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Abstract
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The Psychology of Two-Part Tariffs

This paper investigates preferences for two-part tariff pricing plans which require consumers to pay a flat fee plus a per unit surcharge for usage beyond an allowance. People have difficulty estimating the effective cost of a two-part tariff, so they apply heuristics to the most salient attributes. Compared to a normative benchmark of expected cost, these heuristics lead people to excessively choose plans with smaller flat fees, larger usage allowances, and lower overage rates. When these attributes are in conflict, people assign greater importance to comparisons of the two attributes that provide upside protection against overage charges: the usage allowance and the overage rate. The presence of usage uncertainty heightens the reliance on these comparisons, and calculating a cost does not appear to reduce them.

Firms frequently use nonlinear pricing plans, where the mapping from quantity purchased to total price is not a strictly linear function. An example is a two-part tariff[1] which consists of an upfront flat fee plus a per unit surcharge for usage beyond an allowance. Increasingly we see the use of such two-part tariffs in consumer settings such as cell phones, car rentals and leases, utilities, time shares, etc. The popularity of these plans has been linked to a number of benefits that include legally implementing price discrimination, managing capacity, meeting consumer expectations of quantity discounts, encouraging greater volume commitments, passing on declining per unit service costs, and creating incentives for consolidating volume with one firm (Nagle and Holden 1995; Nason and Della Bitta 1983; Oi 1971; Wilson 1993). Traditional economic analyses of nonlinear pricing plans have assumed that the consumer calculates an accurate and unbiased cost and has no preferences for specific attributes of a pricing plan beyond its expected cost (Dolan 1987; Kohli and Park 1989; Weng 1995). However, recent work has questioned these assumptions by demonstrating that people prefer to pay a flat fee for unlimited usage rather than per unit (Lambrecht and Skiera 2006; Nunes 2000; Train, McFadden, and Ben-Akiva 1987). This paper demonstrates that this flat-rate bias represents only one of several preferences people have for two-part tariffs. We propose and present evidence for a single decision process that underlies these biases and identifies the conditions that increase their influence.

To accurately estimate the cost of a two-part tariff, consumers must overcome two cognitive obstacles. First, the cost calculation requires performing three mathematical operations -- subtraction, multiplication, and addition -- and so the effective cost is non-obvious. For example, try estimating the cost of the following plan if the expected usage is 530 units: $28 for 350 units and $0.22 for each additional unit. Second, integrating this cost

calculation over all possible usage levels requires a sophisticated mental calculus. Continuing the previous example, now estimate the expected cost if the usage varies uniformly from 300 to 700 units. Although the estimation of product usage is beyond this paper, the mere presence of usage uncertainty compounds the difficulty of determining expected cost. Usage uncertainty renders a cost estimate at a single usage level inadequate to capture costs across the full range of usage. These cognitive hurdles make it likely that consumers will sometimes choose higher priced plans. A pilot group of 139 college students (average SAT score >1400) made over 2,400 choices between pairs of two-part tariff plans and chose the more expensive over 26% of the time, despite an average cost difference exceeding 12%.

Given the difficulty of estimating the cost of a two-part tariff, decision makers may choose to avoid an explicit calculation when choosing a plan. For example, consumers may rely on general cues such as "a lower rate for over usage is always preferable". Prior research has shown that attributes receive more weight in comparative judgments when they are alignable and evaluable (Hsee 1996; Hsee 2000; Markman and Medin 1995; Zhang and Markman 2001). The alignable attributes for a two-part tariff include the dollar amount of the flat fee, the usage allowance included with the flat fee, and the overage rate for additional usage. We posit that consumers use each component of the pricing plan like the attribute of a product (Dickson and Sawyer 1990; Slovic et al. 2002; van Osselaer, Alba, and Manchanda 2004). This leads people to prefer pricing plans with greater comparative advantages on these attributes beyond any differences in cost.

Two studies demonstrate that after controlling for differences in actual and estimated costs, people still prefer two-part tariffs with smaller flat fees, larger usage allowances, and lower overage rates. Reliance on direct comparisons of these attributes increases when usage

is uncertain, presumably because calculating the actual cost becomes too difficult. When attribute comparisons oppose each other, people give more weight to wins on usage allowance and overage rate than a win on the dollar flat fee. We attribute this behavior to a desire to limit the potentially unlimited upside risk associated with much higher than expected usage. Two experiments document these effects and show that most people definitely do not do what would seem the obviously thing to do: estimate the cost of both plans and then choose the one with the lowest estimated cost.

Pricing Plan Preferences

A value-maximizing choice among two-part tariffs requires the consumer to estimate expected costs. However, consumers may avoid difficult calculations and instead rely on simplifying heuristics to reduce cognitive effort (Bettman, Luce, and Payne 1998) or due to an inability to correctly calculate cost. Unit pricing research suggests many consumers do not possess the cognitive skills required to calculate a rate per unit or remember one price while estimating another (Capon and Kuhn 1982; Gatewood and Perloff 1973; Mitchell, Lennard, and McGoldrick 2003). Even if consumers could easily calculate the effective cost for a specific usage level, they may realize the inadequacy of this summary statistic when usage is neither constant nor certain. Calculating the cost at only a single usage level misses an important asymmetry — over-usage can dramatically increase the cost yet under-usage has no effect and still fully incurs the flat fee. Consumers wanting to account for potential overage charges in their plan choice may search for simpler cues than expected cost.

If consumers do not rely solely on an estimated cost, what heuristics could they use to supplement two-part tariff choice? Prior research suggests consumers frequently use wins and losses over the decision attributes (Alba and Marmorstein 1987; Russo and Dosher 1983;

Weber, Goldstein, and Barlas 1995). Given the use of this heuristic, pricing plan attributes will facilitate comparisons when they are alignable and evaluable. Alignability occurs when the decision maker finds a relationship to create correspondence between two attributes of different options (Markman and Medin 1995; Zhang and Markman 1998; Zhang and Markman 2001). Attributes are easily alignable if they share semantic meaning and unit of measure. Similarly, a consumer will be able to evaluate an attribute in isolation only if they have knowledge about the distribution of values for that attribute (Hsee 1996; Hsee 2000). A choice task generally facilitates evaluability as the consumer can easily identify whether an attribute is better or worse than the present alternative. Therefore, we expect consumers to focus on attributes that are alignable and evaluable when choosing a two-part tariff.

