Satisfaction with Water Services Delivery in South Africa

The effect of social comparison

*Nouran Zenelabden, Johane Dikgang and Jugal Mahabir**

Abstract

This paper investigate the role of social comparisons in determining household's satisfaction with municipal water service delivery in South Africa. We use a unique balanced panel dataset for years 2015-2017 from the General Household Surveys conducted by statistics South Africa. Our results shows a positive effect of receiving higher water reliability relative to a provincial reference group, but negative effect of receiving higher water service reliability relative to reference group defined by a smaller geographical areas. Moreover, ewe find indication of altruism or risk sharing among closer neighbours. We conclude that since satisfaction with water service delivery seems to be strongly influenced by psychological and behavioral factors such as social comparisons, satisfaction surveys serve a limited purpose as a foundation for public policy.

Keywords: satisfaction, social comparison, water, public services, South Africa

JEL Codes: A12, D10, D60, D62, D63, D64, I30, H41, 020, R20
*Public and Environmental Research Centre (PEERC), University of Johannesburg

Introduction

Assessment of public service performance is important for policy-makers in designing public policy. The assessment can either be based on objective indicators from the service providers or alternatively on citizen feedback through satisfaction surveys. Citizen's evaluation provides valuable insight into how well the local governments meets citizen's needs. The underlying assumption behind the satisfaction surveys is that there is a relationship between the levels of satisfaction and the quality of services provided. And the variation in the level of satisfaction is assumed to be generated from the variation in the services quality. Satisfaction surveys have been applied in many countries such as United states, Sweden, New Zealand, Australia, United Kingdom, India, Taiwan, Indonesia and Bangladesh (Van Ryzin, 2008; Van Ryzin et al., 2004; Holmes et al., 2006; Griffiths, 2003, Johnson et al., 2001; Lewis and Pattinasarany, 2009). Similarly, In South Africa, citizen's evaluation has become increasingly popular as a response to protests and dissatisfaction with public services

(Akinboade, Kinfack and Mokwena, 2012). It is therefore becomes important to understand the relevance of using these surveys as a basis for future policy.

One way of acquiring more knowledge on this matter is through analysing factors that might affect satisfaction, but that are unrelated to what authorities actually can influence. Scholars have analysed the variation in user's evaluations of public services with service characteristic and non-service-related factors such as personal characteristics and household composition (Festinger, 1954; Stipak, 1977; Dermer et al., 1979; Brown and Coulter, 1983; Fitzgerald and Durant, 1980; Parks, 1984). While few scholars analysed the effects of social comparisons of public service performance on satisfaction, specifically in water services delivery (e.g. Deichmann and Lall, 2003; Vásquez, Trudeau and Franceschi, 2011). When social comparisons are found to have a significant effect on satisfaction, it is often taken as a sign of satisfaction being affected by psychological and behavioral factors, which for public policy-makers are difficult both to observe and influence (Deichmann and Lall, 2003). In such cases, it is not clear whom public policy should target and what the welfare effects would be of implementing policies aiming at reducing the influence of comparison effects on satisfaction. Hence, evidence of significant effects of social comparisons on satisfaction might undermine the use of satisfaction surveys as a basis for public policy making. In the light of this, the study aim to provide empirical evidence for the factors affect South African household satisfaction with water service. And to what extent did social comparisons affect satisfaction and how did the effect vary between different definitions of reference groups. Where reference groups are defined by ethnicity and three descending geographical levels – province, municipality and Primary Sampling Unit (PSU), the latter approximately equal to an enumerator area. Given that water in South Africa is both a scarce resource and a constitutional right, water service is a prioritized topic. In studying social comparisons effects, South Africa is particularly interesting due to the legacy from apartheid, which still divides groups in the society.

This paper contribute and extend upon existing literature in public service satisfaction in emerging markets/developing countries by, first, First, unlike previous studies on public service satisfaction in emerging markets/developing countries, this paper is

based on data with national coverage, allowing for identification of differences on several geographical levels (province, municipality and PSU). Second, this paper is, to our knowledge, the first to study the effects of social comparisons on public service delivery satisfaction using panel data, rather than cross-sectional data. As such, we contribute to research by controlling for individual random effects, time fixed effects and by investigating a larger sample than in previous studies, increasing precision of predicted estimates. Moreover, we are the first ones to use a unique panel dataset from the South African General Household Survey comprising a balanced panel for three years (2015-2017) and 14,166 households. Third, in addition to examining the role of households' relative position in terms of water service delivery, this paper analyzes the importance of *asymmetric* (downward and upward) comparison effects, accounting for the fact that social comparisons might affect households' satisfaction differently. This has, to our knowledge, not been done previously with regard to satisfaction with public services.

We find evidence that social comparisons matter to households' satisfaction with water service delivery. At the provincial level, results display a positive relationship between a household's probability of being satisfied with water service delivery and its water service reliability relative to the reliability, controlling for households' own service reliability. However, at Municipal and PSU level, the effect is the opposite. This indicates that the effect of social comparisons depends on whether comparisons are made to close neighbours or to more distant others. In addition, when testing for asymmetric comparisons, we find evidence of both *upward* and *downward* comparisons at Municipality and PSU level, whereas at the provincial level we only find evidence of downward comparisons – suggesting that social comparison effects differ between households.

The remainder of the article is organized as follows. Section 2 Background. Section 3 literature review. Section 4 provides the analytical framework. Section 5 presents the data and variables used to structure this study. Section 6 presents the results. Section 7 concludes the article.

