TOWARDS A STATED CHOICE METHODOLOGY TO DETERMINE MINIBUS-TAXI DRIVER WILLINGNESS TO PROVIDE OFF-PEAK FEEDER SERVICE

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ABSTRACT

The City of Cape Town has now signalled its intention to use minibus-taxis as feeder services to scheduled trunk services within a hybrid public transport network. Earlier research in Cape Town has indicated that a potential problem within a hybrid system is a mismatch between the service spans of minibus-taxi feeders and those of trains and large buses. This study seeks to determine the viability of interventions to address such a mismatch by assessing individual minibus-taxi operator willingness to provide service. Interventions would have varying implications for minibus-taxi business operations and driver remuneration. The success of efforts to reform the city's public transport network will, therefore, depend heavily upon the willingness of minibus-taxi drivers (as the key decision-makers with respect to the timing and frequency of service) and owners to provide complementary service under new 'hybrid' conditions. Measuring this willingness presents an important policy challenge. Where most choice experiment applications in transportation seek to determine passenger mode choice preferences, this paper will report lessons learned from the development of a specific and unique stated choice experiment aimed at determining the willingness to supply, rather than use, a public transport service. The use of stated choice experiments to determine preference for service provision is rare, especially in the context of paratransit services. The paper discusses survey design considerations and presents first results. Future research, both quantitative and qualitative, is needed to ensure the industry's voice is heard.

1. INTRODUCTION

To address deficiencies in the public transport system, the City of Cape Town embarked upon an ambitious effort to replace minibus-taxis (MBTs) with a bus rapid transit (BRT) trunk and feeder system (City of Cape Town, 2007) in line with national policy (National Department of Transport, 2007, 2006). Vehicle operating companies were formed to incorporate MBT operators into the new BRT system to prevent loss of income stemming from the replacement program (Schalekamp and Behrens, 2013; Siyongwana and Binza, 2012). However, the process proved problematic due to resistance from MBT operators as well as a realization that operator compensation was expensive (Business Planning Branch, TDA, 2017; McLachlan, 2010). In addition to issues with the reform and engagement process, the resulting BRT system has required much larger subsidies for operational expenses than expected (TCT, 2015; Von der Heyden et al., 2015). As a result, the City of

Cape Town has indicated their intention to incorporate MBTs as providers of feeder services to scheduled trunk services in the 2017 Integrated Public Transport Network Business Plan.

However, integrating MBT services with other modes of public transport in a trunk and feeder system requires that transfers between public transport modes are of high quality to ensure that the system as a whole moves residents to their destinations efficiently. Previous research at the University of Cape Town has assessed the level of complementarity between minibus feeder/distributor service and scheduled Metrorail, MyCiTi, and Golden Arrow trunk service at the Mitchells Plain Public Transport Interchange (PTI) (Behrens et al., 2017). The study assessed complementarity with respect to minibus service span and frequency of departures. Issues were found particularly related to service span, with minibus service ending too early in the evening to accommodate later trunk service arrivals, as well as some indication of long wait times for minibus departures during off-peak times.

With complementarity issues known, questions remain regarding mechanisms by which such transfers might be improved when individual minibus owners and drivers are under no obligation to provide service during periods when ridership demand will not produce an attractive profit or if there is a high risk of robbery (Behrens et al., 2016; Cervero, 2000; Schalekamp and Behrens, 2013). A variety of policy interventions might be considered to improve the complementarity of service spans, including, among others, the introduction of a range of incentives or off-peak MBT feeder services operating under contract to the City. These interventions will have varying implications for MBT business operations and driver remuneration, the latter of which is based on fare revenue rather than hours worked. The success of efforts to reform the city's public transport network will, therefore, depend heavily upon the willingness of MBT drivers (as the key decision-makers with respect to the timing and frequency of service) and owners to provide complementary service under new 'hybrid' conditions (McCormick et al., 2016).

