A MINIBUS SUPPLY CONTROL MEASURE IN INDONESIA

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ABSTRACT

A minibus service, called “Angkot”, in the medium-sized city of Bogor, Indonesia is losing its patrons due to rapid private motorization, especially to motorcycles. The Angkot is a “flexible” public transport system with a fixed route without a timetable using a minivan with a standard capacity of 11 passengers. This paper focuses on the city’s unique approach, called the “Angkot shift program”, to regulate the supply of Angkot vehicles by assigning each of the vehicles into one of three shift groups, and only two shift groups are allowed to operate in a given day. A series of surveys were conducted to analyze the impact of the program. The program reduced the number of Angkot vehicles, and the owners can expect an increase in net income due to reduction of maintenance costs. Besides, drivers can take additional leave. The survey results also revealed the structure of the Angkot business which relies on low wages and a minimum level of service to passengers. Taking into consideration the rapid economic growth followed by the private motorization of the region, the number of the Angkot passengers may decrease further without a fast, cheap and safe public transport system meeting the demands of the passengers. This implies that the Angkot shift program can be an effective provisional measure to compensate for the decreasing number of passengers even though substantial reformation of the Angkot regulatory framework is required in the long run.

Minibus, Paratransit, Supply Control, Motorization in Developing Countries

INTRODUCTION

In urban areas of developing countries, road-based public transport has been a primary mode of motorized trips (Darido 2003) especially for those who owned neither car nor motorcycle. However, at the same time, some megacities in emerging countries started to

develop rail-based transit networks (Gwilliam 2002). The varieties of road-based public transport include buses, paratransits, taxies and motorcycle taxies. Paratransits are generally used on non-trunk routes, feeder services and narrow streets where large and medium size buses are not able to travel. Paratransit, which is classified as a transportation mode in between the private motorized mode and conventional public transportation, is usually a shared ride mode (Goodwill and Carapella 2008). In the context of developing countries, "paratransit" is used to describe a public transport service outside of the conventional public transport regulatory system (Gwilliam 2002). This plays a dominant role in providing affordable public transport for lower income groups and residents in lower density urban areas due to its flexibility and low initial investment. In small and medium sized cities of developing countries this can be a main mode of motorized transport. Minivans, minibuses or microbuses with passenger capacities of roughly 8 – 15 are often used for paratransit vehicles in many cities of developing countries.

For instance, minibus services in São Paulo of Brazil utilizing 8 to 10 passenger vans function as an authorized feeder service to larger buses and transit systems and carried roughly 2 million passengers per day as of 2000 even though it was originally commenced as an informal service. The services have been planned, managed and controlled by a syndicate which originated from informal operators (Brasileiro 1999 cited in Darido 2003; and Bertozzi 2009 cited in Eiró et al. 2011). The Jeepneys of Manila, The Philippines, with 12-24 passenger capacity, have a share of 45% of trips in the city (Gwilliam 2002), and this reaches 60% of motorized transport for poverty groups (Kato 2010). Similar examples are observed in many cities such as Bangkok, Harare, Caracas and others (Cervero, 1992; Cervero, 2000; Gwilliam 2002). Indonesian cities also have minibus services locally called a variety of names, but generally called Angkot or Angkutan Kota (Joewono and Kubota 2007).

Since these services often originate from a market-driven informal sector, the services sometimes remain unregulated. While some cities such as Bangkok in Thailand succeeded in regulating it (Cervero, 1992; Cervero 2000), this open market scheme results in excessive competition among operators of minibuses and even absorbs passengers of conventional buses in a majority of cities in developing countries (Eiró et al. 2011). Operators have little incentive to coordinate with other operators or other modes of transport (Darido 2003). A number of concerns and negative externalities over unregulated minibus operation were indicated, such as safety issues, air pollution, limited level of service, inhumane working conditions and overcrowding in inner-city roads caused by the concentration of small vehicles and aggressive driving, as operators have no economic incentive to solve these problems (Cervero, 1992; Cervero, 2000; Kaltheier 2002; Darido 2003; Iles 2005; Joewono and Kubota 2007). In addition, frequent change in operators due to intense competition results in a lack of stability and reliability in operation (Goméz-Ibáñez 1997).