Three alignable and evaluable attributes uniquely define a two-part tariff: (1) the dollar amount of the flat fee; (2) the usage allowance included with the flat fee; and (3) the overage rate per unit for additional usage. Consumers can compare pricing plans on these attributes using a simple set of comparison rules. Specifically, these rules should favor smaller flat fees, larger usage allowances, and lower overage rates. We predict [H_1] the outcomes of these attribute comparisons will influence preferences beyond any effects reflected in the actual cost. Consumers can evaluate each of these alignable attributes regardless of the level of usage. However, the presence of usage uncertainty further encourages the use of these simplifying comparisons [H_2] by increasing the difficulty of any calculation efforts and decreasing the adequacy of the cost at a single usage level.

Although the previous discussion has assumed that attribute comparisons operate independently, the three attributes are correlated in practice. For example, as firms increase the dollar amount of the flat fee (bad for the consumer), they also are likely to increase the

usage allowance (good for the consumer). Similarly, the dollar amount of the flat fee and the overage rate will tend to be negatively correlated. For the stimuli used in the two studies reported here, these attribute correlations were +0.75 and -0.18 respectively. The negative correlation of attribute comparisons guarantees consumers will find choice pairs where the comparisons do not all support the same choice. When these comparisons conflict, consumers could weight each comparison based on their usage level. For example, consumers might increase the weight given to the overage rate comparison when they expect the usage allowance to cover only a small portion of their expected usage. However, weighting the attribute comparisons in this manner is quite difficult since the plan winning the comparison may suggest a very different weighting than the plan losing the comparison. And so we predict each attribute comparison will receive a weight largely independent of the portion of expected usage associated with the comparison.

Instead of weighting comparisons based on usage, consumers might have a general preference for using one of the attribute comparisons as a tiebreaker. If consumers are more concerned with avoiding losses and limiting their exposure to high overage charges (Kahneman and Tversky 1979), they will favor plans that offer a larger usage allowance and a lower overage rate at the expense of a higher flat fee. Here, a higher flat fee is an accepted cost of insurance to protect against uncertain and potentially unlimited overage fees (Lambrecht and Skiera 2006). It is possible of course that consumers could instead prefer to limit the waste of prepaid units if they view any excessive commitments as a booked loss (Thaler 1985). Here, consumers must realize that a very low level of usage still fully incurs the flat fee so they may want to reduce the flat fee by opting for a smaller usage allowance. Clearly, these two frames make opposing predictions. We expect consumers will generally

frame any overage charges as a loss and unused prepaid units as a foregone gain (Thaler 1980). Therefore, we predict [H_3] consumers will give more weight to the attribute comparisons involving the usage allowance and overage rate than the flat fee.

Although choice may rely on attribute comparisons, the overage rate comparison should be diagnostic only when consumers expect their usage might exceed the usage allowance. Consumers, however, may overgeneralize their use of the overage rate comparison. First, alignable overage rates may be used as long as it applies to any one alternative. Second, consumers may believe that fairness norms require firms to offer quantity discounts and decreasing marginal rates (Nason and Della Bitta 1983). Third, consumers may anchor on the overage rate in estimating the value offered by the flat fee and usage allowance combination on a cost-per-unit basis (Tversky and Kahneman 1974). Finally, favorable overage rate comparisons may create positive affect that encourages choosing that option (Slovic et al. 2002), regardless of whether this cue is deemed relevant (van Osselaer, Alba, and Manchanda 2004). Thus, we predict [H_4] consumers will exhibit a preference for lower overage rates even when they do not expect them to apply based on their usage.

In sum, we predict that preferences for two-part tariffs exhibit several systematic tendencies. (1) Beyond differences in actual or estimated cost, people prefer plans that compare favorably on the three attributes of a two-part tariff. (2) Greater usage uncertainty increases these preferences and reduces the reliance on expected cost. (3) Loss aversion leads people to especially favor pricing plans with larger usage allowances and lower overage rates. (4) Favorable attribute comparisons influence preference regardless of the likelihood and penalty for overage. Two studies support these four predictions.

Study 1

Method

We gathered choices and cost estimates for two-part tariff plans from 117 undergraduates participating in exchange for course credit. Participants made choices in an unknown product context to reduce the likelihood that they would base decisions on prior experience. The study used a 2x3 full factorial design with task order and usage uncertainty as between-subject variables. Within one of the six treatments, each participant completed a block of 32 choices and a block of cost estimates containing 24 different pricing plans. By having each person both make choices and estimate costs, we can test our predictions about preferences and rule out misestimations of cost as an alternative explanation.

Participants first received an explanation of two-part tariffs and examples of how to calculate the total cost with and without overage charges. Next, a web-based application constructed the 24 possible pricing plans based on a 2x3X4 full factorial on three different properties (shown in Appendix 1). The total cost at the average usage level was one of two amounts ($55 or $62), a >12% difference. The effective rate per unit was increasing, decreasing, or remained the same as usage increased. The usage allowance was well below (100), slightly below (200), slightly above (300), or well above (400) the expected usage of 250 units. The comparison pairs were then constructed by randomly selecting from these 24 pricing plans. We removed any pairings that consisted of identical plans, differed only on overage rate, or had the same usage allowance exceeding expected usage. This left 240 of the 288 possible pricing plan pairs, of which each participant viewed only 32 random sets.

The online application completely randomized the stimuli order within each block to control for fatigue or practice. Also, the stimuli underwent a random “currency conversion”

to reduce task carryover, increase task novelty, and mitigate any rounding effects. The conversion rate was randomly chosen from a uniform distribution between 1 and 2. Usage units were divided by the conversion rate, and prices were multiplied by the conversion rate. Since the generic context could reasonably have any level of usage and the conversion rates were uniformly distributed, this conversion should have no systematic bias on the results. All stimuli and analyses will report values in standardized units to facilitate comparisons.

To create a pricing plan, attributes were first adjusted using the currency conversion rate. The usage allowance was then rounded to the nearest tens unit to make the plan seem less complicated. The percentage change produced by this rounding was also applied to the flat fee to keep the rate per unit the same. Additionally, the flat fee and overage rate were rounded to the nearest dollar and penny respectively. Finally, participants were asked either "Which Pricing Plan Do You Prefer?" or "Estimate of Price Per Unit Based on This Usage" according to the task. The final pricing plan was presented like the example below:

$27 per month covers first 120 units

$0.14 for each additional unit

Since participants did not know the product context, they were explicitly given their expected usage. Usage always centered on a mean of 250 units and ranged from 175 to 325 units in cases of uncertain usage. To manipulate usage uncertainty, the usage information was presented to make it either certain, uncertain with range information, or uncertain with usage distribution information. For participants in the certain condition, usage was given only as a single number (e.g., Your Usage = 250). Participants in the range uncertain condition received the average, minimum, and maximum usage levels (each listed on a separate line).

Finally, participants in the uniform uncertain condition were given usage as a range and told their usage was equally likely to fall at any level in the range (i.e., a uniform distribution).