This paper discusses the application of a stated choice (SC) experiment to measure minibus driver willingness to provide service during a period where no service is currently provided. Where most choice experiment applications in transportation seek to determine passenger mode choice preferences, this paper will report upon the development of a SC experiment aimed at determining the willingness to provide a public transport service. From an extensive review of the academic literature, no examples could be found where a SC experiment was used to determine individual operator (driver) preference for providing public transport service, suggesting a need for a paper to outline methodological lessons learned. This paper discusses survey design considerations and presents first results.

2. STATED CHOICE EXPERIMENTS

Choice modelling analyses how individuals make choices by quantifying the impact of various factors on the choice being made (Hensher et al., 2015). Modelling can be done either with revealed preference (RP) or stated preference (SP) data, where stated choice experiments ask respondents to select their preferred alternative from those shown in hypothetical choices (Hensher et al., 2015). An example of a common application in the transportation industry is provided in Figure 1, with mode alternatives in each column (Washbrook et al., 2006).

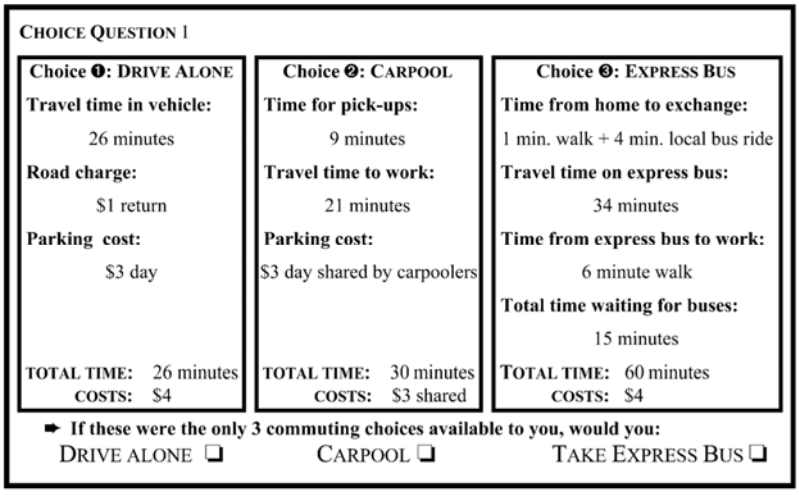

Figure 1. Example choice card from stated choice experiment.

Each respondent is presented with multiple choice sets with varying attribute levels and repeatedly responds with a preferred choice. At the conclusion of the SC portion of the survey (to avoid influencing choice responses), respondents are typically asked to provide additional data relevant to the line of inquiry of the study (Hess and Rose, 2009), such as age, income, or whether they hold a driver's license.

Data for all respondents, in the form of chosen responses for each varying choice set, generates a regression-like equation optimized to develop a model of choice behaviour. This is shown in Equation 1, where U_i indicates the utility for a particular alternative, i, stemming from the observable factors in that alternative, V_i, and the unobservable factors, ε_i, that cannot or are not measured due to survey complexity limitations or other reasons (Louviere et al., 2010). V_i is equivalent to a vector of attribute levels and associated beta values (β) to be estimated using the dataset and ε_i is assumed to be independently, identically distributed Type 1 extreme value when using the multinomial logit model as in this study. This model form was selected because estimation is straightforward compared to probit models and results can be rescaled to equivalency using either model.

$$U_i = V_i + \varepsilon_i = \beta' x + \varepsilon_i \quad (1)$$

Multinomial logit models rely on random utility theory (Thurstone, 1927) that assumes respondents maximize utility when making choices, assuming the more preferred option will be selected more often by respondents (McFadden, 1974). Equation 1 allows calculation of relative utility of each alternative based on its attribute levels, and further calculation can predict the probability of choosing particular alternatives (Equation 2) as well as a monetary amount that indicates the willingness of individuals to pay for something or to accept a condition required of them (Hensher et al., 2015). In Equation 2, P_{ni} is the probability of a particular respondent, n, of selecting alternative i based on the vector of attribute levels and associated beta values for alternative i and all alternatives, j (Train, 2003).