Although the above mentioned shortcomings of these services have been highlighted, minibus services in developing countries have provided affordable and high frequency public transport service to usually low and middle income groups in areas which are not covered by conventional public transport in urban areas with a minimum government subsidy. Minibus services in cities of some emerging countries are, however, facing the drastic impact of the trend toward private motorization. In Indonesia, the number of registered cars has increased by a factor of 3.6 in this decade. Additionally, the surge in the number of motorcycles is also astonishing. The number of registered motorcycles per capita in Indonesia reached 0.22

(roughly 4 times that of 2000) (Statistics Indonesia 2010a) fuelled by economic growth and dissemination of motorcycle loans (Kawaguchi et al. 2010).

Bogor City, a medium-size city in Indonesia, with almost a million population (BPS Kota Bogor 2010) is not an exception. The minibus service called Angkot is a major mode of transport in the city. Declining passenger numbers and revenues are affecting this industry and contributing to traffic congestion in the city due to drivers' competitive maneuvering to maximize their revenue. In 2009 the transport agency of Bogor City introduced a unique approach to regulate the supply of Angkot vehicles called the "Angkot shift program" to alleviate these problems (Overington 2011). All the Angkot vehicles were assigned to one of three shift groups and only two shift groups are allowed to operate in a given day. Operating shift groups alternate every day. This reduces the number of operated Angkot in each day to two thirds of the total. The Japan International Cooperation Agency in conjunction with the Indonesian Coordinating Ministry of Economic Affairs assisted in implementing the Angkot Shift Program for two routes among 23 city Angkot routes and conducted a series of surveys to identify issues in Angkot operation as a part of the Jabodetabek Urban Transportation Policy Integration Project (JUTPI). The JUTPI Project is a Japan-Indonesia joint technical cooperation project aiming to improve urban transportation systems in the Jakarta metropolitan area, to ease traffic congestion and to develop urban economic activities.

Based on this background, this paper aims to explore the entire picture of Angkot service in the context of economic efficiency, finance and social welfare. By utilizing transport survey results before and after the "Angkot shift program", the impacts on the above-mentioned aspects were evaluated. Finally, issues and implications for road-based transport systems in the city were identified.

MINIBUS TRANSPORT IN BOGOR CITY

Bogor City and Surrounding Areas

Bogor City, which is located roughly 40 km (25 miles) south of the capital city of Jakarta, had 272,000 population in 1990. The population has more than tripled to 949,000 according to a preliminary figure of the 2010 population census (BPS Kota Bogor 2010) in spite of its limited area of 118.5km2 (45.75 mi2). Population density was roughly 80 persons/ha (32.4 persons/acre) as of 2010. Bogor City, the surrounding Bogor Regency, the special capital province of Jakarta (DKI Jakarta) and six other cities and regencies comprise the Jakarta metropolitan area. The city is connected to Jakarta by a railway line and a toll road (roughly 1 hour) and 6% of employees residing in Bogor city commute to Jakarta. On the other hand, 23% of the employees working in Bogor city are from the surrounding Bogor Regency.

The gross regional domestic product (GRDP) per capita of the city is 11.57 million rupiahs (1,354 U.S. dollars) (Statistics Indonesia 2010b) whilst that of Jakarta and the Indonesian average are 82.33 million rupiahs (9,633 U.S. dollars) and 24.26 million rupiahs (2,838 U.S. dollars), respectively (Statistics Indonesia 2010a). In summary, Bogor City can be compared with other local cities in Indonesia rather than metropolises.

Transportation in the City

In spite of her roughly one million population, the inner city transport of the city relies heavily on road-based transport. While a longitudinal railway passes through the city, the railway serves for inter-city trips such as trips to Jakarta. The newest type of mode in the city is a simplified bus rapid transit (BRT) service called Transpakuan that commenced in 2007. Although the new air-conditioned service stops only at dedicated bus shelters with raised platforms, it is a simplified BRT system without dedicated bus lanes. Some of the shelters are not equipped with roofs and some of the shelters only have a step ladder for climbing into the busses. Daily passenger volume was roughly 2,300 persons as of 2008. The modal share of BRT is roughly 0.2% of inner city trips.