Results

Since the results did not differ based on the order of the estimation and choice tasks, we collapsed the results across task order. Figure 1 presents the percentage choice of the lower cost plan according to the net number of attribute comparisons favoring that plan. For example, the net positive comparisons would be +1 if a plan had a higher flat fee and usage allowance, but a lower overage rate. The results indicate that participants selected the less expensive plan more often when the simple attribute comparisons supported that choice ($\chi^2(1)=36.25$, $p<0.0001$). When all or a majority of the attributes favored the cheaper plan, people generally chose the less expensive plan (83% and 69% respectively). However, when more attributes favored the more expensive plan, they chose the less expensive plan just over chance levels (60%). Similar to a preference reversal, the plan selected in the choice task was estimated to have the higher cost in the estimation task 43% of the time. Therefore, plan choice generally followed the recommendations of the attribute comparisons, even though the number of favorable attribute comparisons was only weakly correlated with the actual cost ($\rho=-0.12$). Complete results for the choice percentages and cost estimations for each pricing plan can be found in Appendix 1.

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Plan Choices: We estimated a binary logit choice model to calculate the net effect of each attribute comparison on choice after adjusting for any cost differences. The choice

model included several variables to test the theoretical predictions. We coded all variables as percentage differences from the alternative plan using the larger of the two values as the denominator. First, the percentage difference in actual cost was included to capture any economic-based influence on preferences. When the usage distribution was not defined, the actual cost was calculated solely based on the average usage. In the case of uniformly distributed usage, the actual cost was calculated by integrating the total cost over each possible usage level.[2] Second, the favorability of each attribute comparison (flat fee, usage allowance, and overage rate) was included as a percentage difference to facilitate comparability among attributes. For example, if a plan had the lower flat fee of the pair, the percentage difference in the flat fee would be positive. Finally, we included a class variable for usage uncertainty and its interactions with the other variables in the model.

Participants provided a total of 3,744 choices with 3,727 observations remaining after excluding missing data points. Table 1 reports the coefficients from the logistical regression of plan choices for this model, as well as models used in subsequent analyses. The overall model (Model 1) explained a significant amount of the variance in plan choices ($\chi^2(14)=653.06$, $p<0.0001$). Although choice increased for plans with lower actual costs ($\beta=-8.93$, $\chi^2(1)=313.53$, $p<0.0001$), preferences also depended on the favorability of the three attribute comparisons. As predicted [H_1], people preferred plans with smaller flat fees ($\beta=+0.72$, $\chi^2(1)=10.65$, $p<0.01$), larger usage allowances ($\beta=+1.18$, $\chi^2(1)=44.18$, $p<0.0001$), and lower overage rates ($\beta=+0.56$, $\chi^2(1)=31.87$, $p<0.0001$). For comparison purposes to the overall model ($R^2=0.21$), a model containing usage uncertainty and only the actual costs ($R^2=0.17$) or only the three attribute comparison terms ($R^2=0.10$) both significantly

influenced choice. Thus, people preferred plans with more favorable attribute comparisons aside from any effects on actual cost.

Although favorable attribute comparisons increased plan preference in all usage uncertainty conditions, the effects were smaller with certain usage. When people had a single usage level, their preference for a favorable overage rate reached statistical significance (β=+0.51, $\chi^2(1)$=6.99, p<0.01) yet the comparisons of the flat fee (β=+0.30, $\chi^2(1)$=0.48, p>0.49) and usage allowance (β=+0.42, $\chi^2(1)$=1.48, p>0.22) received only directional support. However, the introduction of usage uncertainty led people to choose less in accordance with actual cost ($\chi^2(1)$=15.66, p<0.0001), and rely more on the attribute comparisons. As predicted [H_2], usage uncertainty increased the influence of the comparisons on the usage allowance (.42 versus 1.31 and 1.82, $\chi^2(1)$=7.88, p<0.01) and flat fee (.30 versus .76 and 1.09, $\chi^2(1)$=1.53, p>0.21). However, no significant increase appeared for the overage rate (.51 versus .53 and .65, $\chi^2(1)$=0.11, p>0.73). Usage uncertainty led people to rely less on actual costs differences and more on differences in the individual attributes defining the pricing plans.

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To assess whether people take into account the magnitude of the difference in the attribute comparisons, we estimated a separate choice model using binary measures for the attribute comparisons. Here, the simple outcome of each of the three comparison rules was included as an effects-coded variable with wins, ties, and losses coded as +1, 0, and -1 respectively. As can be seen (Model 2 in Table 1), people preferred plans with favorable

simple outcomes on the usage allowance (β=+0.38,$\chi^2(1)$=31.10, p<0.0001) and overage rate (β=+0.18,$\chi^2(1)$=19.91, p<0.0001), but not the flat fee (β=+0.01,$\chi^2(1)$=0.04, p>0.84). Lack of a significant finding for the flat fee may be due to a less sensitive measure and a high negative correlation between the flat fee and usage allowance. The binary attribute comparison model fit just as well as the continuous comparison model, suggesting that beyond any effects captured by actual cost, attributes influence choice largely as a count of the number of favorable comparisons. People apparently use the simple recommendations provided by these comparisons (i.e., wins and losses) as additional cues for choice.

As predicted by the desire to limit overage fees [H_3], the comparisons on the usage allowance and overage rate influenced choice more than the flat fee. Direct comparison of the coefficients in the model suggests the usage allowance tends to act as the "tiebreaker" when it conflicts with the flat fee, especially for highly uncertain uniform usage (i.e., 1.82 versus 1.09 in Model 1). More formally, the estimated coefficient for the usage allowance comparison exceeded the dollar flat fee comparison for certain (ψ=+0.12, $\chi^2(1)$=0.46, p>0.49), range uncertain (ψ=+0.55, $\chi^2(1)$=14.23, p<0.001), and uniform uncertain usage (ψ=+0.73, $\chi^2(1)$=21.42, p<0.0001). Additionally, in the previous analysis using binary rather than continuous comparisons, only the flat fee comparison failed to significantly influence choice. These results all suggest that people generally rely on comparisons of the usage allowance and overage rate more than the flat fee. We believe that people choose to focus on these two particular comparisons because they provide protection against overage charges in the case of higher than expected usage.

