility phenomenon in growing cities. Commuting presents because they result from the spatial mismatch in terms of education or skills between the existing cities (Schwarm & Cutler, 2005). As a result, the magnitude of commuting can have an important role in determining the regional development imbalances between cities (e.g. economic growth, employment distribution, availability, and quality of public services). From this standpoint, it is crucial for the local government to have comprehen-

sive information about worker commuting patterns and their travel behaviors in order to be able to utilize the information for the policy-making process. For example, to design public transportation systems for urban people.

Had realized the importance of the commuting data, the Indonesia Central Statistics Agency (BPS) has held a series of commuting surveys to monitor the changes in people's inter-regional mobility behaviors among several metropolitan regions of Indonesia, including Jakarta, Medan, Denpasar, Bandung, and Surabaya. However, our paper only focuses on the Jakarta Metropolitan Area (JMA) due to several reasons. First, the JMA is the largest and the densest metropolitan region in Indonesia as well as in Southeast Asia. Secondly, compared to other metropolitan regions, the JMA offers the most various urban public transportation choices. At last, the BPS has conducted the JMA commuting surveys twice in the last ten years: 2014 and 2019, and hence it allows us not only to analyze but also to compare the results of two cross-sectional surveys.

Finally, the main purpose of this paper is to provide and to compare a detailed statistical overview of commuting patterns, as well as spatial commuting flows by a set of origin-destination, and travel-to-work behavior of workers

who work and reside within the Jakarta Metropolitan Area (JMA) from 2014 to 2019.

The remaining structure of this paper proceeds as follows. Section II describes the study region and the survey methodology. Sections III overviews the socio-demographic profile of respondents. Section IV provides a detailed statistical overview of commuting patterns and travel-to-work behavior by groups of workers and compares their differences between 2014 and 2019. Finally, the last section concludes the study.

## 2. Study Region and Survey Methodology

The JMA commuting surveys cover thirteen cities – which by administrative arrangement are consisted of 8 municipalities and 3 regencies from three different provinces that share the same border within the Jakarta Metropolitan Area (as shown by Figure 1), namely: DKI Jakarta Province (i.e. Central Jakarta, North Jakarta, South Jakarta, East Jakarta, and West Jakarta), West Java Province (i.e. Depok, Bogor, Bogor City, Bekasi, and Bekasi City), and Banten Province (i.e. Tangerang, Tangerang City, and South Tangerang).

With a total area of 6,329 km<sup>2</sup>, there are approximately 34,564,230 inhabitants living in these cities by 2019. These numbers have made the Jakarta Metropolitan Area as the largest and the densest metropolitan region in Indonesia, or even further in Southeast Asia. Table 1 provides a comparison of cities within the Jakarta Metropolitan Area in terms of area, total population, and population density. Central Jakarta and West Jakarta are the two densest cities within the JMA, while Bogor and Bekasi are the two cities with the lowest population density in the metropolitan region. The two former and the two latter cities have the smallest and the largest administrative areas, respectively.

Through the surveys, the BPS collected the comprehensive information on daily commuting activities, residential location, income, and job characteristics, educational background, family composition, household assets, individual's health outcomes, and perceived stress through an extensive questionnaire survey both at household and individual levels. For all households that participate in the survey, residential records were linked to the questionnaire responses for each individual. Table 2 summarizes the total number of respondents at each level. The number of households that BPS interviewed during the survey were 12,960 (2014) and 13,120 (2019). However, the response rates of household interviews were only 94% (2014) and 93% (2019).

The commuting surveys are actually designed to capture all types of commuting activities (e.g. travel to work and travel to school); however, our main interest is to observe the cases of daily work commute only, except travel as part of the job. To ensure that the survey samples are representative, the BPS has set these surveys to follow a spatially stratified sampling strategy at the subdistrict level by considering household and population size distribution based on Indonesia 2010 census data. It is noteworthy to mention that the BPS has also employed the 2015 Indonesia Inter-census data and annual Indonesia National Labor Force Survey (SAKERNAS) to determine the sample distribution.

Using the two-stages sampling selection method, the BPS first selects a number of census blocks systematically in each stratification level based on the size of the total employed population aged 15 and older. Later, for each census block, 10 households are random-systematically selected. Interviews and data collection then are performed by visiting selected households (i.e. door-to-door survey).

## 3. Socio-demographic Profiles of Respondents

In order to obtain a better understanding of the commuting patterns and travel-to-work behavior of workers who work and reside within the Jakarta Metropolitan Area (JMA), we describe and compare the socio-demographic composition of individual respondents from the JMA Commuting Surveys between 2014 and 2019, as shown by Table 3. We measured all variables in the percentage of total respondents. Under a monocentric city framework, we may further treat Jakarta as the core of the JMA's economic activity. Next, we classify the JMA into two subregions: Jakarta (all cities inside the DKI Province) and other cities (all cities outside the DKI Province).

By gender, most commuter respondents in the JMA are male, with a share of 69,9–74,3 percent of total respondents. Most commuters are dominated by respondents whose ages ranged between 26-36 years old (2014) and 36–45 years old (2019). Based on educational background, commuters with secondary school qualifications contribute 56,2 up to 58,9 percent of total respondents. In both sub-regions, the shares of married respondents are higher than their single counterparts. Based on the residential location, interestingly, there is still a small share of respondents who commute from rural areas. Most commuter respondents work in the services sectors with formal employment and earn an average monthly income which ranges from IDR2,000,000 to IDR5,000,000.