$$P_{ni} = \frac{e^{\beta' x_{ni}}}{\Sigma_j e^{\beta' x_{nj}}} \quad (2)$$

Ordered logit models convert latent utility, which exists on a continuous scale, to a finite number of ordered categories like those used in Likert-type responses (Train, 2003). In this case, a certain range of utility values is associated with each category. Essentially this is a method of censoring an unobservable and continuous utility into discrete categories per

Equation 3, where y_i* represents the latent continuous utility separated by thresholds μ into numbered categories (Daly and Hess, 2014). For detailed equations for calculating the probability of an individual selecting a particular response category, the reader is directed to chapter seven in Train (2003). This study uses an ordered logit model to predict the probability of a driver selecting one of the five response categories, while a binary logit can also be used to predict the probability of a driver agreeing to provide service (or not).

$$\begin{aligned} y_i &= 0 \; if \; \mu_{-1} < y_i * < \mu_0 \\ &= 1 \; if \; \mu_0 < y_i * < \mu_1, \\ &= 2 \; if \; \mu_1 < y_i * < \mu_2. \\ &\ldots \end{aligned} \tag{3}$$

In the public transport field, SC experiments are typically used to determine demand for planned additions to the suite of transport options, such as a new rail line (McFadden, 1974). To estimate ridership for planning purposes, a SC experiment can ask respondents to choose a preferred mode. A probabilistic indication of modal split indicates potential demand to inform design and benefit-cost analysis of the investment. However, rather than determine user preferences, this study instead seeks to determine the likelihood that a transport operator will provide a service.

Examples of measuring willingness to provide a service are limited in the literature across all fields. A number of cases involve assessment of uptake of farming conservation programs where farmers are presented with conditions that must be complied with in exchange for a specified level of compensation (Broch et al., 2013; Espinosa-Goded et al., 2010; Schulz et al., 2014). The choice model can predict the probability that farmers will accept the contract under varying combinations of conditions and compensation. A review of SC experiments in health economics (de Bekker-Grob et al., 2012) identified a few examples from the health field, mainly eliciting preferences of health professionals for varying characteristics of employment and remuneration, including pharmacists (Scott et al., 2007), general practitioners (Scott, 2001), and hospital consultants (Ubach et al., 2003). As employment in this field is focused on service provision, these examples were seen as somewhat analogous to the present study.

A review of the academic literature produced no examples in the public transport field of SC experiments being used to assess operator willingness to provide service, likely because public transport services are often provided by a single government body that can adjust service levels simply by realigning priorities, budgets, and operational decisions/contracts. However, in Cape Town and many other developing cities globally, MBT public transport services are provided by a fragmented collection of individual operators that make operational decisions based on economic self-interest and on an individualized basis (McCormick et al., 2016). Implementing improved service within the city's proposed hybrid system requires an understanding of minibus operator willingness to provide service under conditions desired by city officials to meet the needs of passengers for service frequency and span. Stated choice methodology was selected to assess this willingness to inform policy.

3. STUDY AREA

Survey respondents were sourced from the driver and owner-driver populations from two MBT associations operating *de facto* feeder service from the Mitchells Plain Public Transport Interchange (PTI). Characteristics of each association are listed in Table 1 while characteristics of respondents are listed in Table 2. The PTI serves as a major transfer point for local and line-haul services provided by Metrorail, Golden Arrow Bus Services, MyCiTi, and MBTs. It also serves as a local destination for retail and employment at the Town Centre. Nearby is the Promenade Mall which also serves as a major retail and employment hub, with MBT service linking it to the PTI.

Both associations experience fluctuations in demand based on time of month, with higher demand when salaries and South Africa Social Security Agency (SASSA) benefits are paid. Demand is also dependent on the reliability of Metrorail service; with the recent deterioration in service, demand for local feeder and distributor service provided by MBTs has declined as commuters use other modes (De Klerk, 2017).