We performed two additional analyses to test whether the influence of the attribute comparisons depend on the likelihood and penalty for overage. First, people might weight the

overage rate comparison based on the portion of their expected usage that exceeds the usage allowance. To test this possibility, we limited the regression analysis to cases where both pricing plans had usage allowances that exceeded expected usage (i.e., overage fees very unlikely). As predicted [H_4], people still chose in accordance with favorable comparisons on the usage allowance (β=+0.95, $\chi^2(1)$=4.86, p<0.03) and overage rate (β=+0.90, $\chi^2(1)$=9.64, p<0.01). Similar to the previous results for all of the choice data, greater usage uncertainty increased the influence of the usage allowance comparison ($\chi^2(2)$=9.15, p<0.02) but not the overage rate comparison ($\chi^2(2)$=2.04, p>0.35). People continue to rely on these two attribute comparisons even when they should not expect any overage charges based on their usage. This suggests the current findings can not be fully explained by the "taxi meter" and "insurance" motives (Lambrecht and Skiera 2006). Second, people may choose plans much larger than they need because they specifically want to avoid paying an exorbitant rate for additional usage. If so, preference for plans with larger usage allowances should be greater when the plan also has a higher overage rate. However, the preference for plans with larger usage allowances (β=+2.12, $\chi^2(1)$=5.85, p<0.02) and lower flat fees (β=+1.63, $\chi^2(1)$=2.54, p>0.11) still remained in a regression limited to only the cases where the overage rates were the same for both pricing plans. As before, greater usage uncertainty increased the preference for both a larger usage allowance ($\chi^2(2)$=5.74, p<0.06) and lower flat fee ($\chi^2(2)$=5.28, p<0.08). Across all analyses, the influence of attribute comparisons on choice remains robust regardless of the likelihood and penalty for overage.

Although the previous results support our predictions, they do not demonstrate that people actually use the proposed attribute comparisons. To better understand how people made their choices, we asked them to describe their decision process. A cost calculation was

mentioned by 66%, 39%, and 39% of the participants for certain, range uncertain, and uniform uncertain usage respectively.[3] Apparently, significantly fewer people based their choices on a calculated cost once usage became uncertain ($\chi^2(1)=4.14$, $p<0.05$). Even though people calculating the cost displayed a greater sensitivity to differences in actual cost (β=-11.67 versus -7.39, $\chi^2(1)=13.24$, $p<0.001$), they still chose in accordance with favorable comparisons on the flat fee (β=+1.25, $\chi^2(1)=13.04$, $p<0.001$), usage allowance (β=+1.49, $\chi^2(1)=27.97$, $p<0.001$), and overage rate (β=+.70, $\chi^2(1)=19.10$, $p<0.0001$). Several of the verbal protocols suggest the attribute comparisons may have served to adjust a preliminary calculation for potential overage and to help decide between plans of similar cost. In contrast, people not claiming to calculate the cost mentioned that they compared the usage allowance (81%) and overage rate (49%) much more than the flat fee (5%). This group's use of these two attributes appears driven by an aversion to overage charges, a desire often explicitly stated (41%) and evidenced by their preference for larger usage allowances (β=+1.23, $\chi^2(1)=16.49$, $p<0.0001$) and lower overage rates (β=+.54, $\chi^2(1)=10.29$, $p<0.01$). In sum, whether conscious or not, people rely on attribute comparisons that lead to an excessive preference for plans with larger usage allowances and lower overage rates. Presumably, they believe these comparisons are cues that can help them choose the lower cost plan and avoid overage charges. Although making an explicit cost calculation increased sensitivity to actual cost differences, it did not significantly reduce the influence of these attribute comparisons.

Cost Estimation: Finally, we examined whether subjects' cost estimates could explain their preference for favorable attribute comparisons. Appendix 1 contains average per unit cost estimates for each of the pricing plans. We tested the accuracy of these cost estimates using a linear model without an intercept that included the accurate cost per unit

and three independent variables for each of the attribute values. If participants correctly compute the cost without bias, the coefficient for the accurate cost should equal 1 and the other three coefficients should equal 0. Before estimating the model, we removed any responses with absolute percentage errors more than three standard deviations from the mean (just over 10% of the responses) to prevent them from skewing the results.

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Results in Table 2 indicate that sensitivity to the actual cost did not significantly differ from the normative value of one for certain usage (β=+0.936, t(2351)=1.20, p>0.23), but decreased for range uncertain (β=+0.874, t(2351)=2.54, p<0.02) and uniform uncertain usage (β=+0.891, t(2351)=2.15, p<0.04). People did not appear to be influenced by the flat fee when estimating the cost for certain (β=-0.001, t(2351)=-0.40, p>0.68), range uncertain (β=+0.006, t(2351)=2.13, p<0.04), or uniform uncertain usage (β=+0.004, t(2351)=1.16, p>0.24). However, people underestimated the cost as the overage rate decreased whether the usage was certain (β=+0.095, t(2351)=3.17, p<0.01), range uncertain (β=+0.199, t(2351)=7.20, p<0.0001), or uniform uncertain (β=+0.128, t(2351)=4.46, p<0.0001). As well, people underestimated the cost as the usage allowance increased for range uncertain usage (β=-.021, t(2351)=-5.43, p<0.0001) and uniform uncertain usage (β=-.013, t(2351)=-3.29, p<0.001), though not for certain usage (β=-0.001, t(2351)=-0.12, p>0.90). In sum, people underestimated the cost of plans with low overage rates and large usage allowances. These two estimation biases might be expected due to excessive anchoring on the compatible

overage rate (Tversky and Kahneman 1974) and failure to adjust for the fact that usage below the usage allowance does not lower the total cost.

Even though these estimation biases would encourage a choice pattern consistent with the proposed attribute comparisons, ironically the cost estimates do not mediate the preference for favorable attribute comparisons. Specifically, the coefficients for the attribute comparisons change very little and remain significant when the choice model includes estimated cost (see Model 3 in Table 1). Even when restricting the mediation analysis to only those people saying they calculated the cost, choices still reflect a preference for favorable comparisons on the flat fee (β=+1.20, $\chi^2(1)$=11.19, $p<0.001$), usage allowance (β=+1.47, $\chi^2(1)$=24.86, $p<0.0001$), and overage rate (β=+0.72, $\chi^2(1)$=18.94, $p<0.0001$). It appears that the alignabilty of attributes in the preference task encourages people to use heuristics other than the estimated cost/unit to make choices. Along with the verbal protocols, this provides strong evidence for the use of the proposed heuristic of comparing attributes.

Discussion

The current findings make it clear that consumers display biases when choosing amongst two-part tariffs. Apparently, exact costs are too tough to estimate and increased uncertainty about usage renders the actual cost at a single usage level inadequate anyway. In place of a cost calculation, people use simple comparisons on the attributes of the pricing plan as cues for choice. Unfortunately, over reliance on the outcome of these comparisons leads to systematic shifts in preferences even for people who claim to base their choice on a cost calculation. The choice context apparently makes attributes comparisons readily available and easy to use, either overriding or inhibiting efforts to estimate an exact cost.