## 4. Descriptive Analysis

### 4.1 Home-to-work Commuting Patterns

Table 4 summarizes the average values of travel distance, travel time, and travel cost across cities within the JMA as the traditional indicators to analyze the home-to-work commuting patterns. According to the 2014 JMA Commuting Survey results, commuter respondents travel 21,3 kilometers and spend around 64,6 minutes on average from home to the workplace. For a return trip, this amount of time is equal to 2 hours 9 minutes per day. On average, commuter respondents spend around IDR18,432 per trip for their travel costs.

Unsurprisingly, the average values of commuting indicators also vary by where respondents live. In 2014, commuter respondents who reside in Bogor City and West Jakarta had the longest (41,1 km) and the shortest (12,3 km) distance commute to work, respectively. The highest and the lowest average commuting cost for a home-to-work trip is IDR24,633 (Bogor City) and IDR 2,347 (Central Jakarta), respectively.

In addition, commuter respondents who reside in Depok spend 78,1 minutes each way or equal to 2 hours 36 minutes



**Figure 1. The Regional Map of Jakarta Metropolitan Area**

Source: Authors' documentation

**Table 1. Comparison of Cities within the Jakarta Metropolitan Area**

Province	City	Area (km <sup>2</sup> )	Estimated Population (in persons, 2019)	Density (person/km <sup>2</sup> )
Special Capital Region of Jakarta	Central Jakarta	48	928,110	19,336
	South Jakarta	141	2,264,700	16,062
	North Jakarta	146	1,812,910	12,417
	West Jakarta	130	2,589,930	19,923
	East Jakarta	188	2,937,860	15,627
West Java	Depok	200	2,406,826	12,034
	Bogor	2,664	5,965,410	2,239
	Bogor City	118	1,112,081	9,424
	Bekasi	1,225	3,763,886	3,073
	Bekasi City	210	3,003,923	14,304
Banten	Tangerang	959	3,800,787	3,963
	Tangerang City	154	2,229,901	14,480
	South Tangerang	147	1,747,906	11,891

Source: Data for Jakarta collected from BPS Provinsi DKI Jakarta (2020), West Java from BPS Provinsi Jawa Barat (2020), and for Banten from BPS Provinsi Banten (2020)

**Table 2. Summary of Sample Size from JMA Commuting Survey 2014 and 2019**

Metropolitan Region	Total Households Samples		Total Commuter Respondent Samples		Total Travel-to-work Respondents Samples	
	2014	2019	2014	2019	2014	2019
Central Jakarta	771	744	399	317	319	256
South Jakarta	965	924	487	367	409	295
North Jakarta	932	937	352	280	275	233
West Jakarta	1,009	963	514	401	453	333
East Jakarta	1,031	1,006	561	472	488	404
Depok	963	953	679	659	540	498
Bogor	1,131	1,115	410	370	298	301
Bogor City	712	735	210	243	193	195
Bekasi	1,111	1,007	324	248	258	182
Bekasi City	979	954	628	488	515	411
Tangerang	1,034	986	251	273	188	235
Tangerang City	966	938	507	375	419	313
South Tangerang	765	759	509	325	385	274
<b>TOTAL</b>	<b>12,369</b>	<b>12,021</b>	<b>5,831</b>	<b>4,818</b>	<b>4,740</b>	<b>3,930</b>

Source: JMA Commuting Survey 2014 and 2019 (Authors' calculation)

**Table 3. Socio-demographic Composition of Respondents from JMA Commuting Surveys**

Socio-demographic Variables	2014 Commuting Survey			2019 Commuting Survey		
	Jakarta	Other Cities	All Cities	Jakarta	Other Cities	All Cities
<b>Gender</b>						
Male	69.9	72.5	71.4	68.3	74.3	72.0
Female	30.1	27.5	28.6	31.7	25.7	28.0
<b>Age Group</b>						
15–25 years old	19.1	18.7	18.9	20.6	18.2	19.1
26–35 years old	32.7	28.2	30.0	27.6	25.4	26.2
36–45 years old	27.9	28.0	28.0	26.8	26.9	26.8
46–55 years old	15.0	20.5	18.2	18.8	23.5	21.7
56 years old and above	5.3	4.7	4.9	6.3	6.1	6.1
<b>Highest Education Attained</b>						
Unschooling	1.3	1.6	1.5	1.1	2.1	1.7
Primary School	4.8	5.5	5.2	3.6	5.6	4.8
Secondary School	59.5	54.0	56.2	62.0	56.9	58.9
Diploma	7.9	9.6	8.9	7.0	8.3	7.8
University	26.5	29.3	28.1	26.3	27.1	26.8
<b>Marital Status</b>						
Single	37.6	28.0	31.9	38.3	29.9	33.2
Married	62.4	72.0	68.1	61.7	70.1	66.8
<b>Residential Location</b>						
Urban area	100	98.4	99.0	100.0	95.8	97.4
Rural area	0.0	1.7	1.0	0.0	4.2	2.6
<b>Employment Sector</b>						
Informal jobs	7.6	6.9	7.2	8.0	13.1	11.1
Formal jobs	92.4	93.1	92.8	92.0	86.9	88.9
<b>Employment Status</b>						
Employees	83.4	87.2	85.7	84.3	87.8	86.4
Employers	16.6	12.8	14.4	15.7	12.2	13.6
<b>Economic Sector</b>						
Agriculture	1.3	1.7	1.5	1.2	1.4	1.3
Manufacture	14.4	21.1	18.3	12.5	20.2	17.2
Services	84.3	77.3	80.2	86.3	78.5	81.5
<b>Average Monthly Income</b>						
Less than IDR2,000,000	12.8	12.3	12.5	3.2	3.7	3.5
IDR2,000,000–IDR4,999,999	63.8	60.1	61.7	56.5	50.4	52.7
IDR5,000,000–IDR7,999,999	13.7	16.0	15.1	21.6	22.2	22
IDR8,000,000–IDR9,999,999	3.1	3.3	3.2	4.9	4.8	4.8
IDR10,000,000 and above	6.5	8.3	7.6	13.7	19.0	17.0
Total Respondents (N)	1,944	2,796	4,740	1,521	2,409	3,930