Previous research identified complementarity issues between scheduled public transport services and unscheduled MBT service (Behrens et al., 2017), particularly related to operating hours. Minibus-taxi service typically ends by 7 pm, while trunk arrivals continue until approximately 10 pm.

Table 1. Characteristics of taxi associations from which respondents were sourced: Hazeldene Shuttle Services (HSS) and 7th Avenue Taxi Association (7ATA).

Characteristic	HSS	7ATA
Drivers/owner-drivers	~45	78
Routes	1	3
Leadership	Two individuals	Committee
Flat fare	ZAR 7	ZAR 8

Table 2. Characteristics of respondents.

Characteristic	HSS	7ATA
Total respondents	36	46
Percent male	92%	98%
Average age	53 years	44 years
Percent drivers (v. owner-drivers)	78%	100%

4. LESSONS FOR STATED CHOICE EXPERIMENTS

4.1 Survey design

Literature provides guidance for designing and conducting SC experiments in general (Daly and Hess, 2014; Hensher et al., 2015; Train, 2003). For this application, more specific guidance was needed to determine if this methodology was appropriate and if so, to design an experiment appropriate for a respondent population that speaks additional languages than the principle researcher and may be less formally educated.

Van Zyl, Lombard, and Lamprecht (2001) reviewed the use of SC experiments in South Africa, finding that individuals maximize utility in a manner similar to that of other populations. Assuming these findings hold for all South Africans, choice modelling is an appropriate way to assess a MBT driver's willingness to provide a service as decision-making will align with fundamental assumptions of the method.

For respondents with limited literacy, SC experiments can be designed with pictorial or visual attribute levels as opposed to tabular text. Some studies have also used video clips to present attributes (Anderson et al., 1993; Tilahun et al., 2007). However, a study conducted comparing SC experiment validity between text and visual representation of attributes found that visual aids did not significantly impact the estimated parameters, and for less literate respondents, visual aids in fact reduced model fit, suggesting the effort required to develop a visual questionnaire is not worthwhile (Arentze et al., 2003; Del Mistro and Arentze, 2002). Indeed, a study that recommends using pictorial aids did not use visuals exclusively; attributes were always presented in text form as well (Nkurunziza et al., 2012). Regardless, from engagement with the respondent population prior to the survey being conducted, it was decided that the population is not of limited literacy and therefore text-based choice cards would be appropriate.

The decision to use a text-based questionnaire meant terminology used would need to be carefully designed to ensure respondents understood concepts as intended by researchers (Mangham et al., 2009; Venter and Venkatesh, 2010). The principle researcher spent extensive time with the respondent population to note how particular elements of the MBT industry were discussed. This informal data-gathering process fed directly into questionnaire design and terminology was later confirmed in a meeting with the taxi association leadership. As these individuals were intimately involved with the particular context of the association from which driver respondents would be sourced, but would not be taking the survey, they were instrumental in refining terminology. For example, for HSS the attribute levels requiring a driver to leave after 10 or 20 minutes were explained using the association's own system of leaving the rank with only 10 passengers on Sunday. This is done to reduce wait times on a day with low demand. This concrete reference to an existing practice in the association served as a way to clearly communicate the attribute levels for an element that is otherwise unusual in the MBT industry (leaving without a full load). After the pilot survey was completed, the principle researcher interviewed the four individuals to confirm consistent understanding of terminology used.

In addition to direct engagement with the respondent pool, local experts were consulted to ensure a deep understanding of the context (Mangham et al., 2009). These local experts ranged from researchers at University of Cape Town who have worked with the MBT industry for many years, those within the MBT industry in other associations, and City of Cape Town officials working with the industry both directly and in a planning capacity. This was particularly important as the MBT industry consists of complex relationships between association and owners, owners and drivers, and the whole industry with city officials and provincial regulators.