2. Background

South Africa is the largest country in Southern Africa, and the second largest economy in Africa, with over 57 million people (Statsa, 2017). And ranked as the 30th most water scarce country in the world (DWA, 2013). South Africa has many regional and socioeconomic disparities because of its colonial and oppressive history. The country is divided into nine provinces, the richest provinces are Gauteng and Western Cape while provinces comprising previously homeland areas, such as Limpopo and Eastern Cape are substantially poorer (Statsa, 2017). Also, there are differences within the provinces, at a municipal level, where metros such as Johannesburg (Gauteng) and Cape Town (Western Cape) attract industries and hence offer more employment opportunities (National Treasury, 2011). Socioeconomic differences also exist between ethnical groups, which since the apartheid era are categorized into black, colored, Asian and white-representing 80.9%, 8.7%, 2.6% and 7.8 % of the population respectively (Statsa, 2017). The income inequality gap remains largely widened along racial lines. Although the majority of the population are black, 64.2 % of black people lives in poverty, followed by colored 41.3%, Indian 5.9% and 1% white in 2015 (Statsa, 2017). The annual average income for black households is R92 983 ZAR, while white household earn on average R444 446 ZAR which is roughly 4.5 times larger than Black African households (Statsa, 2016).

Access to public services is relatively high on a national level. In 2017, slightly over 80.1% of South African households lived in formal dwellings. Between 2002 and 2017, the percentage of household connected to the electricity supply from the main improved from 76.7% to 84.4%, and 75.9% of the South African households use electricity for cooking (GHS, 2017). Nationally, 71.3% of South African household satisfied with the electricity service they receive. Moreover, there is an improvement in water and sanitation services, 88.6% of South African households had access to piped water and 46.7% of households had access to piped water in their dwellings in 2017. While the percentage of household with access to improved sanitation improved from 61.7% in 2002 to 82.2% in 2017. Nationally, 63.9% of households are satisfied with the quality of water-related services they received (GHS, 2017).

Focusing on the water sector, several measures have been taken to reduce the inequalities in service delivery stemming from sixty years of apartheid. Access to sufficient water became a constitutional right in the Water Services Act of 1997 and in 2001 the government adopted the policy of Free Basic Water, which provides all households with 6 kiloliters of water per month for free (Seago and McKenzi, 2007; Statistics South Africa, 2013). While investments in water infrastructure have historically been low in deprived areas, more resources have been allocated during the past twenty years of post-apartheid (Smith, 2011). Despite the improvement in providing access to water and sanitation facilities, there has been a steady decrease in the number of households that are satisfied with the water services they receive. Illustrated by the number of service delivery protests – 144 protests in the first six months of 2018 – households are increasingly dissatisfied with the quality, quantity, access and number of interruptions in water delivery (Statsa, 2016).

3. Literature Review

Research on social comparison effects originates from psychology and sociology literature which early acknowledged that it is human nature for individuals to operate within reference groups, i.e. the groups of people with whom individuals compare themselves (McBride, 2011). A main theory was that of the Social Comparison Theory, where the idea is that humans have an innate drive for accurate self-evaluation. However, in the absence of objective means to evaluate their own situation, individuals compare themselves to others (Festinger, 1954). More specifically, individuals will engage in social comparisons with *similar* and *proximal* others since it is difficult to accurately compare oneself to a very different reference group (Festinger, 1954). In economics, influences from social comparisons were recognized later. The focus here has mainly been on income comparisons and the dominating finding is a negative correlation between subjective well-being and the income of a reference group to whom the individual compares herself (e.g. Blanchflower and Oswald, 2004; Clark and Oswald, 1996; Ferrer-i-Carbonell, 2005).

There is no general consensus in literature on who constitutes an individual's reference group, since the actual interaction between the individual and the reference group is difficult to observe and since individuals usually compare themselves to different groups in different contexts (Deichmann and Lall, 2003; Kingdon and Knight, 2007). As such, reference groups could vary between population groups, change throughout an individual's life and depend on the individual's degree of social and geographical isolation (Clark and Senik, 2010; Fafchamps and Shilpi, 2008; Herrera and Roubaud, 2006). In other cases, reference groups seem to stay the same throughout life. For example, Senik (2009) shows that it is common for individuals in post-transition countries to compare their welfare to people they knew before the transition, implying that former classmates or colleagues constitute the relevant reference groups even later in life. Considering the difficulties in defining reference groups, it is common to take account of both social and geographical factors. For example, besides including racially defined reference groups, Kingdon and Knight (2007) assume reference groups based on cluster and district levels in South Africa and conclude that higher average income of the reference group is associated with higher subjective well-being when the reference group is defined on a local cluster level (close neighbors). Interestingly, this coefficient becomes negative when the reference group is defined on a broader, district, level (including strangers). Another example is Deichmann and Lall (2003), who assume that service performance comparisons take place between those with the same income level and belonging to the same ethnic group (speaking the same language) in addition to geographically constructed reference groups. Thus, both the physical and social distance between individuals and their reference groups might matter. Due to lack of knowledge on actual reference groups, most empirical studies simply assume that reference groups are exogenously given. However, there is substantial support in the social psychology literature for the notion that people actively choose their reference standards (Falk and Knell, 2004). In response to this, a scarce number of studies have in recent years investigated the endogeneity of reference groups (e.g. Knight, Song and Gunatilaka, 2009). Literature on social comparisons has yielded mixed empirical evidence on the sign of the relationship between subjective well-being and the performance of the reference group. When reviewing empirical evidence, it therefore becomes important