This study finds empirical evidence for nearly all of the predicted effects. If the attribute values of the two-part tariff were unimportant, consumers would choose plans based solely on the actual cost. These results show that consumers still compare the attributes of the pricing plans beyond any effects these attributes have on actual cost. In particular, people prefer two-part tariffs with smaller flat fees, larger usage allowances, and lower overage rates. These comparisons influence choice primarily when the usage level becomes uncertain. When these comparisons make opposing recommendations, people attempt to limit their exposure to overage charges by focusing on the comparisons of the usage allowance and overage rate. The next study replicates these findings in a specific product context (rental cars) and further explores the underlying decision process.

Study 2

Method

One hundred and seventy-six undergraduates completed the experiment in exchange for $5 of compensation. The design of this experiment replicated the previous study with four critical changes. First, participants were provided a product context of renting a car to make the task more realistic. Specifically, participants were told they would be taking a number of different day trips for which they would need to rent a car. Usage units were given as miles, but the stimuli values remain unchanged since they were reasonable prices and driving distances for renting a car. Second, we eliminated the range uncertain condition to reduce the number of treatment cells. Third, cost estimates were always collected after the choice block and in the units of total dollars rather than as a cost per unit. Based on the process descriptions given in the last study, total dollars seems to be a more natural currency for

estimating cost. Fourth, participants rated the importance of the two-part tariff attributes after making their final choice. These changes allow this study to achieve several objectives: replicating the results in a specific product context, eliminating cost misestimation in total dollars as an alternative explanation, and providing further process-level insight into choice.

Results

We performed the same analyses as in Study 1 to test the influence of attribute comparisons on choice. The model included the percentage differences for the actual cost and three attribute comparisons, and class variables for usage uncertainty and its interaction with the other variables in the model. As shown in Table 1, the results replicate the findings from the previous study and support the four hypothesized effects. First, people chose in accordance with the favorability of the attribute comparisons on the flat fee (β=+0.29, $\chi^2(1)$=2.61, p>0.10), usage allowance (β=+0.94, $\chi^2(1)$=42.96, p<0.0001), and overage rate (β=+0.46, $\chi^2(1)$=31.11, p<0.0001). Similar to a preference reversal, the plan selected in the choice task was estimated to have the higher cost in the estimation task 38% of the time. Second, usage uncertainty decreased people's reliance on actual cost (β=-14.43 to -7.00, $\chi^2(1)$=72.36, p<0.0001) and increased the preference for smaller flat fees (β=-0.24 to +0.82, $\chi^2(1)$=8.85, p<0.01), larger usage allowances (β=+0.26 to +1.26, $\chi^2(1)$=22.51, p<0.0001), and lower overage rates (β=+0.07 to +0.86, $\chi^2(1)$=22.65, p<0.0001). Here, none of the attribute comparisons reached statistical significance for certain usage (all p>.05). Third, the two attribute comparisons protecting against potential overage losses had the greatest influence on choice as evidenced by the larger coefficients for the usage allowance and overage rate. A model using effects-coded binary outcomes of the attribute comparisons (Model 2 in Table 1) found the simple outcome of a lower flat fee decreased choice in the

case of uncertain usage (β=-0.15, $\chi^2(1)$=4.54, p<0.04). This suggests a higher flat fee may even act as a cue that signals insurance against overage losses, since it typically has also the larger usage allowance. Fourth, the preference for plans with larger usage allowances (β=+1.21, $\chi^2(1)$=10.65, p<0.01) and lower overage rates (β=+0.74, $\chi^2(1)$=8.49, p<0.01) remained in an analysis restricted to cases where the usage allowance covered the expected usage (i.e., overage fees very unlikely). Likewise, the preference for smaller flat fees (β=+2.53, $\chi^2(1)$=7.94, p<0.01) and larger usage allowances (β=+3.00, $\chi^2(1)$=15.60, p<0.0001) remained in an analysis limited to pairs with equal overage rates. Therefore, the preference for plans with favorable attribute comparisons appears quite robust to the likelihood and penalty for overage. In sum, we find support for the predicted effects.

As in the previous study, we asked participants to describe how they made their choices. Fewer people stated that they calculated the cost when usage was uncertain (42% versus 78%, $\chi^2(1)$=16.91, p<0.0001). Those people who performed a calculation chose more in accordance with actual cost (β=-13.18 versus -4.21, $\chi^2(1)$=77.66, p<0.0001). However, people calculating the cost still preferred plans that compared favorably on the flat fee (β=+0.37, $\chi^2(1)$=2.52, p>0.11), usage allowance (β=+0.95, $\chi^2(1)$=25.47, p<0.0001), and overage rate (β=+0.51, $\chi^2(1)$=22.44, p<0.0001). These coefficients did not significantly differ from those for the people who did not say they calculated a cost (all p > .05). For those people not calculating the cost, they mentioned using comparisons on the usage allowance (85%), overage rate (43%), and flat fee (23%). Their focus on these first two comparisons appears driven by the stated desire to avoid overage charges (40%). This aversion led people to prefer plans that compared favorably on the attributes that protect against overage charges.

Although people often recognized that attribute comparisons influenced their choices, it is not clear whether they believe these comparisons should matter. To assess this possibility, we asked people to rate the importance for choice of the following statements using a 7-point scale anchored on "Not Important" and "Very Important": (a) "A small daily rate (before any charges based on actual driving)"; (b) "A daily rate that includes a large number of miles"; and (c) "A low rate for driving any miles beyond the included miles". As predicted by a focus to avoid overage charges, people rated the flat fee (M=3.9) much less important than the usage allowance (M=4.8, $t(175)=6.67$, $p<0.0001$) or overage rate (M=5.0, $t(175)=8.42$, $p<0.0001$).

To test if rated importance determined the influence of each comparison on choice, we expanded the original statistical model to include the three importance ratings and the interaction of each with the associated attribute comparison. Favorable attribute comparisons increased choice more as people believed the comparisons were more important for choice. Specifically, the importance rating interaction term reached significance for the flat fee ($\chi^2(1)=44.82$, $p<0.0001$), usage allowance ($\chi^2(1)=70.20$, $p<0.0001$), and overage rate ($\chi^2(1)=4.26$, $p<0.04$). Usage uncertainty further increased the relationship between rated importance and influence for the flat fee ($\chi^2(1)=6.45$, $p<0.02$), usage allowance ($\chi^2(1)=7.18$, $p<0.01$), and overage rate comparisons ($\chi^2(1)=6.08$, $p<0.02$). Apparently, people have beliefs about the importance of each attribute that drive the influence of that comparison on choice. These beliefs become especially relevant when usage becomes uncertain.