Source: JMA Commuting Survey 2014 and 2019 (Authors' calculation)

Note: All variables are measured in percentage of total respondents

for one return trip. This is the maximum commuting time when compared to the other cities. Meanwhile, respondents in Central Jakarta spend the least amount of time to commute – that is, 47,8 minutes each way or equal to 1 hour and 35 minutes for one return trip. These results can be justified by the geographic location of both cities.

Based on the 2019 JMA Commuting Survey results, we find that the commuting indicators decrease, except for the travel cost. The average commuting distance decreases by 5,16 percent, while the average commuting time decreases by 11,6 percent. The average commuting distance is 20,2 kilometers. In contrast, the average travel cost rises by 21,6 percent. We consider the fluctuation of gasoline prices over the last five years as a plausible reason to explain why the commuting cost increases significantly.

The average commuting time in 2019 has been reduced to 57,1 minutes each way or equal to 1 hour 54 minutes for one return trip. By retaining the monocentric model and the assumption of employment location, we argue that there is an increasing awareness of the tendency to work closer to

home among the commuters (particularly, those who live in Bogor City) relative to 5–6 years ago. Additionally, the decreasing trend of commuting distance was experienced by more than half of the total cities. The average commuting time also has a decreasing trend, except for the commuters who reside in Bekasi – which is constantly around 68 minutes each way or equal to 2 hours 16 minutes for one return trip.

Table 5 shows the average values of travel distance, travel time, and travel cost between the male and female groups. By gender, we find that women commute shorter distances than men. This result confirms previous studies (e.g. Sermon & Koppelman, 2001; Clark et al., 2003; Axisa et al., 2012; Kawabata & Abe, 2018). On average, male commuters travel 1,2 times as far as female commuters. The differences between gender groups indicate that women have a lower willingness to commute compare to men. Nevertheless, the gender gap in the commuting distance is higher among respondents who reside in Jakarta subregions. Unlike in 2014, the average travel cost for female

**Table 4. Home-to-work Commuting Indicators within the JMA, by cities**

City	2014 Commuting Survey			2019 Commuting Survey		
	Travel Distance (km)	Travel Time (minutes)	Travel Cost (IDR)	Travel Distance (km)	Travel Time (minutes)	Travel Cost (IDR)
Central Jakarta	15.8	47.8	12,347	12.4	38.8	16,903
South Jakarta	15.7	59.4	18,504	18.4	52.4	18,933
North Jakarta	16.0	51.9	17,070	15.2	48.4	19,041
West Jakarta	12.3	47.1	14,722	13.1	42.7	17,107
East Jakarta	20.4	72.3	17,391	16.4	57.6	21,318
Depok	23.5	78.1	20,657	23.1	63.7	23,429
Bogor	33.7	71.6	23,387	30.0	71.0	24,854
Bogor City	41.1	73.8	24,633	25.9	59.2	28,407
Bekasi	23.6	68.2	18,676	25.3	68.9	22,673
Bekasi City	24.3	72.1	19,798	24.1	70.4	28,516
Tangerang	24.3	64.0	16,120	22.7	57.0	26,706
Tangerang City	18.7	61.0	14,669	19.0	54.0	19,516
South Tangerang	20.2	66.9	23,229	20.8	54.5	25,010
All Cities	21.3	64.6	18,432	20.2	57.1	22,425

Source: JMA Commuting Survey 2014 and 2019 (Authors' calculation)

Note: Each city reflects the residential locations where the respondents live

**Table 5. Home-to-work Commuting Indicators within the JMA, by gender**

Region	2014 Commuting Survey			2019 Commuting Survey		
	Travel Distance (km)	Travel Time (minutes)	Travel Cost (IDR)	Travel Distance (km)	Travel Time (minutes)	Travel Cost (IDR)
Jakarta:						
Male	16.6	57.4	16,221	16.3	49.6	18,070
Female	14.9	55.3	15,921	12.9	47.1	20,462
Other Cities:						
Male	25.8	70.2	20,630	24.4	63.2	24,473
Female	22.4	69.7	18,457	21.0	61.1	25,676
All Cities:						
Male	22.1	65.1	18,862	21.3	58.0	22,032
Female	19.2	63.5	17,359	17.5	54.9	23,382

Source: JMA Commuting Survey 2014 and 2019 (Authors' calculation)

commuter respondents in 2019 has been higher than their male counterparts. This is possible to occur because more female commuters move from public transport modes to privately-owned vehicles in order to save transport time (Fiorio & Percoco, 2007).

Table 6 exhibits the average values of travel distance, travel time, and travel cost by the employment sector. Commuter respondents with formal jobs spend more commuting time (as a result of longer commuting distance) to their workplaces than those with informal jobs. Yet, these informal workers have to pay more travel costs than the formal workers. Perhaps, this is because they decide to move and live closer to the CBD area while searching for better job offers (Moreno-Monroy & Posada, 2018). The JMA 2019 Commuting survey results may justify this argument. The gap in commuting costs between informal and formal workers in 2019 has been shrunk when compared to the previous five years.