There were many detailed design decisions for the survey instrument related to task complexity, attribute dominance, and attribute levels. Van Zyl, Lombard, and Lamprecht (2001) reviewed five SC experiments conducted in South Africa, each presenting only two alternatives per choice set. Accordingly, this study sought to reduce respondent burden by simplifying the choice sets as much as possible while still gathering required information. Final choice sets presented one unlabelled alternative asking the question, "Would you drive your van from 7 pm to 10 pm?" Responses were Likert-type: Definitely yes, Probably yes, Unsure, Probably no, Definitely no. This allowed respondents to focus on the information of just one alternative while providing data to enable a binary logit to be estimated with two alternatives (yes and no) or an ordered logit using the Likert-type responses. An example choice card is shown in Figure 2. The study used a d-efficient design with a d-error of 0.391308. This is an acceptable design as d-errors above one are considered to be poor designs, though only designs for the same experiment can be compared (Hensher et al., 2015).

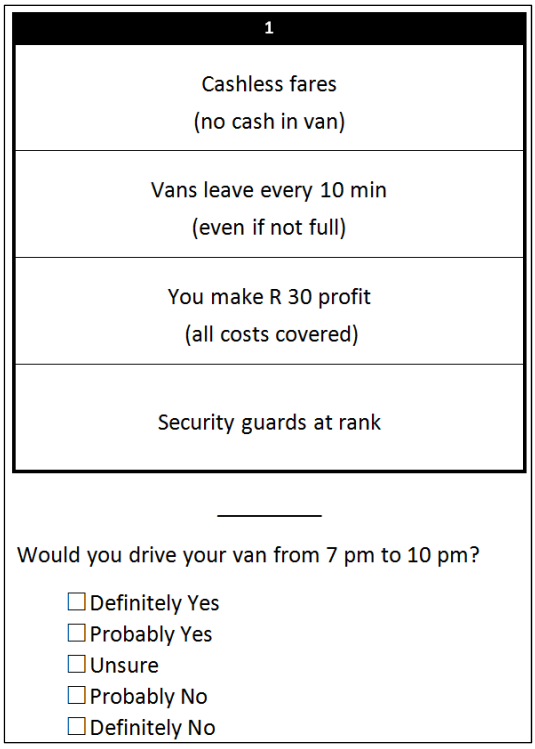

Figure 2. Example choice card presented to respondents.

Each card/alternative presents four attributes: fare payment, departure schedule/headway, driver profit, and security provision at the rank. These were attributes identified through a focus group as important factors in a driver's decision to provide service. The focus group also found that drivers consider passenger loyalty in terms of providing customer service, keeping fares affordable, respecting passengers, and providing services that are not necessarily profitable at the moment with the hope that passengers will remain loyal and provide revenue at other times. This attribute was included in the pilot version of the survey, but in response to a question asking which attributes the respondent considered in their choice, three of the four pilot respondents self-stated that they ignored the passenger loyalty attribute. In the interest of simplifying the experiment, this attribute was removed for the full survey.

A number of studies have considered the impact of task complexity on SC experiment results. Caussade et al. (2005) conducted a study in Santiago, Chile that found the greatest impact on Willingness to Pay (WTP) and model estimates resulted from the number of

attributes with the second largest impact stemming from the number of alternatives. Arentze et al. (2003) found a significant increase in error variance when increasing the number of attributes from three to five and Chintakayala et al. (2009) found that experiments with six attributes increased response randomness. These studies support the efforts to reduce the total number of attributes to a total of four and to present only a small number of alternatives in a choice set.

Additionally, Caussade et al. (2005) found the factor that least affected WTP and model estimates was the number of choice sets, supported also by Arentze et al. (2003) who found no increase in error variance when respondents were presented with 16 choice sets compared to eight. This study presented respondents with 12 choice sets, which is supported by these studies and by the fact that each choice set is simpler than those in many SC experiments that present two or more alternatives per set.