The dominant mode of transport was a minibus service called Angkot with an estimated 714,000 daily passengers on weekdays. In 2002, 50% of motorized commuting trips were by Angkot services in Bogor City (JICA and BAPPENAS 2010). Along with the increase in the number of cars and motorcycles, there was a tremendous shift to private modes of transport. The number of registered motorcycles in Bogor City increased by a factor of five between 2002 and 2010 and reached 207,000. There were about 50,000 automobiles in 2010, and this is almost double the number in 2002 (Bogor City Police, 2010). As a result, the modal share of Angkot declined to 18 % of motorized commuting trips. Load factor is one of the key indicators for the city to consider the optimum number of buses for a route. The load factor is estimated by averaging the number of passengers divided by the capacity of a vehicle throughout all sections of a route, usually by utilizing an on-board survey or sectional passenger count survey. Load factors of 9 routes out of 23 bus routes in the city are less than 50%.

A Minibus Service, Angkot

The Angkot is a “flexible” public transport system with a fixed route without a timetable using a minivan with a standard capacity of 11 passengers whilst it carries a maximum of 14 persons in peak hours. Although fares of most of the Angkot routes are stipulated as 2,500 rupiahs (29 cents) by city ordinance, there are some exceptions of 3,000 to 3,500 rupiahs (35 cents to 41 cents) for longer routes, and fares are negotiable for shorter distance trips. There is no special discount for a transfer. Angkot vehicles are simplified and remodeled for service with smaller passenger seats and with minimum equipment. Air-conditioners and sometimes even instruments, except for a fuel gauge, are omitted to minimize costs.
Angkot service has a dense network of 23 routes in the city comprised of 10 routes authorized by the city and 13 routes authorized by the regency. While Angkot vehicles follow the routes in the city center, some take non-route roads looking for passengers. Frequencies of routes vary from 20 services per hour per direction to 380 services per hour per direction during peak hours (Bogor City Transport, Communication and Information Agency 2010). There are no specified bus stops, and passengers board and alight anywhere along the route, even in intersections. Since several routes meet at an intersection, the number of passengers transferring in the intersections inhibits other traffic flow.

While Bogor City attracts tourists both from Jakarta metropolitan area and other Indonesian regions, with a few exceptions they are not provided with information on Angkot services such as route maps produced by the abovementioned JUTPI (Jabodetabek Urban Transportation Policy Integration) project.

FIGURE – 1 Angkot vehicles backed up in Bogor city.

Administration of Angkot Service and Issues

Bogor city transport agency is in charge of all Angkot administration including route planning, licensing, vehicle inspection and coordination among stakeholders in addition to administration of all other public transport and commercial vehicles. In spite of the limited human and financial resources, it is working on innovative policies such as a conversion to compressed natural gas (CNG) engines for Angkot vehicles, development of new bus rapid transit (BRT) routes, an electronic fare collection system for BRT, an area traffic control system, sidewalk pavement and other improvements.

Angkot operation is generally market-driven with a minimum subsidy while the agency regulates routes, fares and the number of vehicles in a designated route. A total of around 6,300 Angkot vehicles are permitted to operate in the city (Bogor City Transport, Communication and Information Agency 2010). Due to the current trend of a decreasing number of passengers, the agency has halted registration of new Angkot vehicles since 2008.

An Angkot vehicle is the property of an owner which usually owns roughly two vehicles on average. An owner leases a vehicle on a daily basis to a driver. A rental fee is determined by a stakeholder meeting for each route including drivers, owners and the transport agency. Drivers have to cover other operational costs such as fuel, bus terminal fees and payment to an association of drivers and owners which covers a driver's insurance while the maintenance cost is born by the owner. Drivers earn their income from the surplus of collected fares above the rental fee and other operational costs. Angkot drivers, as well as other private vehicle users, can use subsidized fuel. This is the only governmental subsidy.