Finally, we examined whether biases in cost estimation could explain the preferences for favorable attribute comparisons. Appendix 1 contains average total cost estimates for each of the pricing plans. Similar to Study 1, we modeled the total cost estimates using actual

total cost and the three attribute values. The analysis did not include any responses with absolute percentage errors more than three standard deviations from the mean (less than 3% of the responses). Based on the average absolute percentage error, people provided quite accurate estimates when the usage allowance exceeded expected usage (1.3%). However, they had trouble adjusting their cost calculation when plans would incur overage fees for certain (4.4%) and uncertain usage (12.3%).

Although people displayed errors in their cost estimations, the pattern of misestimation shown in Table 2 can not explain the preference for favorable attribute comparisons. For certain usage, people overestimated the cost of plans with favorable comparisons on the usage allowance (β=+0.125, $t(2096)=0.71$, $p>0.47$) and overage rate (β=-2.930, $t(2096)=2.69$, $p<0.001$). These misestimation biases would predict that people would prefer unfavorable comparisons on these two attributes. For uncertain usage, people underestimated the cost of plans with favorable comparisons on the flat fee (β=+0.832, $t(2028)=6.73$, $p<0.0001$), usage allowance (β=-1.094, $t(2028)=6.11$, $p<0.0001$), and overage rate (β=+1.785, $t(2028)=1.61$, $p>0.10$). Although these estimation biases could contribute to a preference for favorable attribute comparisons, adding estimated cost to the model of choice barely changed the influence of the attribute comparisons (Model 3 in Table 1). Therefore, people have a preference for favorable attribute comparisons that can not be explained by misestimations of total dollar cost.

Discussion

This study replicated all of the hypothesized effects in the context of renting cars. People prefer two-part tariffs with favorable comparisons on the flat fee, usage allowance, and overage rate. These preferences do not appear driven by cost calculations as we could not

explain choice using estimates of the total cost (this study) or cost per unit (previous study). Reliance on these comparisons for choice increases as uncertain usage renders cost calculations more difficult. People saying they calculated costs did choose more in accordance with actual cost, but still preferred plans offering more favorable attribute comparisons. When these comparisons make opposing recommendations, people believe usage allowance and overage rate are more important than the flat fee. We attribute these beliefs to an aversion to the potentially unlimited overage charges that people perceive as a loss. The flat fee might arguably be the most important attribute since that commitment can not be recovered in cases of lower than expected usage. However, people think it best to view this flat fee as the cost of insurance to avoid overage charges. This suggests that consumers might improve their decision making by focusing more on the unrecoverable cost of the flat fee to counter the natural allure of a larger usage allowance.

General Discussion

Most prior research has assumed that consumers can choose between two-part tariffs without any systematic bias. We find, however, that consumers have difficulty calculating the cost of these complex pricing schemes. Two studies demonstrate that consumers respond to this difficulty by using simple comparisons on the alignable attributes. In effect, consumers allow their preferences to be influenced by a set of simple comparisons such as "Which plan has the lower overage rate?" Although each of these cues are generally associated with lower cost plans, they also lead people to prefer two-part tariffs with a smaller flat fee, a larger usage allowance, and a lower overage rate more than the cost justifies. This is because people deal with each individual cue one-at-a-time and ignore the fact that actual costs demand a more complicated treatment that requires combining the

individual cues in not only an additive but also a multiplicative fashion. We find that these comparisons influence choice primarily when expected usage becomes uncertain, and people especially rely on the comparisons of the usage allowance and overage rate over the flat fee. We attribute this pattern of findings to: (a) the increased difficulty of performing calculations; (b) the decreased sufficiency of cost at a single usage level as a summary statistic when usage is uncertain; and (c) beliefs about the greater importance of attributes that limit the extent of out-of-pocket upside risk arising from higher than expected usage.

The current approach to understanding preferences for two-part tariffs leads to several valuable insights. First, we have outlined a general process for choosing two-part tariffs that can easily explain some well established phenomena. For example, previous research has demonstrated that people prefer flat-rate over pay-per-use pricing plans (Lambrecht and Skiera 2006; Nunes 2000; Train, McFadden, and Ben-Akiva 1987). The current findings predict that if people could design their ideal two-part tariff, they would select an unlimited usage allowance and free overage rate (i.e., a flat rate plan). Second, the proposed decision process correctly predicts the presence of previously unidentified effects. For example, people prefer two-part tariffs with lower overage rates even when their usage is unlikely to exceed the usage allowance. Third, we have demonstrated the importance of usage uncertainty in determining people's reliance on heuristic attribute comparisons. This suggests that consumers might attenuate these effects and make more cost-effective decisions with increased certainty about their usage. Fourth, we have linked the use of these attribute comparisons to beliefs about the importance of the shortcuts for choosing a plan. People believe they should willingly absorb the sunk cost of the flat fee and leave money on the table, yet reluctantly pay additional out-of-pocket costs. People could view excessive prepaid

flat fees and subsequent overage charges both as losses, but they seem more averse to those losses that occur after the initial payment (i.e., overage charges).

Although prior research offers alternative explanations for these preferences, it can not fully account for the current findings. The preference for lower overage rates could be linked to consumers' preferences for improving sequences (Loewenstein and Prelec 1993) or quantity discounts (Nason and Della Bitta 1983). However, both of these mechanisms fail to explain why the preference for a lower overage rate would appear when usage is not expected to exceed the usage allowance or rates increase with usage. More importantly, not a single participant mentioned a declining rate as a consideration for choice. The preference for larger usage allowances could be attributed to misestimations of usage (Nunes 2000), greater enjoyment from decoupling payment from consumption (Prelec and Loewenstein 1998), or insurance to prevent any out-of-pocket overage charges (Lambrecht and Skiera 2006). However, misestimations of usage can not explain why estimated costs did not mediate the effects on choice. The free enjoyment and insurance stories, though undoubtedly operating, do not explain why people preferred larger usage allowances even when they still incur overage charges. Our explanation, a reliance on simple attribute comparisons, anticipates all the effects and matches what participants recalled doing when making their choices.

The current findings may also be relevant to different price formats and settings. We expect that other complex pricing schemes also encourage consumers to use attribute comparisons as a simplifying heuristic. For example, consumers may choose a credit card by comparing the rate of interest, percentage cash back, late fees, annual dues, and overdraft penalties. Likewise, consumers may evaluate products with many add-on fees (e.g., tax, shipping, delivery, and service) by comparing each of the individual price components.