A particularly problematic feature of this study was the expected dominance of the monetary attribute. Considering the unsalaried nature of the MBT industry, drivers are particularly concerned about their earnings and are likely to consider this attribute foremost. Kjær et al. (2006) found dominant behaviour is equivalent whether a monetary attribute is placed first or last in the list of attributes, increasing price sensitivity by a factor of 1.42. Therefore, the monetary attribute was placed third among the four attributes to reduce dominance.

Related to the monetary attribute, Hensher, Rose, and Greene (2015) suggest respondents' choices are influenced by attributes in previous choice sets. In this case, if respondents were presented with a high-profit alternative in the first set, they would be less likely to respond Definitely or Probably yes in remaining sets. Conversely, they would be more likely to respond positively if presented with a low-profit alternative in the first set. To counteract the dominance of profit and ensure all respondents were presented with consistent information, choice set order was randomized, but adjusted so that all first choice sets presented profit attribute levels of the lowest two values of six levels.

Attribute levels were also adjusted from the pilot to maximize trade-off behaviour among respondents. Values at the low (high) end of the profit level range were consistently no (yes) responses, suggesting that the range of values was too wide to be realistic. The full survey version used a narrower range of values. Values were difficult to estimate due to the nature of the industry where target values, fuel and maintenance costs, and other elements of the business are not as well-documented as they would be in a registered company. As drivers may underreport their earnings in a commission system or may be convinced that research is part of a MyCiTi buyout assessment, there are a multitude of valid reasons for misreporting revenue and profit as researchers were informally engaging with drivers. Compared to a standard SC experiment that considers an individual's mode choice based simply on the cost of fuel and tolls or of public transport fare, there is a wide variety of costs to consider in the MBT industry. These include lines fees (paid either by the driver or the vehicle owner), conductor wages (if the driver runs with a conductor), and fuel and target (both of which vary by vehicle type).

4.2 Survey administration and observations

For both the pilot and full surveys, interviewers fluent in Afrikaans and/or isiXhosa were used to ensure full understanding by respondents (Van Zyl et al., 2001). The vast majority of respondents seemed to prefer communication in either English or Afrikaans, though some respondents from 7ATA preferred isiXhosa. Interviewers were fluent in Afrikaans and in the case of 7ATA, one was fluent in isiXhosa. The option was provided for respondents to take the survey with text translated into Afrikaans, though no respondents selected this option.

While this may be because respondents were comfortable in English, it may also stem from the need for them to make an active choice to switch from English to Afrikaans, as English was presented as the default option. For future surveys, it may be beneficial to force respondents to select what language they are most comfortable with without providing any default option (Johnson and Goldstein, 2003).

Considering the complexity of the experiment, an example choice card was included to allow respondents to become familiar with the format and responses with a simple and concrete scenario Figure 3. The attribute levels were deliberately designed to elicit a response of Probably no or Definitely no as a way to check for understanding. If respondents responded in an unexpected way, interviewers would then be able to explain the survey format again before beginning data collection. However, this did not work in practice; from open responses and feedback from interviewers, it seems many individuals responded yes because it meant spending time with their families. Many drivers and owner-drivers work long hours and value time with family highly.

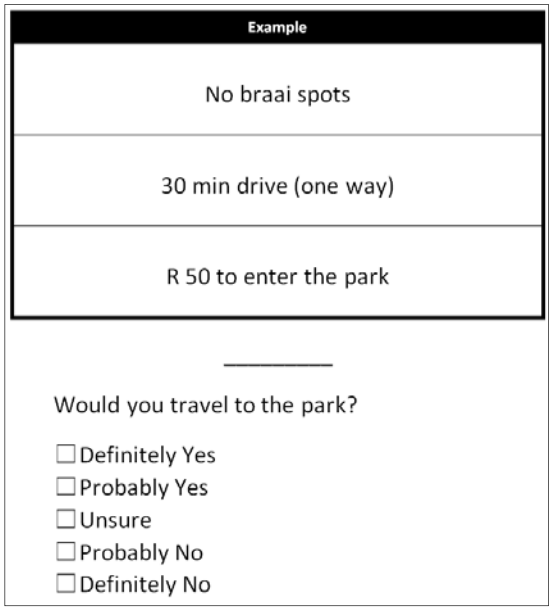

Figure 3. Example choice card included in survey.