In this market, an owner has an incentive to minimize maintenance cost and maximize the vehicle usage period. This results in the use of old deteriorated vehicles with minimum

maintenance and they often break down during operation. Though all vehicles have to be inspected by the transport agency every 6 months, some owners pass inspection with temporary “rental parts”. Owners have also formed an association for collective bargaining.
On the other hand, drivers compete with each other for passengers by aggressive driving behavior. For instance, drivers flock to high demand sections such as intersections, railway stations and shopping malls without consideration of other traffic and this grid locks all the traffic. Other drivers travel longer distances searching for passengers regardless of their designated route. It also has to be noted that drivers need virtually no education except for a general driver’s license.
Another issue to be noted is the unilateral relationship between a driver and an owner. Since all the drivers are freelance, they are less organized and have less bargaining power as they compete with each other for passengers. As a consequence, net income of a driver is almost the same as the city’s minimum wage.

ANGKOT SHIFT PROGRAM

Facing the declining passenger numbers, in 2009 the transport agency of Bogor City commenced the Angkot shift program which regulates the number of Angkot vehicles to be operated in a route. All the Angkot vehicles of the designated route are assigned to two or three shift groups and labeled with a shift group designation such as “A”, “B” or “C”. In cases where there are three shift groups, an “A” shift and a “B” shift operate in day 1, an “A” shift and a “C” shift operate in day 2, and a “B” shift and a “C” shift in day 3 etc. In cases where there are two shift groups, only one shift group is allowed to operate in a day.
The shift program can be implemented with a minimum expenditure in the following manner. After selection of the routes, the program is discussed between the association of drivers, the owners of the routes and the agency, taking supply and demand into consideration. Through informal and formal meetings with the stakeholders, a memorandum of understanding is created and signed by all of them. The program commenced as a trial of a month and it will be continued if there are no problems.
In this paper, the Angkot shift program for two routes, 5A and 8A, which was conducted as a part of a pilot project of the Jabodetabek Urban Transportation Policy Integration (JUTPI) project, are focused on and impacts before and after the program are analyzed. Route 5A and Route 8A are typical Angkot routes each roughly 12-13 km in length and operated by 371 and 80 registered vehicles respectively. These routes connect a central business district and a suburban center. Peak hour load factors are roughly 60%.

TABLE – I Procedures of the Angkot shift program

Process	Descriptions
1. Identification of possible routes	Based on previous transport survey results such as load factors, the agency identifies the routes with lower demand compared to supply.
2. Selection of routes	Through informal discussions with the drivers' and owners' associations of the city, routes for the program shall be selected by the agency. A route partially overlapping with other routes is usually exempted from the program as it would be unfair for buses in the duplicated section that are subject to the program

	compared to buses that are not subject to the program.
3. Informal meeting with route association	The city agency, along with the association of the city, has informal discussions with a route association usually represented by a driver.
4. Informal meeting members	The route association has informal discussions with all drivers and owners of the routes.
5. Formal discussions and consensus building	Through formal discussions the implementation of the program shall be agreed among all stakeholders.
6. Agreement among all stakeholders	A memorandum of understanding on the implementation as well as detailed rules such as penalties and rental fees are signed.
7. Preparation for the program	A preparation meeting is held regarding detailed implementation procedures for the program
8. Commencement of the program	The program commences as a trial of one month. If no objections are raised during the trial period, the program will be continued.

SURVEYS (SUMMARY OF SURVEY METHODOLOGY)

Based on the abovementioned issues regarding the service and the shift program, five questions on impacts of the program are identified as below.

1. How does the implementation of the program alleviate congestion in the city?
2. Does the supply of Angkot service match the demand?
3. What are the incomes and expenditures of a driver and an owner before and after the program?
4. Does the program improve the quality of life of the drivers?
5. Do passengers also receive benefits from the program or do they suffer from any drawbacks from the program such as longer traveling and waiting times?

By utilizing the results of the surveys in the table below, the above hypotheses shall be investigated.