Table 7 presents the average values of travel distance, travel time, and travel cost by employment status. We find that employees spend more commuting time (as a result of longer commuting distance) to their workplaces than those who are employers. Commuting employees pay a lower travel cost than commuting employers. Perhaps, the behind reason is that most of commuting employers have a better income to afford a higher-cost transport mode that offers more satisfaction in commuting (see Nadeau, 2016).

## 4.2 Commuting Mode Shares

In the following section, we review the share of transport mode used by respondents for their work commute trips within the JMA. Our interest is to examine whether there is any significant change in the trend of commuting mode shares between 2014 and 2019. Table 8 summarizes the share of transport modes used by commuter respondents to travel to work based on the results of two JMA Commuting surveys.

According to the 2014 survey results, there is 72,8 percent of total respondents who commute daily from home to the workplaces by privately-owned vehicles and around four-fifth of this group use motorcycle as a preferred transport mode. While there is only 27,2 percent of total respondents who ride public transport, many commuter respondents apparently still depend on using "traditional" buses which have no dedicated lanes, followed by the train (i.e. the *KRL Commuter Line*).

Unsurprisingly, the situation has not been much different after five years. Based on the 2019 survey results, private vehicles still significantly dominate the mode share within the JMA, though its share decreases around 2,4 percent (i.e. from 72,8 percent to 70,4 percent). Interestingly, the decrease of private vehicle users tends to occur outside the Jakarta subregion. Alternatively speaking, respondents who live and work in Jakarta who previously travel using private vehicles tend to have a lower willingness to shift to public transport for work commute trips than those are from other

**Table 6. Home-to-work Commuting Indicators within the JMA, by employment sector**

Region	2014 Commuting Survey			2019 Commuting Survey		
	Travel Distance (km)	Travel Time (minutes)	Travel Cost (IDR)	Travel Distance (km)	Travel Time (minutes)	Travel Cost (IDR)
Jakarta:						
Informal jobs	16.3	52.1	20,656	14.1	40.5	19,092
Formal jobs	16.1	57.2	15,757	15.3	49.2	18,825
Other Cities:						
Informal jobs	24.1	59.4	22,543	22.1	53.7	26,942
Formal jobs	24.9	70.8	19,848	23.6	63.2	24,655
All Cities:						
Informal jobs	20.7	56.3	21,721	19.2	48.9	24,068
Formal jobs	21.3	65.3	18,178	20.3	57.6	22,320

Source: JMA Commuting Survey 2014 and 2019 (Authors' calculation)

**Table 7. Home-to-work Commuting Indicators within the JMA, by employment status**

Region	2014 Commuting Survey			2019 Commuting Survey		
	Travel Distance (km)	Travel Time (minutes)	Travel Cost (IDR)	Travel Distance (km)	Travel Time (minutes)	Travel Cost (IDR)
Jakarta:						
Employees	16.2	57.3	15,622	15.3	49.2	18,123
Employers	15.6	54.1	18,684	14.6	46.5	22,804
Other Cities:						
Employees	25.4	71.2	19,691	23.7	63.3	24,536
Employers	21.2	61.8	22,370	21.7	57.0	26,951
All Cities:						
Employees	21.7	65.7	18,066	20.5	57.8	22,059
Employers	18.6	58.1	20,619	18.3	52.0	24,952

Source: JMA Commuting Survey 2014 and 2019 (Authors' calculation)

cities.

A possible rationale to explain the decrease in private vehicle dependence within the JMA in 2019 is the rise of online-ride hailing services which have been gaining increased popularity since 2015. Commuter respondents who previously traveled by either cars or non-dedicated lane buses shift to the online-ride hailing services, and hence it leads to a shrink of the share of "traditional buses" more than two times smaller than it was in 2014. A significant decrease in the share of non-dedicated lane buses in the JMA between 2014 and 2019 confirms such rationale.

Table 9 shows the share of transport modes for work commuting by gender. Based on the 2014 survey results, we find that there are more male respondents use privately-owned vehicles to travel to work rather than their female counterparts. In terms of the use of privately-owned vehicles, both male and female respondents prefer to use motorcycles than cars. Meanwhile, in terms of the use of public transport modes, most of the male and female respondents ride non-dedicated lane buses.

Unlike the group of female commutes, the overall situation of private vehicles versus public transport modes in 2019 has been improved moderately for male commuters. More male respondents shift from privately-owned vehicles to public transport modes. Yet, more male commuters who previously use non-dedicated lane buses switch to other public transport modes. Meanwhile, more female respondents who commute by private cars or non-dedicated lane buses switch to online-ride hailing services or private motorcycles. This finding may indicate the important role of online-ride hailing services in providing better opportunities for female commuters to access job locations.

Table 10 shows the share of transport modes for work commute in terms of formal and informal employment sectors. By comparing the results between the 2014 and the 2019 JMA Commuting surveys, we find a different composition of the transport mode share between formal and informal employment sectors. Similar to commuters whose jobs in the formal sector, the majority of commuters with informal employment tend to privately-owned vehicles to travel to work. Yet, there is a significant change within this group in 2019. That is, unlike the other group, more commuters with informal employment switch to public transport.

Table 11 presents the share of transport modes for work commuting by groups of employers and employees. The results of the 2014 JMA Commuting survey shows that the majority of employers, as well as employees, prefer to use privately-owned vehicles (i.e. motorcycles) for their work commute trips. However, in 2019, both groups tend to switch to public transport modes. The highest increase occurs in employees' group as its share of private vehicle users decreases from 75 percent to 67.7 percent. In terms of the use of public transport modes, most of the commuter respondents from these two groups switch from non-dedicated lane buses to the online-ride hailing services and other public transport.