to distinguish between symmetric comparison effects and asymmetric comparison effects. A majority of the literature considers *symmetric comparison effects* where a change in the reference group's mean performance affects all individuals' subjective well-being in the same way. A positive relationship between individuals' own satisfaction and the performance of the reference group, controlling for individuals' absolute performance, is often explained by positive externalities stemming from altruism or risk-sharing within the community whereas a negative relationship is hypothesized to originate from feelings of rivalry (Kingdon and Knight, 2007). The *asymmetric comparison effect* approach implies that a change in the reference group's mean performance could influence different individuals in different manners. Hence, the sign of the reference group effect on an individual's own utility might depend on the comparison direction. In other words, it matters whether the individual makes a downward, or upward, comparison to a reference group with a performance lower, or higher, than the individual's own performance. While empirical evidence is mixed, it is commonly assumed that underperforming one's reference group (upward comparisons) affects individuals' well-being more than outperforming it (downward comparisons) (Clark and Senik, 2010). However, the effect of upward and downward comparisons on individuals' well-being is still a disputed question. The following asymmetric comparison effects have been summarized by Blanco-Perez (2012). As for upward comparisons negatively affecting individuals' satisfaction, it has been hypothesized that there is an "envy" effect associated with comparisons to a high-performing reference group. Alternatively, upward comparisons could positively affect individuals' well-being due to a so called "information effect" where individuals see an improvement of the reference group's performance as a signal of their own future performance improvement. In the case of downward comparisons, there could be a positive effect from "prestige" associated with being better off than one's reference group. However, research has also shown that individuals might also feel "regret" for being better off and that downward comparisons therefore could negatively affect their well-being.

Turning to the scarce empirical evidence on the relationship between well-being and public service provision in developing countries. To our knowledge, at least two other studies have focused on social comparisons with respect to water services. First,

Deichmann and Lall (2003) analyze household survey data for two major cities in India, Bangalore and Jaipur, and conclude that households' satisfaction with water service delivery is correlated to households' relative water service position. Hence, households' satisfaction with water service delivery is likely to be higher when the reference group receives equal or worse water services, controlling for the households' absolute water service level. Second, Vásquez et al (2011) examine the effect of relative water service quality on citizens' satisfaction with water service delivery in León, Nicaragua, by conducting a survey where citizens were explicitly asked to compare their water service performance to other households. In line with the findings of Deichmann and Lall (2003), citizens' satisfaction with water services appears to be higher when individuals perceive that their water service performance is superior relative to that of their reference group.

As discussed, a substantial number of studies have demonstrated that social comparisons matter to individuals' subjective well-being. However, focus of prior research has been on, mainly symmetric, income comparisons and scant attention has been devoted to relative positions in relation to performance of a public service (Cuesta and Budría, 2012). In particular, empirical evidence for social comparison effects in developing nations is still scarce. This paper aim to contribute to literature by threefold. First, we investigate the role of social comparisons with regard to a public service in an emerging market/developing country and to our knowledge only two similar studies exist (Deichmann and Lall, 2003; Vásquez et al, 2011). In contrast to these studies, this paper uses data with national coverage, allowing for identification of differences on several geographical levels (province, municipality and PSU). Second, unlike the two previously discussed studies, based on cross-sectional data, we use a unique panel dataset from the South African General Household Survey comprising a balanced panel for three years (2009-2011) and 11,327 households. Analysis of such two-dimensional data allows for consideration of effects that cannot be observed in pure cross-sectional or times-series datasets, such as accounting for individual specific effects. Third, to date, research on social comparisons has tended to focus on s*ymmetric* comparison effects, meaning that all individuals are similarly affected by changes in the reference group. Such analysis does not take account of the fact that

changes in the reference group might affect different households' satisfaction differently – implying an *asymmetric* comparison effect. In addition to solely examining whether households' relative position in terms of water service delivery matters, we investigate the importance of such asymmetric comparison effects. While existing empirical evidence on asymmetric comparison effects has focused on asymmetry for income comparisons, this thesis is concerned with asymmetric comparisons with regard to a public service, and constitutional right, such as water service delivery.

Given the theoretical framework presented above, we expect the effect of relative water service delivery to be in line with results by Kingdon and Knight (2007). We thus hypothesize that social comparisons will have different effects on satisfaction depending on at which level the reference group is defined. At the lowest (PSU) level we hence expect to see a negative effect of relative water service reliability, whereas at the higher levels (municipal and provincial), where reference groups include more distant others, we expect to see the opposite, controlling for households' own water service reliability. Regarding the asymmetric comparison effect, hypothesized effects are in line with the downward and upward comparisons described by Blanco-Perez (2012). At the provincial and municipal levels, we thus hypothesize positive downward comparisons and negative upward comparisons. However, at the PSU level, we expect upward comparisons to be positively correlated to satisfaction, and downward comparisons to have no significant effect. Besides motivated by theory, this last hypothesis is also anchored in contextual factors. Since clean water is a constitutional right in South Africa, we expect upward comparison to be the most relevant effect.

4. Analytical Framework

The model specification used in this thesis takes its starting point in the utility function of Deichmann and Lall (2003) in which utility (*U*) of public services depends on a function of a vector of actual quality and reliability performance indicators (*A*) as well as on a vector of individual and community characteristics forming expectations (*E*), as can be seen in equation (1):

$$U=f(A,E) \qquad (1)$$

Deichmann and Lall (2003) develops this simple model into a specification of service delivery of water (2), in which satisfaction with water service delivery (*Si**) depends on the household's received performance (*Pi*) and on a relative measure of the performance received by the household in relation to what the household's reference group receives on average (*Pi/P**). Moreover, satisfaction depends on individual and household characteristics (*Ii*), as well as on the benefit from consumption of other goods and services than water (*Yi*):

$$Si* = \alpha' Pi + \tau'(Pi/P*) + \delta' Ii + \gamma' Yi + \varepsilon i \qquad (2)$$