TABLE – II Transportation surveys

Process	Descriptions	Timing
1. Traffic count survey	Traffic count surveys at 4-6 locations per route during their operation period were conducted to determine the daily operations of Angkot vehicles. The numbers of bus passengers as well as the number of other modes of vehicles were counted.	Before and 1 week after the program
2. On-board survey	Surveyors count the number of passengers of an Angkot vehicle by counting and recording locations of boarding and alighting passengers. Five vehicles were randomly sampled for this survey.	Before and 1 week after the program
3. GPS survey	In addition to the on-board survey, route operations and travel speed were verified by utilizing global positioning system (GPS) devices. The survey was conducted for 50 vehicle-days (5 days with 10 vehicles).	Before and 1 week after the program
4. Interview survey with drivers	Ten drivers were interviewed on personal attributes, income, expenditures, working	1 week after the program

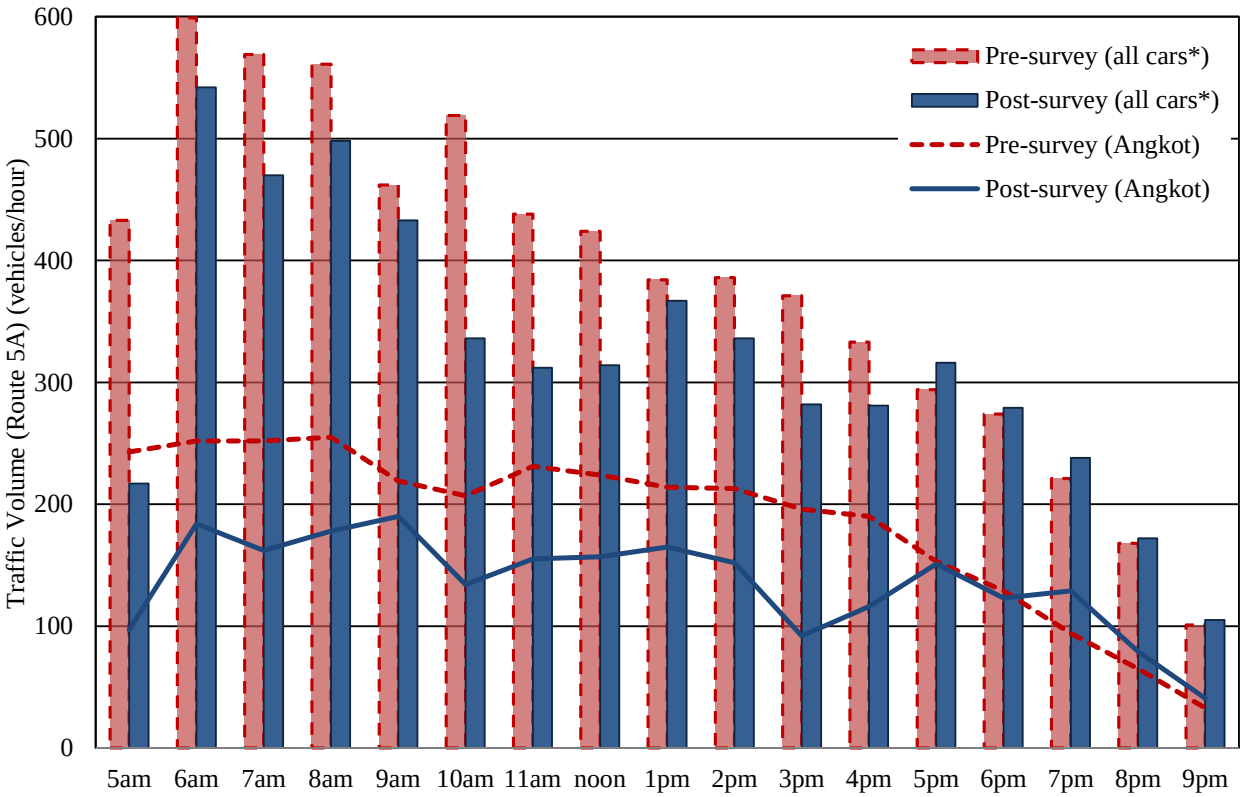
	conditions, road conditions, quality of life, satisfaction with the program and other related issues.	
5. Interview survey with owners	Five owners of Angkot vehicles were interviewed on personal attributes, income, expenditures, satisfaction with the program and other related issues.	1 week after the program
6. Interview survey with passengers	Fifty Angkot passengers were interviewed on personal attributes, road condition, waiting time, satisfaction with the program and other related issues.	Before and 1 week after the program