### 4.3 Travel-to-work behavior

In the following section, we review the departure time choices and home arrival times from work commute trips within the JMA. Figure 2 illustrates the departure time choices of commuter respondents from their homes to their workplaces and Figure 3 depicts the home arrival time of



**Table 8. Share of Transport Mode for Work Commuting within the JMA, by subregions**

Transport Mode Choices	2014 Commuting Survey			2019 Commuting Survey		
	Jakarta	Other Cities	All Cities	Jakarta	Other Cities	All Cities
Privately-owned vehicles:	73.6	72.3	72.8	73.4	68.5	70.4
Car	14.3	14.8	14.6	9.3	9.6	9.5
Motorcycle	59.3	57.5	58.2	64.1	58.9	60.9
Public transport modes:	26.4	27.7	27.2	26.5	31.5	29.5
Bus Rapid Transit	5.3	0.4	2.4	5.7	2.1	3.5
Train	2.8	11.1	7.7	3.2	11.1	8.0
Online-ride Hailing Services	-	-	-	7.0	1.6	3.7
Bus (without dedicated lanes)	13.1	10.5	11.6	3.8	6.1	5.2
Other public transport	5.2	5.7	5.5	6.8	10.6	9.1

Source: JMA Commuting Survey 2014 and 2019 (Authors' calculation)

Note: All variables are measured in percentage of total respondents

**Table 9. Share of Transport Mode for Work Commuting within the JMA, by gender**

Transport Mode Choices	2014 Commuting Survey		2019 Commuting Survey	
	Male Commuters	Female Commuters	Male Commuters	Female Commuters
Privately-owned vehicles:	82.2	49.4	78.7	49.2
Car	14.9	14	10.1	8.1
Motorcycle	67.3	35.5	68.6	41.1
Public transport modes:	17.8	50.6	21.3	50.8
Bus Rapid Transit	1.2	5.3	1.9	7.7
Train	6.1	11.6	6	13.2
Online-ride Hailing Services	-	-	1.1	10.4
Bus (without dedicated lanes)	6.8	23.6	2.9	11.1
Other public transport	3.7	10.1	9.4	8.5

Source: JMA Commuting Survey 2014 and 2019 (Authors' calculation)

**Table 10. Share of Transport Mode for Work Commuting within the JMA, by employment sectors**

Transport Mode Choices	2014 Commuting Survey		2019 Commuting Survey	
	Informal Employment	Formal Employment	Informal Employment	Formal Employment
Privately-owned vehicles:	78.2	72.4	40.3	74.2
Car	23.2	14.0	8.9	9.6
Motorcycle	55.0	58.5	31.4	64.6
Public transport modes:	21.8	27.6	59.7	25.8
Bus Rapid Transit	0.3	2.6	0.7	3.9
Train	4.4	8.0	4.4	8.5
Online-ride Hailing Services	-	-	0.7	4.1
Bus (without dedicated lanes)	11.8	11.6	3.2	5.4
Other public transport	5.3	5.5	50.8	3.9

Source: JMA Commuting Survey 2014 and 2019 (Authors' calculation)

**Table 11. Share of Transport Mode for Work Commuting within the JMA, by employment status**

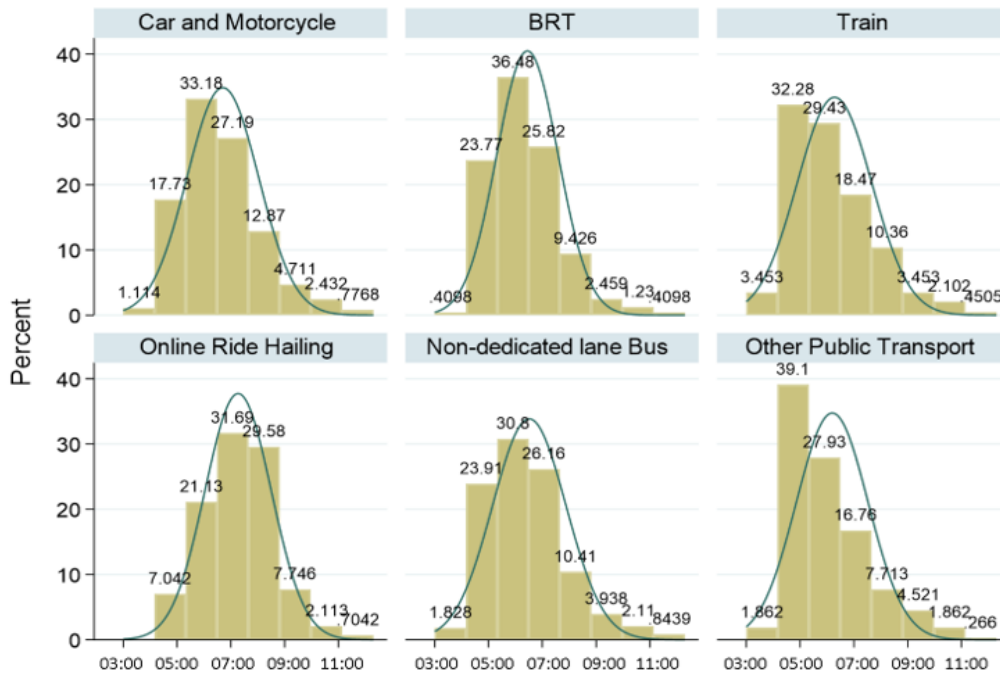
Transport Mode Choices	2014 Commuting Survey		2019 Commuting Survey	
	Employees	Employers	Employees	Employers
Privately-owned vehicles:	72.5	75	70.8	67.7
Car	13.6	21.0	8.5	16.0
Motorcycle	58.9	54.0	62.3	51.8
Public transport modes:	27.5	25.0	29.2	32.3
Bus Rapid Transit	2.4	2.1	3.7	2.4
Train	8.2	4.7	8.3	6.2
Online-ride Hailing Services	-	-	3.8	3.2
Bus (without dedicated lanes)	11.5	11.9	5.3	4.5
Other public transport	5.4	6.3	8.1	16.0