Thus, the household's satisfaction increases with its own improved service performance (α') as well as from receiving better service performance than its reference group (τ'), that will say when *Pi>P**. However, if the reference group receives better service performance than the household (*Pi<P**), the relative performance ratio (*Pi/P**) decreases and the household is less satisfied. The error term (εi) follows a normal distribution with mean equal to zero and variance equal to $\sigma 2$.

we add time fixed effects, Mundlak corrections , a bivariate variable for payment of water, and a second performance variable to equation (2), presented in Deichmann and Lall (2003). Our first model specification thus becomes:

$$Si,t* = \alpha' Pi,t + \pi' Pqi,t + \tau'(Pi,t/Pt*) + \delta' Ii,t + \gamma' Yi,t + \varphi' Tt + \Sigma j \lambda j \bar{z} j,i + wi + \eta i,t \qquad (3)$$

where (S^*) is satisfaction with water service delivery, (Pi,t) is the reliability of water services, (Pqi,t) is quality of water services, ($Pi,t/P^*t$) is relative reliability of water services, (Ii,t) is a vector of individual and household characteristics, (Yi,t) is a bivariate variable indicating whether the household pays for water, (Tt) is time fixed effects, and ($\Sigma j \lambda j \bar{z} j,i + wi + \eta i,t$) is the error term. The parts of the error term not correlated with individual characteristics (wi and $\eta i,t$) are assumed to follow a normal distribution with mean equal to zero and variance equal to $\sigma 2$.

In order to test for the existence of asymmetric reference group effects, a second model specification is added in the spirit of the income comparisons study by Ferrer-i-Carbonell (2005). Hence, in specification (4), we include two variables, measuring the effect of receiving more or less reliable water services than the mean service of the reference group. The variables, here referred to as More (*Mi,*) and Less (*Li,*), are created to account for downward and upward comparisons respectively.

Our second specification includes these two variables instead of the relative reliability variable (*Pi,t/P*t*) included in (3), and hence becomes:

$$Si,*= \alpha'Pi,t+\pi' Pqi,t + \theta'Mi,t+\mu'Li,t+\delta'Ii,t+\gamma'Yi,t+\varphi'Tt+\Sigma j\lambda j\bar{z}j,i+wi+\eta i,t \qquad (4)$$

The vector of individual and household characteristics (*Ii,t*) in equation (3) and (4) includes gender, age, years of education, years of education squared, ethnicity, the natural logarithm of household size, the natural logarithm of household income, whether or not the household owns its own home and whether or not the household lives in a metro. Moreover, in line with Deichmann and Lall (2003), we also include fixed effects for main source of drinking water. Besides this, fixed effects for locality type and province are included. These variables will, together with all other variables, be described in detail in Table 1.

Table1: Description of Variables and Summary Statistics

Variable	Definition	Obs	Mean	Std. Dev.
Dependent variables Satisfaction	1= "Good", 0="Average" and "poor"	38,546	0.58	0.49
Independent Variables **Water-related factors**				
Perceived water Service reliability	Reliability Score, 1-4	38,546	2.95	1.2
perceived water quality	Quality score, 1-5	38,048	4.8	0.82
Pays for water	1="Pays for water", 0=Otherwise	38,546	0.28	0.45
Individual characteristics				
Female	1="Female", 0="Male"	38,546	0.45	0.5

Age Household Head		38,546	47.8	16.02
Age squared		38,546	2542.6	1622.3
Years of Education Household Head		37,935	5.46	1.76
Ethnicity	Dummies For *Black, Colored, Asian and White*	38,546	-	-
Household Characteristics log of household size		38,546	2.3	1.14
Log of Household income	Household income includes earned income as well as social grants, remittances and private pensions	38,546	7.34	1.21
Owns dwelling	1="Owns", 0=Otherwise	38,449	0.65	0.48
Lives in Metro	1="Lives in metro", 0=Otherwise	38,546	0.41	0.5
Reference Groups ***Relative Reliability***	Reference group defined by Province and Ethnicity	38,546	1	0.42
Relative Reliability	Reference group defined by Municipality and Ethnicity	38,546	1	0.37
Relative Reliability	Reference group defined by PSU level	38,546	1	0.32
More Reliable Water Service than Prov/Mun/PSU	Effect of having more reliable water services than the mean reference group reliability	38,546	0.42, 0.33, 0.24	0.54,0.48, 0.43
Less Reliable Water Service than Prov/Mun/PSU	Effect of having less reliable water services than the mean reference group reliability	38,546	0.42,0.33, 0.25	0.63, 0.54, 0.45
Fixed *effects* Geotype	Dummies For, *Traditional, Urban and Farms*	38,546		
Year	Dummies For *2015, 2016 and 2017*	38,546	-	-

Provinces	Dummies For Western cape, Eastern Cape, Northen Cape, Free state, KwaZuku-Natal, North West, Gauteng, Mpumalanga and Limpopo	38, 546	-	-
Drinking water	Dummies for *Piped water in Dwelling, pied water in yard , Borehole on Site*, *Rainwater Tank*, *Neighbor's Tap*, *Public Tap*, *Water-carrier*, *Borehole off Site*, *Flowing Water*, *Dam/Pool*, *Well*, *Spring*, *Other*	38,546	-	-

5. Data and Variables

5.1 Data source

The study employs data from General Household Survey (GHS) recent data collected by Statistics South for the years 2015-2017 for approximately 33 000 dwelling units. The scope is national coverage, with province as the lowest geographical unit of identification. The Survey objective is to measure the living standards of South African households. GHS data provide a wide range of information about individual and household demographics which allows us to capture all the regional and social disparities among the South African households.