ANALYSIS AND IMPLICATIONS

Traffic condition

According to results of the traffic count survey, a reduction in the number of Angkot vehicles was observed for both Routes 5A and 8A. In the case of Route 5A, the daily number of Angkot vehicles passing the traffic count points were 3,170 vehicles per day and 2,305 vehicles per day (73%) respectively for pre and post implementation while the number of Angkot vehicles in the post-survey should be two-thirds of the pre-survey in theory. While this might imply that the drivers travelled longer distances searching for passengers, it is also noted that the result can be affected by other factors such as fraud of an Angkot driver, accuracy of the traffic count and daily fluctuation. A 16% reduction in total traffic volume of 4-wheeled-vehicles was observed in route 5A where half of the 4-wheeled-vehicles were Angkot. On the other hand, the reduction in the number of 4-wheeled vehicles for route 8A was limited due to a low percentage of Angkot vehicles.

Although increases in travel speed were observed in some sections of both routes, the average travel times for one round trip before and after the program were almost the same according to the GPS survey. As mentioned above, each driver tries to maximize the number of passengers and therefore, some drivers flock to passenger collecting points while other drivers travel at a slow speeds searching for passengers. It is assumed that Angkot travel speed was not improved significantly due to this behavior even though 90% of the drivers indicated in the interview survey that they had experienced increases in travel speed.



* All cars includes all types of 4-wheel-vehicles including passenger cars, pickups, trucks, Angkot and buses.

FIGURE – 2 Hourly traffic volume of pre/post-survey of the Angkot shift program in route 5A.

Supply and demand balance

In light of the supply and demand balance, load factors of the post-survey period have shifted upward compared to those of the pre-survey as shown in the figure below. The figure shows hourly load factors of a survey location along route 5A traveling in the direction from the suburban center to the city center. Especially in the morning peak period, the load factors increased by roughly 20%. This implies an increase in efficiency.

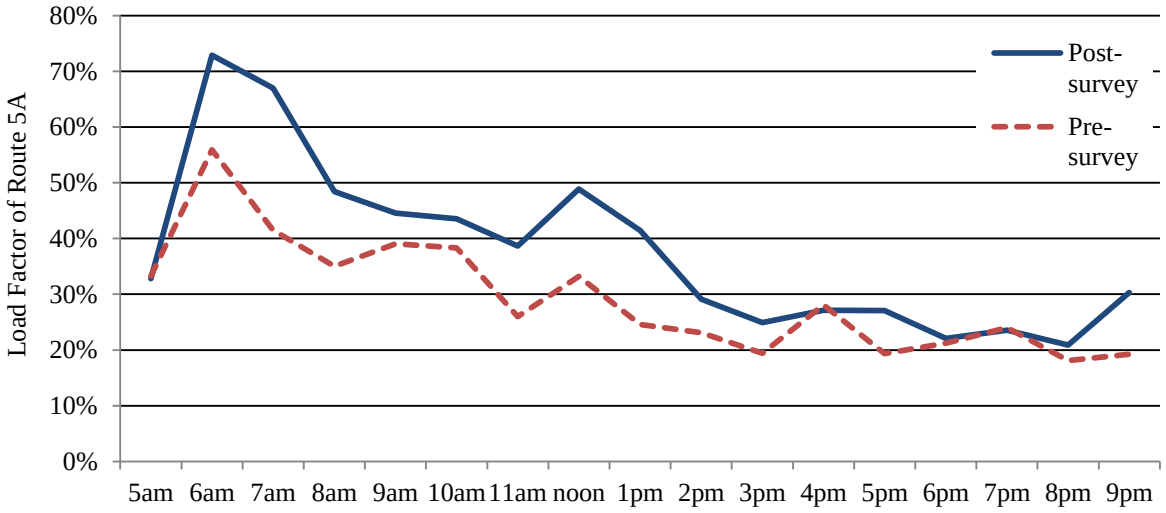


FIGURE – 3 Load factor of pre/post-survey of the Angkot shift program in route 5A.