As discussed above, one of the most important and also most challenging elements of the survey was the profit amounts presented. In some cases, respondents misunderstood profit for revenue, beginning to subtract fuel costs from the profit value on the choice card. As much as possible interviewers corrected misunderstanding, though surely did not recognize or correct all instances. Great care should be taken to ensure understanding of this attribute. More extensive testing of word choice and phrasing should be done.

Related to the departure schedule attribute, respondents often found it hard to conceptualize leaving the rank with anything less than a full van. This is a fundamental part of the business and a quick way to assess how much money will be made for that trip. Because of this, it was difficult for respondents to reconcile the requirement to depart every 10 or 20 minutes with the profit amount shown as these were almost duplicative indications of viability. One possibility for counteracting this effect may be to explicitly state the potential for outside funds to cover the cost of empty seats. Minibus-taxi drivers and owner-drivers are experts in their business and understand the relationships between passenger numbers and their own profit; to conceptualize a profit and departure combination that was unrealistic in the current reality was difficult and could be assisted by clearly indicating an external source of funds to allow

for a change in thinking. In survey design this was specifically excluded to avoid setting up expectations of government support, though it was implied.

The context for the choice experiment asked respondents to consider a Wednesday at the beginning of the month. Unfortunately, for logistical reasons, the surveys could not be conducted at the beginning of the month. For HSS, interviews were conducted during the third week of the month and 7ATA during the last week of the following month. Ideally, scheduling the surveys the first week of the month could make respondents more likely to naturally think in terms of demand present at the beginning of the month.

There were logistical challenges in conducting interviews. HSS has a quiet rank, allowing interviews to take place with relative ease. However, drivers queue at two additional locations which forced interviewers to move around searching for respondents that had not already been interviewed. 7ATA operates from a busier rank, creating distraction issues for respondents. This was compounded by the timing of the survey in the last week of the month when passenger demand is high. Many surveys were interrupted by the need to move up in the queue or by bystanders. More interviews took place outside of vans, reducing the privacy of drivers.

5. DRIVER WILLINGNESS TO PROVIDE SERVICE

The primary purpose of the study was to determine what would be required to induce drivers and owner-drivers to provide service from 7 pm to 10 pm when service is not currently provided. The survey was intended as a census, though not all individuals were available. Comparing total respondents to the total number of drivers in Tables 1 and 2 shows that a majority of the population was surveyed. An ordered logit model was estimated using Biogeme (Bierlaire, 2009), which produced only two significant beta values: those for profit and security provision. A reduced model was then estimated using only these attributes; the estimation results are shown in Table 3. Further analysis regarding driver profit required to induce service provision and therefore achieve policy goals is obtained using the reduced model.

Table 3. Model estimation results.

Null LL	-1430.79
Final LL	-1178.18
AIC	2368.362
BIC	2357.246
Adjusted Rho square	0.172
Observations	889

Parameter	Estimate	Robust s.e.	Robust t-test	Robust p-value
Profit	0.0255	0.00375	6.79	0.00
Protect	0.200	0.123	1.63	0.10
Tau1	0.687	0.214	3.21	0.00
Tau2	1.06	0.216	4.90	0.00
Tau3	1.18	0.217	5.45	0.00
Tau4	2.00	0.227	8.81	0.00

The tau values are thresholds that divide latent utility into the response categories offered in the survey (Definitely no, Probably no, Unsure, Probably yes, Definitely yes). The probability of an individual's willingness to provide service can be calculated for each category based on a given profit and security provision scenario.