5.2 Variables used in the model

Table 1 describe all the variables used in the regression. In line with statistical publications by Statistics South Africa, the rating of overall electricity service is used as a proxy for the dependent variable satisfaction with service delivery (e.g Statistic South Africa, 2016). The score constructed by statistics South Africa, can take on values 1-3 with 1="poor", 2="average", 3= "good". However, this ordinal variable is redesigned into a bivariate variable for satisfaction that takes on value=1 if the rating is "good" and value=0 if the rating is "average" or "poor". Hence, we consider those that rate services as "good" to be satisfied and those that rate services as "average" or "poor" to be dissatisfied. This transformation of the dependent variable is done to obtain more straightforward interpretations of the regressions. Since an ordinal scale does not reflect mathematically equal steps, it is not obvious that the step from "poor"

to “average” is the same as the step from “average” to “good”. Addressing this issue by transforming the ordinal variable into a bivariate one is a common method used in similar studies.

Regarding performance variables, we construct both a reliability score and a quality score to control for perceived water service performance, and we hypothesize a positive correlation between both scores and households’ probability of being satisfied with water service delivery. First, the Perceived Water Service Reliability score can take on values 1-4 and is constructed in line with the Household Food Insecurity Access Scale for measurement of household food access (Coates, Swindale and Bilinsky, 2007). The idea is that bivariate responses to occurrence and frequency of interruptions can be summarized in a scale to provide a continuous measure of households’ perceived water quantity in terms of interruptions. Thus, the lowest score (1) was assigned to those reporting interruptions in their water supply during the last twelve months, with at least one lasting for longer than two days, and with the total interruptions amounting to more than fifteen days without water. The second lowest score (2) is assigned to respondents who had interruptions that either amounted to a total of fifteen days or where at least one interruption lasted for two days. Next, the second to highest score (3) is assigned to respondents who reported interruptions, but where none of the interruptions lasted for two days or longer and where the total time without water during the last twelve months did not exceed fifteen days. The highest score (4) is assigned to respondents reporting no interruptions.

The Relative Reliability is constructed by the reference group ratio, defined as the household’s perceived water service reliability divided by the mean perceived water service reliability of the households’ assumed reference group. Since reference groups are defined exogenously, we construct these by sorting respondents into groups according to geographical proximity. The reasons for this are as follows. First, given that the Social Comparison Theory hypothesizes that individuals compare themselves to similar others, previous literature commonly defines reference groups both socially and geographically (Deichmann and Lall, 2003).

The asymmetry variables *More Reliable Water Service than Reference Group* and *Less Reliable Water Service than Reference Group* indicate whether the household perceives its water service to be more or less reliable than the mean perceived water service reliability of the reference group.

6. Results

Average marginal effects of relative water service reliability on satisfaction with water services delivery at a provincial, municipal, and PSU level are reported in column 1,2 and 3 of Table 2. The results show significant estimates for Relative Reliability at all geographic levels. For the provincial level, as expected Relative Reliability is positive and significant at the 1% level of significant. Implying that higher perceived water service reliability relative to reference group is associated with increased probability of being satisfied with water service delivery. More specifically a one unit increase in the reference ratio correlates with an average increase of 5.1 percent points in the probability of being satisfied with water service delivery, controlling for household own service reliability. Results from the Municipal and PSU level display a negative and highly significant estimate of the Relative Reliability, indicating that a one unit increase of the reference ratio, is on average, associated with a decrease in the probability of being satisfied with water service delivery by approximately 4 and 12 percentage points respectively. As expected, estimates of the perceived water service reliability and perceived water quality are positive and highly significant in the three specification. Implying a one unit increase in the reliability score is associated with an average increase of 10, 13 and 15 percentage points in the probability of being satisfied for provincial, municipal and PSU reference group specification respectively. While the magnitude of perceived water quality remains constant at all levels.

For individual and household characteristics all three model specifications in Table 2 reveal estimates similar in magnitude, signs and significance levels. We find no significant correlation of Female, age of household head, years of education household head, log of household size and log of household income. The estimate of pays for water services and living in metro are all positive and highly significant at 1

percent significance level at all levels. While negative estimate for owns dwelling in all specifications. Furthermore, the dummies for Ethnicity are significant in all three specification, with exception of colored at the provincial and municipal level and Asian at the PSU level. Results suggest that being Asian or white, compared to being black is on average associated with increase probability of being satisfied with water service delivery.

Table 2: Bivariate Probit Specifications with Random Effects (Average Marginal Effects)

VARIABLES	(1) **Provencial level**	(2) **Municipal level**	(3) **PSU level**
Relative reliability	0.0508**	-0.0372***	-0.121***
	(0.0243)	(0.0107)	(0.00981)
Perceived water service reliability	0.0996***	0.131***	0.151***
	(0.00944)	(0.00404)	(0.00318)
Perceived water quality	0.0949***	0.0949***	0.0941***
	(0.00287)	(0.00287)	(0.00338)
Female	-0.00548	-0.00507	-0.00439
	(0.00485)	(0.00485)	(0.00484)
Age	6.81e-05	5.77e-05	8.24e-05
	(0.000781)	(0.000780)	(0.000786)
Squared Age	-2.36e-07	-8.16e-09	-2.51e-07
	(7.70e-06)	(7.69e-06)	(7.79e-06)
Years of Education	0.00105	0.000483	0.000920
	(0.00439)	(0.00439)	(0.00427)
Squared Education	-0.000151	-0.000107	-0.000138
	(0.000301)	(0.000301)	(0.000296)
Log hhsize	-0.00131	-0.00129	-0.00107
	(0.00209)	(0.00209)	(0.00210)
Log hhincome	0.000966	0.000852	0.000706
	(0.00179)	(0.00178)	(0.00178)
Owns dwelling	-0.0115**	-0.0118**	-0.00990*
	(0.00530)	(0.00530)	(0.00543)
Lives in Metro	0.0393***	0.0340***	0.0275***
	(0.00704)	(0.00716)	(0.00686)
Pays for water	0.0240***	0.0240***	0.0209***
	(0.00610)	(0.00609)	(0.00614)
Colored	-4.57e-05	-0.0144	-0.0185*
	(0.0114)	(0.0104)	(0.00997)
Asian	0.0468**	0.0292*	0.0250
	(0.0186)	(0.0175)	(0.0171)
White	0.0488***	0.0322***	0.0279**
	(0.0128)	(0.0117)	(0.0112)
y2016	0.0103**	0.0100**	0.00862*
	(0.00486)	(0.00485)	(0.00484)
y2017	0.0110**	0.0115**	0.0111**
	(0.00551)	(0.00551)	(0.00548)