Source: JMA Commuting Survey 2014 and 2019 (Authors' calculation)

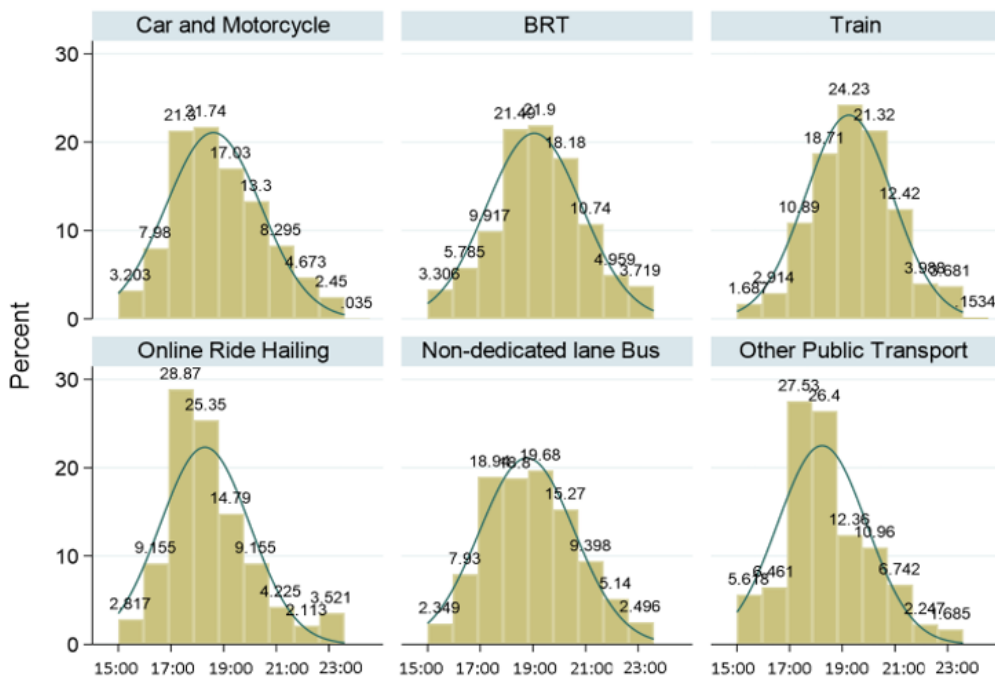
commuter respondents, both by different transport modes. As there is no significant difference in terms of departure time choices and home arrival times from both surveys, both figures plot the single 2019 dataset without losing the generality of the previous results.

In general, the morning rush hours for home-to-work trips in the JMA start from 06:30 and end at about 09:00. Commuters who travel to work by the train or other public

transport are more likely to choose an earlier departure time (e.g. by leaving home at dawn or around 04.30–05:30 at the local time). Meanwhile, the evening rush hours for work-to-home trips in the JMA start from 16:30 and end at about 19:30. Commuters with flexible working time who ride the train or drive a car are more likely to arrive at home earlier as they leave their workplaces at least an hour before the evening rush hours begin.



**Figure 2. Departure time choices for work commuting trips, by transport mode**  
Source: JMA Commuting Survey 2019 (Authors' calculation)



**Figure 3. Home arrival time from work commuting trips, by transport mode**  
Source: JMA Commuting Survey 2014 and 2019 (Authors' calculation)

We later calculate the coefficient of variation to analyze the variability in departure time choices, as well as home arrival time, for a specific transport mode based on two JMA Commuting surveys as shown by Table 12 and 13, respectively. From the 2014 JMA Commuting survey results, we find that the coefficient of variation ranges from 0,372 to 0,420 – which is relatively low. Lower variability in departure time choices suggests that commuters in the JMA are able to predict their travel time accurately given a particular departure time due to having information or learning from previous experience about transport reliability, and this ap-

plies to all commuters regardless their flexibility to choose departure time or use a scheduled service (see Hendrickson & Plank, 1984; Fosgerau & Engelson, 2011; Börjesson et al., 2012).

In 2014, the travel time variability of private vehicles was higher than public transport modes regardless of the direction of commuting (i.e home-to-work or work-to home commute). Contrarily, in 2019, the travel time variability of private vehicles was lower than public transport modes for any directions of commuting. These findings possibly indicate that the travel reliability of certain public transportation

services within the JMA has been worsened during the last five years of operation. Hence, it gives us a notable explanation of the previous histogram on why commuters who ride non-dedicated lane buses and other public transport modes are necessary to depart earlier.

#### 4.4 Work Commuting Flows within the JMA

In the following subsection, we attempt to analyze the spatial aggregation of work commuting flows by observing origin-destination sets – that is, the travel to work trips from residential municipalities toward employment centers within the JMA. Figure 4 (i.e. panel A and panel B) depicts these work commuting flows based on the 2014 and the 2019 survey datasets, respectively. We measure the degree of commuting flows as the ratio of estimated total commuters from residential location  $i$ -th who travel to workplace  $j$ -th to the estimated total population of commuters within the JMA.