Income and expenditure structure

By utilizing the series of interview survey results, the GPS survey and the on-board survey, incomes and expenditures of the Angkot drivers and owners were analyzed and the findings are shown in the tables below. Since the number of working days per month of Angkot vehicles and drivers before the program varied by person, two cases for working days, 25 days (Case 1) and 30 days (Case 2), were assumed. Daily travel distances were acquired by the GPS survey. Depreciation period as well as vehicle price were acquired from the interview survey. Most Angkot vehicles are second-hand remodeled ones which were purchased more than 10 years ago.

According to the table, the vehicle rental fee (234 U.S. dollars per month for Case 1 and 281 U.S. dollars for Case 2) is the largest expenditure item followed by fuel cost while the expenditures of the Angkot owners are 85 U.S. dollars per month for Case 1 and 88 dollars per month for Case 2). While net income of the drivers and owners are in the same range (approximately 150-200 U.S. dollars), this same level net income for drivers and owners shows the unilateral relationship between them taking the physical labor of the drivers into consideration.

The estimation depicted that monthly income of the drivers and the owners are at almost the same levels before and after the program. This amount is almost as same as the minimum wage of the province. The drivers can enjoy additional holidays with almost the same monthly income. Further, the Angkot owners can expect an increase in their monthly income. Since they have succeeded to increase the daily vehicle rental fee from 80,000 rupiahs (9.36 U.S. dollars) to 120,000 rupiahs (14.04 U.S. dollars), and the reduction of maintenance cost is to their direct benefit.

It should be noted that the gasoline for road transport, including private cars and Angkot vehicles, is subsidized in Indonesia. The subsidy amounts to roughly half the price of the gasoline as of July 2011. The drivers' incomes would be halved if the subsidy was discontinued.

In terms of the administration fees, including payments to the city, the association and the insurance company, the payments from the drivers are approximately three times those of the owners. In addition, drivers cannot work without making payments to the informal sectors because some sections of routes are virtually "managed" by them.

In summary, the drivers work for approximately the city's minimum wage while they are accepting the risk of further reductions in total passenger fares due to the rapid private motorization trend. On the other hand, the owners can earn approximately double their monthly expenditures. Taking the driver's work load, responsibility and risk into consideration, a more equitable benefit sharing process should be considered.

TABLE – III Driver's monthly income and expenditures

	Items	Unit	*Before the program*		*After the program*
			Case1	*Case2*	
Assumptions	Working days per month	days/month	25	30	20
	Daily travel distance per vehicle	km/day (miles/day)	147 (91)	147 (91)	180 (112)
Income	Fares	dollars/month	772	927	840
Expenditures	*Fuel (subsidized)*	*dollars/month*	*161*	*193*	*158*
	Administration fees	*dollars/month*	*45*	*54*	*43*
	Facilitation payment	*dollars/month*	*22*	*26*	*19*
	Vehicle rental fee	*dollars/month*	*234*	*281*	*281*
	Total expenditures	dollars/month	463	555	501
Net income	Per vehicle net income	dollars/month	309	372	339
	Per driver net income	dollars/month	155	186	170

Note: 1 U.S. dollar = 8,547 rupiahs as of July 2011

Fare revenue is estimated by multiplying unit fare by the number of passengers. The fare per one ride was 29 cents (2,500 rupiahs) regardless of trip distance. The numbers of passengers are the on-board survey results before and after the Program.

Fuel cost is estimated by the subsidized fuel unit price (53 cents per liter, 4,500 rupiahs), fuel consumption of Angkot vehicles came from the interview survey (8km/liter) and travelled distance from the GPS survey results.

Administration fees and facilitation payment are products of unit costs per one round trip obtained from the interview survey with drivers and the total number of round trips observed from the GPS survey.

Vehicle rental fee is obtained from the interview survey with drivers and owners.