It is worth noting potential boundary conditions. First, participants may have exerted less effort on these tasks because their decisions in the lab had no actual economic consequences. However, people took a reasonable amount of time to make the choices across the two studies (median time of 18 seconds). As well, the preferences found in both of the studies did not systematically change when the analysis included the effects of task order or the time taken for choice. Second, these studies examined only the initial choice of a two-part tariff. When repeatedly making choices, consumers may learn over time that a different choice would cost less. Other research casts doubt on these adjustments as preferences for plans offering unlimited usage over pay-per-use persist over time (Lambrecht and Skiera 2006). Third, the usage allowance ranged from 40% to 160% of expected usage in the stimuli we employed. As the usage allowance increases relative to expected usage, we expect the importance of the usage allowance comparison to diminish. At some point, providing a larger usage allowance provides no value to the consumer as they simply choose the plan with the smaller flat fee. Fourth, we explicitly provided participants their expected usage. In many real-world situations, consumers know little about their usage pattern (e.g., new products). We speculate that people will exhibit a greater aversion to overage fees and rely even more on attribute comparisons in these settings due to the great amount of usage uncertainty. In the extreme case, people may completely avoid two-part tariff pricing formats since they can not reasonably estimate their cost. In response, marketers may consider offering such products with a flat fee that covers unlimited usage, or resort to using a simpler linear pricing structure. Future research should explore how people generate expectations about their usage and apply it to a two-part tariff choice.

Our findings do not completely endorse the pricing plans typically offered in the cellular telephone market. It is the case that the observed preference for larger usage allowances anticipates the fact that consumers generally purchase cellular plans that far exceed their average usage (J. D. Power and Associates 2000). However, counter to most cellular plans, our results suggest lower overage rates might also increase preferences even if the overage rate is unlikely to apply. We speculate that firms may use their current pricing because they believe that consumers choose larger plans only when overage rates impose a severe penalty for additional usage – a belief our results do not empirically support. Future work should explore the optimality of pricing in the cellular telephone market to better understand the current behavior of firms.

This work demonstrates that researchers can not assume that people evaluate the complex price of a two-part tariff in an accurate and unbiased fashion. Rather, people use heuristics to simplify the task. We have shown that these heuristics lead consumers to make suboptimal choices with regard to cost, but we can not make conclusions as to whether consumers maximize their subsequent enjoyment. For example, consumers may be ultimately better off choosing plans with larger usage allowances because it lets them enjoy their consumption free of thoughts about the cost or worries about overage charges (Lambrecht and Skiera 2006; Prelec and Loewenstein 1998). Here, the reliance on attribute comparisons to avoid difficult cost calculations could coincidentally result in the preferred outcome. On the other hand, consumers may overly restrict their usage to avoid overage charges even if the benefits from one additional unit outweigh the marginal cost. At the other extreme, consumers may overestimate their ability to manage subsequent usage. Future situations may absolutely require usage, leaving consumers little choice but to incur excessive overage

charges. In sum, consumer satisfaction with a two-part tariff choice involves a complex interplay between choice and subsequent usage and enjoyment. We have provided some insight into the decision process used by consumers for initial choice. Future work will need to explore how better choices can be made by consumers and provided by marketers.

Table 1

Logistical Regression Coefficients for Choices

	Study 1			Study 2		
	Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
Likelihood Ratio	653.06***	654.44***	659.05***	1257.92***	1284.76***	1265.91***
Max Rescaled R-Squared	0.21	0.21	0.23	0.27	0.27	0.28
Actual Cost (% Difference)	-11.92 ***	-12.05 ***	-12.10 ***	-14.43 ***	-13.93 ***	-14.32 ***
	- 6.86 ***	- 7.51 ***	- 7.16 ***			
	- 8.01 ***	- 9.06 ***	- 7.77 ***	- 7.00 ***	- 8.17 ***	- 6.76 ***
Estimated Cost (% Difference)			- 0.25 n.s.			- 0.22 n.s.
			- 0.03 n.s.			
			- 0.01 n.s.			- 0.66 *
Smaller $ Flat Fee (% Less)	+ 0.30 n.s.		+ 0.18 n.s.	- 0.24 n.s.		- 0.24 n.s.
	+ 0.76 *		+ 0.99 *			
	+ 1.09 **		+ 1.12 **	+ 0.82 **		+ 0.74 **
Larger Usage Allowance (% More)	+ 0.42 n.s.		+ 0.33 n.s.	+ 0.26 n.s.		+ 0.29 n.s.
	+ 1.31 ***		+ 1.55 ***			
	+ 1.82 ***		+ 1.93 ***	+ 1.62 ***		+ 1.59 ***
Lower Overage Rate (% Less)	+ 0.51 ***		+ 0.46 ***	+ 0.07 n.s.		+ 0.06 n.s.
	+ 0.53 ***		+ 0.61 ***			
	+ 0.65 ***		+ 0.65 ***	+ 0.86 ***		+ 0.87 ***
Smaller $ Flat Fee (Effects Coded)		+ 0.07 n.s.			+ 0.12 n.s.	
		- 0.02 n.s.				
		- 0.01 n.s.			- 0.15 *	
Larger Usage Allowance (Effects Coded)		+ 0.18 n.s.			+ 0.34 ***	
		+ 0.38 ***				
		+ 0.59 ***			+ 0.50 ***	
Lower Overage Rate (Effects Coded)		+ 0.20 **			+ 0.10 *	
		+ 0.13 *				
		+ 0.21 **			+ 0.23 ***	

n.s. = non-significant ; * = p-value < 0.05 ; ** = p-value < 0.01 ; ***=p-value < 0.001

1st row contains coefficients when usage is given as just the expected usage
2nd row contains coefficients when usage is given as the expected value and range of usage
3rd row contains coefficients when usage is given as a uniform distribution over a specified range