From the 2014 JMA Commuting survey results, we find that the top five largest commuting flows among working commuters concentrates in following origin-destination sets, from the highest to the lowest consecutively: (i) Depok-South Jakarta, (ii) South Tangerang-South Jakarta, (iii) South Jakarta-Central Jakarta, (iv) Bekasi City-East Jakarta, and (v) East Jakarta-South Jakarta. The presence of a central business district is seemingly the most plausible reason on why work commuting activities have been flowing so intensely into South Jakarta. Moreover, the spatial aggregation of work commuting flows within the JMA has not been changed dramatically over the last five years – at least for the former three origin-destination sets. In 2019, an origin-destination set, Bogor City-Bogor, surged into the top five largest commuting flows. These findings are useful information for the regional government and other relevant policymakers who attempt to develop sustainable transport policies in the JMA.

## 5. Conclusion

Commuting has been a vital aspect of urban daily lives as well as an excess burden, especially for people who spend a lot of time to travel to work. Nevertheless, commuting is an important consequence of the spatial mismatch in terms of education or skills between the existing cities (Schwartz & Cutler, 2005), and hence it has an effect in determining the regional development imbalances between cities.

In 2014, around 2,9 million individuals who live in the Jakarta Metropolitan Area commute every day by using various types of transport means (BPS, 2015). These commuters and their travel behavior, of course, can have many implications in transport planning, policy, and management. For example, not only to determine which public transport modes are the most economic way to accommodate commuting activities, but also to address congestion problems at the same time. Therefore, the availability of data of commuting patterns, commuting flows, and travel-to-work behavior has been more important to analyze to give great knowledge support in terms of the transport-related policy-making process.

To respond to the necessity for this information, the Indonesia Central Statistics Agency (BPS) implemented

two rounds of JMA commuting surveys in 2014 and 2019. However, to our understanding, no previous literature has provided a detailed comparison of the statistical overview of these two survey results. Our study contributes to add an updated insight into the pattern, flows, and behavior of commuting in the Jakarta Metropolitan Area in order to have a better understanding of the changes that may occur in work commuting activities during the period of 2014–2019.

Our study provides several main findings as follows. First, the commuting indicators in the JMA have been decreased in 2019, except for the travel cost. On one hand, the average commuting distance and commuting time decreases by 5,16 percent and 11,6 percent, respectively. On the other hand, the average travel cost rises by 21,6 percent. We consider the fluctuation of gasoline prices as the cause of increasing travel costs over the last five years.

Second, the commuting indicators differ by gender group, employment sector, and employment status. Male commuters travel 1,2 times as far as female commuters on average, which indicates that women have a lower willingness to commute compare to men. Although commuter respondents with formal jobs spend more commuting time than those with informal jobs, those informal workers have to pay more travel costs than formal workers. Employees spend more commuting time, but pay a lower travel cost than commuting employers.

Third, private vehicles still significantly dominate the mode share of the JMA, though its share decreases by approximately 2,4 percent. In terms of the use of privately-owned vehicles, both male and female respondents prefer to use motorcycles than cars. Nevertheless, the decrease share of private vehicle tends to occur outside the Jakarta subregion. Commuters who reside and work in the Jakarta subregion are more likely to have a lower willingness to shift to public transport for work commuting than those who live in other cities.

Fourth, the rise of online-ride hailing services leads to a decrease in private vehicle dependence and causes a shrink of the share of non-dedicated lane buses. Our findings indicate the important role of online-ride hailing services in providing better opportunities, to access job locations, particularly for female commuters.

Fifth, speaking of travel-to-work behavior, the travel time variability of certain public transport modes has increased during the last five years of their operation and has been higher than private vehicles for both direction of commuting (i.e home-to-work or work-to home commute). Finally, by observing origin-destination sets, we find that the spatial aggregation of work commuting flows within the JMA has not been changed dramatically over the last five years.

## References

- Axisa, J. J., Scott, D. M., & Newbold, K. B. (2012). Factors influencing commute distance: a case study of Toronto's commuter shed. *Journal of Transport Geography*, 24, 123-129. doi: <https://doi.org/10.1016/j.jtrangeo.2011.10.005>.
- Börjesson, M., Eliasson, J., & Franklin, J. P. (2012). Valuations of travel time variability in scheduling versus mean-variance models. *Transportation Research Part B: Methodological*, 46(7), 855-873. doi: <https://doi.org/10.1016/j.trb.2012.02.004>.

**Table 12. Coefficient of Variation in Departure Time Choices, by transport modes**

Transport Mode	2014 Commuting Survey	2019 Commuting Survey
Privately-owned vehicles:	0.404	0.387
Car	0.372	0.382
Motorcycle	0.412	0.389
Public transport modes:	0.396	0.582
Bus Rapid Transit	0.358	0.385
Train	0.420	0.407
Online-ride Hailing Services	-	0.314
Bus (without dedicated lanes)	0.384	0.466
Other public transport	0.396	0.498

Source: JMA Commuting Survey 2014 and 2019 (Authors' calculation)