TABLE – IV Angkot vehicle owner's monthly income and expenditures

	Items	*Unit*	*Before the program*		*After the program*
			Case1	*Case2*	
Assumptions	Working days per month	days/month	25	30	20
	Daily travel distance per vehicle	km/day (miles/day)	147 (91)	147 (91)	180 (112)
	Depreciation period	years	10	10	10

Income	Vehicle rental fee	dollars/month	234	281	281
Expenditures	*Vehicle depreciation*	*dollars/month*	*39*	*39*	*39*
	Engine oil	*dollars/month*	*10*	*12*	*8*
	Tires	*dollars/month*	*10*	*12*	*8*
	Administration fees	*dollars/month*	*12*	*12*	*12*
	Routine services	*dollars/month*	*6*	*6*	*6*
	Others	*dollars/month*	*8*	*8*	*8*
	Total Expenditure	dollars/month	85	88	81
Net income	Per vehicle net income	dollars/month	149	193	200

Note: 1 U.S. dollar = 8,547 rupiahs as of July 2011

Vehicle depreciation, administration fees, routine services and other expenses are obtained from the interview survey with owners.

Unit cost for engine oil and tires are obtained from the interview survey with owners. Daily cost for engine oil and tires are estimated by multiplying the unit cost by the travelled distance from the GPS survey.

Driver's quality of life

As mentioned in the previous section, the total working days per month have decreased for drivers due to the program. According to the interview survey with the drivers, roughly 70% of the drivers of Route 5A and roughly 50% of the drivers of Route 8A indicated that their quality of life has improved because the time spent with their family members has increased. The survey also reported that roughly 20% of drivers are working at another job and thus making use of the additional time off. In general, the free time created by the program had a positive impact on the drivers.

Passenger perspective

As mentioned in the section on traffic conditions, the travel speed of the Angkot vehicle was not changed by the program in spite of the initial intention of improving travel time. This result is also consistent with the interview survey with passengers. On the other hand, waiting time before boarding may increase due to reduction of trip frequency due to the program. However, roughly 69% of route 5A passengers and 75% of route 8A passengers indicated that they didn't experience any increase in waiting time at boarding points. It is assumed that the decrease in the number of operated vehicles is partially offset by an increase in travel distance per vehicle but this differential was negligible for the majority of passengers.

CONCLUSIONS

While Bogor's Angkot, which provide a high frequency public transport service with affordable fares with a minimum governmental subsidy, are playing a central role in transportation in the city; they have been facing operational, regulatory and financial problems. The income and expenditure analysis of the drivers and the owners depicted a

one-sided relationship for the owners as the drivers do not have an alternative to accepting a net income near the minimum wage. This market-driven regulatory scheme is contributing to inefficiencies such as becoming gridlocked on the roads caused by competitive driving. The current critical issue is to promote a rapid modal shift, especially to motorcycles. Angkot are losing their patrons in the market.

In light of the Angkot shift program, the survey results of before and after the program have revealed several characteristics of the Angkot and the shift program. The program reduced the number of Angkot vehicles while not sacrificing incomes of the owners or drivers. The shift program has impacted both the drivers and the owners. The owners can expect an increase in their net income due to the reduction of maintenance costs while the drivers can take time off.

The survey, however, revealed that the structure of the Angkot business relies on low wages and a minimum level of service to passengers. Taking the rapid economic growth followed by the private motorization of the region into consideration, the number of Angkot passengers may be expected to decrease further without a fast, cheap and safe public transport system which meets the demands of the passengers. Although one possible idea to overcome this is to introduce large and medium size bus coaches and to increase efficiency in operation, this may require accords among all stakeholders and would take time. This implies that the Angkot shift program can be an effective provisional measure for alleviating the negative impacts caused by the decreasing number of passengers while awaiting the substantial reformation of the Angkot regulatory framework, which is required.

For further studies, long term monitoring of the projects are required. Although the post-program surveys were conducted one week after the commencement of the shift program for preliminary review, the drivers' behavior may change in the long run by finding new part time jobs during their increased time off. The economic analysis of the program taking this long term impact into consideration is also required to understand the whole picture. The impact of the rapid economic growth and private motorization should also be monitored.

The shift program, which is focusing on alleviating excessive competition and decreasing the externality of the Angkot service by regulating the number of operated vehicles, is an operator side approach. However, the long term programs to alleviate the negative impacts of private motorization and to improve working conditions of the vulnerable drivers such as introduction of large buses, scheduled operation and institutional reform have to be studied further toward creating a sustainable transport system.

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