Urban	0.0474***	0.0400***	0.0214***
	(0.00772)	(0.00802)	(0.00814)
Farms	-0.0455**	-0.0501**	-0.0701***
	(0.0212)	(0.0212)	(0.0207)
Free state	-0.228***	-0.215***	-0.204***
	(0.0139)	(0.0134)	(0.0130)
Eastern cape	-0.156***	-0.129***	-0.114***
	(0.0146)	(0.0121)	(0.0114)
Gauteng	-0.107***	-0.106***	-0.101***
	(0.0110)	(0.0110)	(0.0104)
KZN	-0.214***	-0.193***	-0.181***
	(0.0137)	(0.0120)	(0.0111)
Limpopo	-0.266***	-0.228***	-0.213***
	(0.0193)	(0.0141)	(0.0135)
Mpumalanga	-0.163***	-0.127***	-0.110***
	(0.0186)	(0.0144)	(0.0135)
Northwest	-0.191***	-0.164***	-0.150***
	(0.0172)	(0.0147)	(0.0133)
Northern Cape	-0.198***	-0.177***	-0.165***
	(0.0162)	(0.0145)	(0.0141)
Rho	. 322	.323	.320
Wald chi-sq (df)	6200.94***(37)	6176.35***(37)	6069.50***(37)
Likelihood-ratio test (rho=0)	902.17***	904.86***	880.44***
Observation	37, 362	37,362	37,362

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors (shown in parentheses) are adjusted for clustering at the PSU level. Dependent variable is *Satisfaction with Water Service Delivery. Tribal* and *Black* for *Geotype* and *Ethnicity*, respectively, are the reference categories and therefore omitted from the estimation. Fixed effects include *Year and Province.*

[a] The approximate average size of a PSU is 12 square kilometers (estimated by dividing the size of South Africa with the number of enumerator areas).

This effect is largest in magnitude for provincial level. However, being colored is on average negative and significant correlated with the probability of being satisfied with water services delivery at the PSU level. Furthermore, it appears that, living in Urban area is associated with increased probability of being satisfied with water services delivery compared to living in a tribal area at all levels. While living in farms is associated with decrease probability of being satisfied with water services delivery compared to living in tribal area at the three specifications. With regard to the fixed effects for years and provinces, all dummy effects are significant at the three specifications.

Results for asymmetry in social comparisons at the provincial, municipal and PSU level presented in Table3. At the provincial level we find a positive and significant effect of downward comparisons and insignificant effect of upward comparisons, controlling for households' own water service reliability. Hence, since there's no evidence for the

upward comparison effect, we cannot establish that households with less service reliability are more likely to be satisfied.

Table 3: Asymmetric Comparison Effects (RE model, Average Marginal Effects)

VARIABLES	(1) Provincial Level	(2) Municipal level	(3) PSU Level
More reliable water service than Reference group	0.0139	-0.0145**	-0.0598***
	(0.0161)	(0.00677)	(0.00602)
Less reliable water service than Reference group	0.0581***	0.0282***	0.0630***
	(0.0168)	(0.00699)	(0.00662)
Perceived water service reliability	0.144***	0.137***	0.157***
	(0.0158)	(0.00494)	(0.00349)
Perceived water quality	0.0951***	0.0950***	0.0941***
	(0.00286)	(0.00287)	(0.00337)
Female	-0.00517	-0.00498	-0.00412
	(0.00484)	(0.00485)	(0.00484)
Age	8.88e-06	6.51e-05	8.88e-05
	(0.000780)	(0.000780)	(0.000787)
Squared age	5.15e-07	-1.16e-07	-2.72e-07
	(7.67e-06)	(7.69e-06)	(7.79e-06)
Year of Education	0.000618	0.000286	0.00103
	(0.00438)	(0.00439)	(0.00426)
Squared Education	-0.000130	-9.68e-05	-0.000145
	(0.000300)	(0.000301)	(0.000295)
Log hhsize	-0.00128	-0.00135	-0.000996
	(0.00209)	(0.00209)	(0.00210)
Log hhincome	0.000939	0.000787	0.000490
	(0.00178)	(0.00178)	(0.00178)
Owns dwelling	-0.0110**	-0.0113**	-0.00961*
	(0.00529)	(0.00529)	(0.00542)
Live in Metro	0.0369***	0.0313***	0.0252***
	(0.00704)	(0.00724)	(0.00683)
Pays for water	0.0248***	0.0234***	0.0187***
	(0.00609)	(0.00609)	(0.00614)
Colored	-0.0160	-0.0152	-0.0199**
	(0.0129)	(0.0104)	(0.00992)
Asian	0.0283	0.0288	0.0242
	(0.0202)	(0.0175)	(0.0170)
White	0.0333**	0.0316***	0.0269**
	(0.0146)	(0.0117)	(0.0112)
y2016	0.00931*	0.00968**	0.00825*
	(0.00485)	(0.00485)	(0.00483)
y2017	0.0105*	0.0107*	0.00967*
	(0.00551)	(0.00551)	(0.00548)
Urban	0.0474***	0.0368***	0.0180**
	(0.00775)	(0.00822)	(0.00821)
Farms	-0.0465**	-0.0537**	-0.0730***
	(0.0211)	(0.0213)	(0.0207)