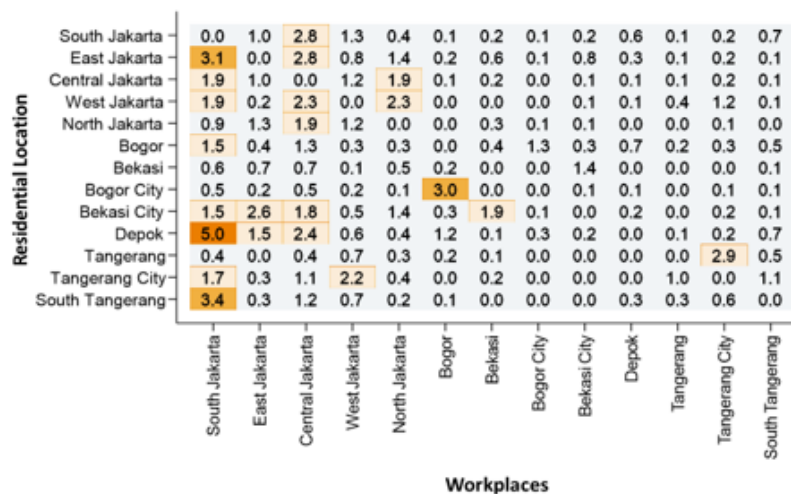
**Table 13. Coefficient of Variation in Home Arrival Time, by transport modes**

Transport Mode	2014 Commuting Survey	2019 Commuting Survey
Privately-owned vehicles:	0.395	0.415
Car	0.318	0.356
Motorcycle	0.414	0.423
Public transport modes:	0.366	0.430
Bus Rapid Transit	0.341	0.389
Train	0.310	0.339
Online-ride Hailing Services	-	0.417
Bus (without dedicated lanes)	0.383	0.406
Other public transport	0.403	0.411

Source: JMA Commuting Survey 2014 and 2019 (Authors' calculation)



(a) JMA Commuting Survey 2014



(b) JMA Commuting Survey 2019

**Figure 4. Share of Home-to-Work Commuting Flows within the JMA, by origin-destination**

Source: JMA Commuting Survey 2014 and 2019 (Authors' calculation)

- BPS. (2015). *Statistik Komuter Jabodetabek 2014*. Jakarta: Badan Pusat Statistik.
- BPS Provinsi Banten. (2020). *Bureau of Statistics (BPS) of Banten Province, Indonesia, Banten*. Retrieved from <https://banten.bps.go.id/>.
- BPS Provinsi DKI Jakarta. (2020). *Bureau of Statistics (BPS) of DKI Jakarta Province, Indonesia, Jakarta*. Retrieved from <https://www.jakarta.bps.go.id/>.
- BPS Provinsi Jawa Barat. (2020). *Bureau of Statistics (BPS) of West Java Province, Indonesia, Jawa Barat*. Retrieved from <https://www.jabar.bps.go.id/>.
- Clark, W. A., Huang, Y., & Withers, S. (2003). Does commuting distance matter? Commuting tolerance and residential change. *Regional Science and Urban Economics*, 33(2), 199-221. doi: [https://doi.org/10.1016/S0166-0462\(02\)00012-1](https://doi.org/10.1016/S0166-0462(02)00012-1).
- Fiorio, C. V., & Percoco, M. (2007). Would you stick to using your car even if charged? Evidence from Trento, Italy. *Transport reviews*, 27(5), 605-620. doi: <https://doi.org/10.1080/01441640701322727>.
- Fosgerau, M., & Engelson, L. (2011). The value of travel time variance. *Transportation Research Part B: Methodological*, 45(1), 1-8. doi: <https://doi.org/10.1016/j.trb.2010.06.001>.
- Hendrickson, C., & Plank, E. (1984). The flexibility of departure times for work trips. *Transportation Research Part A: General*, 18(1), 25-36. doi: [https://doi.org/10.1016/0191-2607\(84\)90091-8](https://doi.org/10.1016/0191-2607(84)90091-8).
- Kawabata, M., & Abe, Y. (2018). Intra-metropolitan spatial patterns of female labor force participation and commute times in Tokyo. *Regional Science and Urban Economics*, 68, 291-303. doi: <https://doi.org/10.1016/j.regsciurbeco.2017.11.003>.
- Lorenz, O. (2018). Does commuting matter to subjective well-being?. *Journal of Transport Geography*, 66, 180-199. doi: <https://doi.org/10.1016/j.jtrangeo.2017.11.019>.
- Moreno-Monroy, A. I., & Posada, H. M. (2018). The effect of commuting costs and transport subsidies on informality rates. *Journal of Development Economics*, 130, 99-112. doi: <https://doi.org/10.1016/j.jdeveco.2017.09.004>.
- Nadeau, C. A. (2016). Unaffordable fare: Cost of public transportation for low-income commuters working at Chicago, Illinois, Midway International Airport. *Transportation Research Record*, 2600(1), 69-79. doi: <https://doi.org/10.3141/2600-08>.
- Schwarm, W., & Cutler, H. (2005, July). Multiple labor groups and their effects on small city and town SAMS and CGE models. *Review of Urban & Regional Development Studies*, 17(2), 162-176. doi: <https://doi.org/10.1111/j.1467-940X.2005.00098.x>.
- Sermons, M. W., & Koppelman, F. S. (2001). Representing the differences between female and male commute behavior in residential location choice models. *Journal of Transport Geography*, 9(2), 101-110. doi: [https://doi.org/10.1016/S0966-6923\(00\)00047-8](https://doi.org/10.1016/S0966-6923(00)00047-8).
- Stutzer, A., & Frey, B. S. (2008). Stress that doesn't pay: The commuting paradox. *Scandinavian Journal of Economics*, 110(2), 339-366. doi: <https://doi.org/10.1111/j.1467-9442.2008.00542.x>.

Gedung LPEM FEB UI

Jl. Salemba Raya No. 4, Jakarta 10430

Phone : +62-21 3143177 ext. 621/623;

Fax : +62-21 3907235/31934310

Web : <http://www.lpem.org/category/publikasi/workingppers/>