Using a 70% chance of drivers agreeing to provide service (combining the probabilities for being in either Probably yes or Definitely yes categories), MBT drivers and owner-drivers from the associations surveyed would require the presence of SAPS at the rank and ZAR 71.65 profit from 7 pm to 10 pm. Without the presence of SAPS, ZAR 79.50 profit would be required to maintain the same probability of a driver agreeing to provide service. In both cases, there is a 51% chance of a driver responding Definitely yes and a 19% chance of responding Probably yes.

The difference in required profit with and without SAPS indicates the Willingness to Accept (WTA) value of ZAR 7.85. To maintain the same probability of a driver agreeing to provide service under both situations, the profit must be increased by ZAR 7.85 if there will be no SAPS presence at the rank.

6. DISCUSSION

While drivers are not paid per hour, putting the required compensation values in terms of hourly rates is helpful for comparing to benchmarks such as the minimum wage. With (without) SAPS, ZAR 23.88 (ZAR 26.50) per hour is required to ensure a 70% chance of drivers agreeing to provide service from 7 pm to 10 pm. Current minimum wage for MBT drivers as specified by the National Department of Labour is R15.47 (Department of Labour, 2016). The higher amount suggested by the survey could be due to a number of factors, including the security risk drivers perceive both at the rank and along the route. SAPS may mitigate this risk at the rank, but do nothing to reassure drivers when en route. Working evening hours also requires foregoing family time or other activities that may lead drivers to demand additional compensation.

The lack of significance of the fare payment and headway attributes suggests that respondents care relatively more about profit and security than which fare payment system (cash or cashless) is used and if a departure schedule of 10 or 20 minute intervals is required. This may suggest a form of attribute processing called elimination by aspects. Respondents determine the most important attribute and a threshold value below which they will respond a particular way (Hensher et al., 2015). If the profit value is too low, responses will be Definitely or Probably no. Other anecdotal situations of this heuristic being used is with cashless fare collection (CFC), particularly for respondents in 7ATA. These drivers operate on the commission system where total fare revenue is split, with 70 percent paid to the owner and the remainder kept by the driver. Some respondents stated that they would respond no to any card with CFC because it would eliminate the possibility of underreporting earnings, reducing take-home pay as a result.

The fact that respondents frequently ignored fare payment and departure schedule may be because, as attributes, they generally deviate from the standard choice experiment design. Typically attributes are included because respondents consider them when making a choice. However, fare payment and departure schedule are not attributes drivers typically consider when deciding to provide service because they are not currently a part of the business. While these attributes were necessary to assess driver willingness to accept quality of service requirements, the fact that many respondents ignored them should not be particularly surprising in retrospect.

While difficult to say how representative they are, two interesting comments are worth highlighting here. First, one driver stated that willingness to drive in the evening would be higher in the third week of the month because money is particularly tight at this time because of lower passenger demand (which results from tight budgets in passenger households).

This suggests that incentive amounts required to achieve a policy goal of providing evening service may vary by time of month.

The second set of comments pertain to CFC. In general, respondents had mixed feelings about moving from cash to cashless fare payment. Some felt a loss of control over money would result in lower earnings, while others discussed the benefits in terms of security. With no cash on vehicles, particularly at the end of the day when large amounts are present, robbery risk will likely decline significantly. One driver explicitly stated an intention to collect cash fares on the side even if a CFC system was implemented, suggesting the implementation of any policy will need to be carefully considered.

7. CONCLUSION

Using a SC experiment to assess a hypothetical situation in such a complex environment presents challenges. More work is needed to determine whether SC experiments are the appropriate method for the minibus-taxi industry and this study highlights some pitfalls to avoid and elements that should be considered more carefully. Certainly in any research involving the minibus-taxi industry extensive engagement is critically important to ensure researchers gain a fuller understanding, but it is likely the full picture will never be perfectly clear. In light of this and due to the fact that associations vary widely in practices and sophistication, the authors caution any major generalizations for South African cities as a result of this study. Future research, both quantitative and qualitative, is needed to understand the industry's perspective regarding changes to the minibus-taxi industry to ensure the industry's voice is heard.

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