Free state	-0.222***	-0.214***	-0.201***
	(0.0153)	(0.0134)	(0.0130)
Eastern cape	-0.131***	-0.126***	-0.109***
	(0.0188)	(0.0123)	(0.0114)
Gauteng	-0.113***	-0.107***	-0.0998***
	(0.0110)	(0.0110)	(0.0104)
KZN	-0.201***	-0.193***	-0.179***
	(0.0167)	(0.0121)	(0.0111)
Limpopo	-0.222***	-0.226***	-0.209***
	(0.0256)	(0.0144)	(0.0136)
Mpumalanga	-0.127***	-0.125***	-0.106***
	(0.0245)	(0.0146)	(0.0136)
Northwest	-0.169***	-0.164***	-0.149***
	(0.0213)	(0.0149)	(0.0133)
Northern cape	-0.180***	-0.176***	-0.163***
	(0.0190)	(0.0146)	(0.0141)
Rho	.319	.323	.320
Walid chi-sq (df)	6280.12***(38)	6160.04***(38)	5543.01(38)
Likelihood-ratio test	877.41	903.39	880.44
Observations	37,362	37,362	37,362

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors (shown in parentheses) are adjusted for clustering at the PSU level. Dependent variable is *Satisfaction with Water Service Delivery. Tribal* and *Black* for *Geotype* and *Ethnicity*, respectively, are the reference categories and therefore omitted from the estimation. Fixed effects include *Year and Province.*

Further, results reports negative and highly significant effects of downward comparisons at both municipal and PSU level, controlling for household own water service reliability. Hence, at the municipal and PSU level, more reliable water service than the reference group is on average is associated with a decrease probability of being satisfied with water service delivery. Moreover, the effect of upward comparison is highly significant and positive, implying that receiving less reliable water service than one's reference group is, on average correlated with an increase in the probability of being satisfied. Moreover, the effect of upward comparisons is highly significant and positive, implying that receiving less reliable water services than one's reference group is, on average, correlated with an increased probability of being satisfied. As can be seen the magnitude of upward comparison effects at the municipal level is twice as large as the downward comparison effects (1.5 percent compared to 2.8 percent). Contrary to our expectation, the asymmetric comparison effects at the municipal level are hence to the results at the PSU level, rather than the provincial level.

This results indicate that the when reference group is defined at the lowest geographical level (PSU), we observe the opposite effect of relative water service reliability on satisfaction, such that an increase in the frequency of interruptions relative to the PSU reference group correlates with a higher average probability of satisfaction, controlling for households' own reliability of water service. Hence, at this level we find signs of altruism or risk-sharing within the reference groups. As outlined in the literature review, a possible explanation to this result is that households receiving more reliable water service than their PSU reference group experience feelings of regret. On the other hand, it could also be the case that households receiving less reliable water service than the reference group benefit from an information signal of how their future water service delivery will be. Conducting the asymmetric comparison effects regressions, reported in Table 3, we find signs of both regret (downward comparisons) and information signaling (upward comparisons), with the latter being the strongest effect. Given that both effects exist and differ in magnitude, we conclude that comparison effects do seem to affect households differently at municipal and PSU levels. However, what is commonly interpreted as an altruistic effect could in fact also be a sign of households with below-mean services benefitting from using water from neighbors with more reliable water, alternatively households with above-mean services suffering from neighbors expecting to share it, which would reflect both positive and negative externalities from risk-sharing. This could also result in the households receiving above-mean services having to pay not only for its own water consumption, but also for that of its less well-off neighbors.

In the discussion on social comparisons it is also important to remember that the performance variable Perceived Water Service Reliability is affecting results through both a direct effect and an indirect effect via Relative Reliability. An improvement in actual reliability would hence be correlated with satisfaction in two ways, and differently at province, municipality and PSU level. At the provincial level, both Perceived Water Service Reliability and Relative Reliability would increase its positive effect on satisfaction by this improvement. At the municipal and PSU level, however, an improvement of actual reliability would affect Perceived Water Service Reliability and Relative Reliability positively, but due to the negative estimate of Relative Reliability, the implied correlation with satisfaction would be more ambiguous. In

conclusion, social comparisons seem to correlate strongly with households' satisfaction with municipal water service delivery and this effect varies between different definitions of reference groups.

Conclusion

This paper aim to analyses the factors affecting household satisfaction with water service delivery in South Africa. And to what extent social comparison can affect satisfaction and how this affect vary between different definitions of reference groups. We find significant effects of water-related factors and household and individual characteristics on households' satisfaction with water service delivery. In addition, social comparisons significantly influence households' satisfaction with municipal water service delivery the three reference group definitions. Interestingly, the sign of the effect varies depending on the reference group definition. When the reference group is defined by the largest geographical unit (province) as well as by ethnicity, we find a positive relationship between households' probability of being satisfied with water service delivery and its relative water service reliability, controlling for households' own water service reliability. When the reference group instead is defined by the smallest geographical units (municipality and PSU groups), results suggest a negative relationship between households' satisfaction and their water service reliability relative to the reference group. The main implication is therefore that households' evaluation of their relative water service reliability depends on whether comparisons are made to close neighbors or to more distant others. Further, when investigating the asymmetry of comparison effects, we find evidence of both *upward* and *downward* comparisons at municipal and PSU levels and *downward* comparisons at the provincial level, suggesting that comparison effects impact households differently. We conclude that satisfaction surveys serve a limited purpose as a basis for public service assessment since psychological and behavioral factors such as comparison effects are found to be significant for the probability of being satisfied. While these factors, non-related to experience by the actual service user, are difficult for policymakers to influence, citizen feedback through satisfaction studies could still have an intrinsic value in a society with an escalating trend of public protests and governmental distrust.