Table 2

Regression Coefficients for Cost Estimates

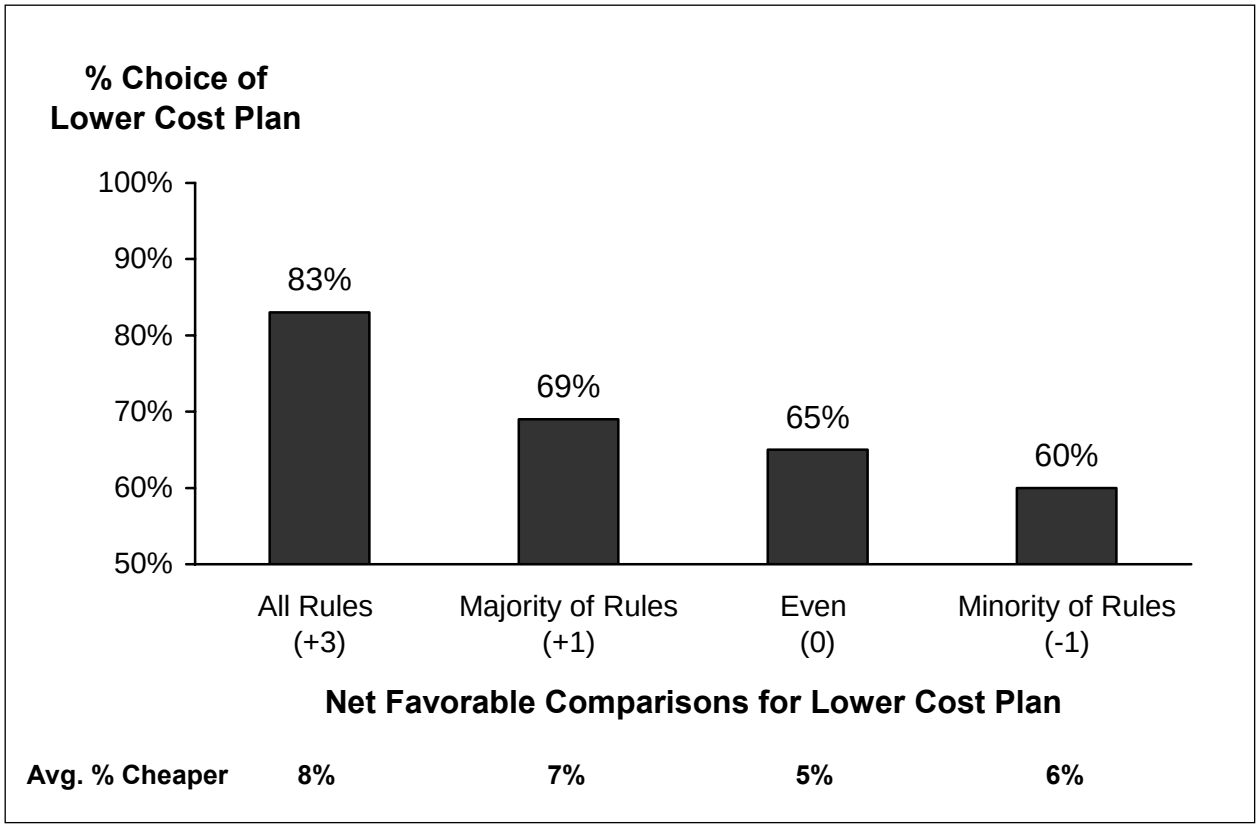
	Study 1 ($/Unit)	Study 2 (Total $)
Actual Cost	+ 0.936 n.s.	+ 0.987 n.s.
	+ 0.874 *	
	+ 0.891 **	+ 0.980 n.s.
Flat Fee (per $10)	- 0.001 n.s.	+ 0.172 n.s.
	+ 0.006 *	
	+ 0.004 n.s.	+ 0.832 ***
Usage Allowance (per 100 units)	- 0.001 n.s.	+ 0.125 n.s.
	- 0.021 ***	
	- 0.013 ***	- 1.094 ***
Overage Rate (per $0.01)	+ 0.095 ***	- 2.930 ***
	+ 0.199 ***	
	+ 0.128 ***	+ 1.785 n.s.

n.s. = non-significant ; * = p-value < 0.05 ; ** = p-value < 0.01 ; ***=p-value < 0.001

1st row contains coefficients when usage is given as just the expected usage
2nd row contains coefficients when usage is given as the expected value and range of usage
3rd row contains coefficients when usage is given as a uniform distribution over a specified range

Figure 1

Percentage Choice of Lower Cost Plan in Study 1



Appendix 1

Pricing Plan Stimuli and Results

						Study 1			Study 2		
Cost for 250 Units	Direction	Usage Versus Allowance	Flat Fee	Usage Allowance	Overage Rate	Choice Overall	Choice vs Same Cost	Average Estimate ($/Unit)	Choice Overall	Choice vs Same Cost	Average Estimate (Total $)
$55	Decreasing	Well Above	$31	100	$0.16	47%	41%	$0.22	52%	37%	$55.81
$55	Decreasing	Just Above	$51	200	$0.08	71%	59%	$0.20	66%	49%	$56.89
$55	Decreasing	Just Below	$55	300	$0.14	73%	66%	$0.21	72%	59%	$55.61
$55	Decreasing	Well Below	$55	400	$0.11	67%	60%	$0.19	72%	64%	$55.80
$55	Flat	Well Above	$22	100	$0.22	53%	28%	$0.23	49%	38%	$54.90
$55	Flat	Just Above	$44	200	$0.22	59%	50%	$0.23	60%	48%	$56.64
$55	Flat	Just Below	$55	300	$0.22	73%	59%	$0.21	71%	53%	$55.89
$55	Flat	Well Below	$55	400	$0.22	66%	52%	$0.21	72%	61%	$55.33
$55	Increasing	Well Above	$10	100	$0.30	62%	49%	$0.22	59%	45%	$53.63
$55	Increasing	Just Above	$39	200	$0.32	56%	49%	$0.25	54%	41%	$56.35
$55	Increasing	Just Below	$55	300	$0.31	63%	49%	$0.23	64%	52%	$56.06
$55	Increasing	Well Below	$55	400	$0.30	64%	45%	$0.21	71%	60%	$55.79
$62	Decreasing	Well Above	$36	100	$0.18	29%	35%	$0.25	34%	45%	$62.49
$62	Decreasing	Just Above	$60	200	$0.05	46%	55%	$0.23	46%	54%	$64.36
$62	Decreasing	Just Below	$62	300	$0.16	53%	59%	$0.22	45%	58%	$63.17
$62	Decreasing	Well Below	$62	400	$0.13	43%	63%	$0.21	42%	63%	$62.65
$62	Flat	Well Above	$25	100	$0.25	31%	41%	$0.26	32%	43%	$61.55
$62	Flat	Just Above	$50	200	$0.25	38%	49%	$0.25	33%	43%	$63.97
$62	Flat	Just Below	$62	300	$0.25	40%	51%	$0.24	40%	54%	$63.32
$62	Flat	Well Below	$62	400	$0.25	45%	61%	$0.22	42%	63%	$62.51
$62	Increasing	Well Above	$15	100	$0.32	35%	42%	$0.26	29%	38%	$62.29
$62	Increasing	Just Above	$41	200	$0.43	27%	36%	$0.28	28%	37%	$64.93
$62	Increasing	Just Below	$62	300	$0.33	38%	48%	$0.25	38%	54%	$63.50
$62	Increasing	Well Below	$62	400	$0.32	42%	57%	$0.23	42%	59%	$62.40

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End Notes

[1] A pure two-part tariff does not include any usage allowance with the flat fee; however, we use the term to refer to the more general class of pricing plans that include some units at no cost as part of the flat fee and impose a quantity surcharge for usage beyond this allowance.

[2] The results do not depend on whether the uncertain usage conditions calculate the actual cost at only the expected usage level or as a uniform distribution across the given range of usage.

[3] The decision process was coded as using a calculation if the participant mentioned any type of mathematical operation or cost estimation.