References

Akinboade, O.A., Kinfack, E.C. and Mokwena, M.P. (2012). An Analysis of Citizen Satisfaction with Public Service Delivery in the Sedibeng District Municipality of South Africa. *International Journal of Social Economics*. 39 (3): 182-199.

Aklin, M., Cheng. C.-Y., Urpelainen. J., Ganesan K., & Jain, A. (2016b). Factors Affecting Household Satisfaction with Electricity Supply in Rural India. *Nature Energy*. 1: 16170. doi:10.1038/nenergy.2016.170.

Brown, K. & Coulter, P.B. (1983). Subjective and objective measures of police service delivery. *Public Administration Review*. 43 (1):50-58.

Bara A. C., van den Heuvel, W. J. A., Maarse, J. A. M., & van Dijk J P. (2002). Users' satisfaction with the Romanian health care system: and evaluation of recent health care reforms. *European Journal of Public Health* (Supplement), 12(4): 39-40.

Carvalho, A. (2017). Derives of reported electricity services satisfaction in transition economies. *Energy Policy*. 107:151-157.

Deichmann, U. & Lall, S. (2007). Citizen feedback and delivery of urban services. *World Development*. 35(4): 649–662.

Dermer, M., Cohen, S. J., Jacobsen, E., & Anderson, E. A. (1979). Evaluative judgments of aspects of life as a function of vicarious exposure to hedonic extremes. *Journal of Personality and Social Psychology*. (37):247–260. doi:10.1037/0022-3514.37.2.247.

Derose K. P., Hays R. D., McCaffrey, D. F., & Baker D. W. (2001). Does physician gender affect satisfaction of men and women visiting the emergency department? *Journal of General Internal Medicine.* 16:218-226.

Falk, A. and Knell, M. (2004), "Choosing the Joneses: Endogenous Goals and Reference Standards", *The Scandinavian Journal of Economics*. 106 (3):417-435.

Festinger, L. (1954). A theory of social comparison processes. Human Relations. (7):117–140.

doi:10.1177/001872675400700202.

Fredrik, C., & Jostein G. (2000). Consumer satisfaction and supplier induced demand. *Journal of Health Economics.* 19:731-753.

Griffiths, J. (2003). Balanced scorecard use in New Zealand government departments and Growth and Change, 40(1): 85–115.

Kingdon, G. G. and Knight, J. (2007). "Community, Comparisons and Subjective Well-being in a Divided Society*", Journal of Economic Behavior and Organization*. 64 (1):69-90.

Knight, J., Song, L. and Gunatilaka, R. (2009), "Subjective Well-being and its Determinants in Rural China", *China Economic Review*. 20(4):635-649.

Holmes J., Gutie´rrez de Pin˜ eres, S., & Kiel, L.D. (2006). Reforming government agencies internationally: Is there a role for the balance scorecard? *International Journal of Public Administration*. 29: 1125–1145.

Lewis, B., & Pattinasarany, D. (2009). Determining citizen satisfaction with local public education in Indonesia: The significance of actual service quality and governance conditions.

Myburgh, N., Solanki, G., Smith, M., & Lalloo, R. (2005). Patient satisfaction with health care providers in South Africa: The influences of race and socioeconomic status. *International Journal for Quality in Health Care*. 17(6): 473–47.

Schuman, H., & Gruenberg, B. (1972). Dissatisfaction with City Services: Is Race an Important Factor? People and Politics in Urban Society, Sage Publications, Beverly Hills, pp. 369–391.
Statistics South Africa (2017).

Statistics South Africa (2017). *General Household Survey 2017 Statistical release – P0318*. Pretoria: Statistics South Africa.

Stipak, B. (1974), Citizen Evaluations of Municipal Services in Los Angeles County, Institute of Government and Public Affairs, *University of California*.

Senik, C. (2009), "Direct Evidence on Income Comparisons and Their Welfare Effects", *Journal of Economic Behavior and Organization*. 72 (1): 408-424.

Van Ryzin, G. (2008). Citizen perceptions of road smoothness: Evidence from New York with implications for comparative performance measurement. *International Review of Administrative Sciences*. 74: 575–588.

Van Ryzin, G., Muzzio, D., Immerwahr, S., Gulick, L. & Martinez, E. (2004). Drivers and consequences of citizen satisfaction: An application of the American customer satisfaction index model to New York City. *Public Administration Review*. 64(3): 331–341.

Vásquez, W. F. & Trudeau, J. (2011). External and internal consistency of user evaluations. *Int.J. Public Admin*. 34:918–925.

Vásquez, W. F., Trudeau, J. & Franceschi, D. (2011). Can user perception influence the quality of water services? Evidence from León, Nicaragua. *Int. Rev. Adm. Sci*. 77:481–503.

Vásquez, W.F. (2015). A validity assessment of consumer satisfaction to measure performance of water services in Guatemala. *Journal of water, sanitation and Hygiene for development.* 5(2). doi:10.2166/washdev.2015.007