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Restaurant Tips and Service Quality: A Commentary on Bodvarsson, Luksetich and McDermott

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ABSTRACT

Bodvarsson, et. al. (2003) argue that a non-recursive relationship between service and tipping has lead researchers to under-estimate the strength of the causal impact of service on tipping. In this paper, I criticize their arguments, analyses, and conclusions. Then, I reanalyze their data to draw more appropriate conclusions about what the data say concerning the effects of service on tipping.

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Restaurant customers around the globe often leave parting gifts of money (or tips) for the waiters and waitresses who served them. By custom, these tips, which amount to approximately 20 billion dollars a year in the United States alone, are supposed to reflect the customers' appraisals of service. However, researchers have found only a weak relationship between customers' evaluations of service and the tip amounts they leave (Lynn & McCall, 2000a). The weakness of this relationship has both theoretical and practical implications. Specifically, it challenges economists' theories that tipping exists because it is the most efficient means of providing servers with an incentive to deliver good service (Bodvarsson & Gibson, 1994; Jacob & Page, 1980) as well as restaurant managers' reliance on tips to motivate servers, measure server performance, and identify dissatisfied customers (Lynn, 2001, 2003).

In a recent article appearing in *Applied Economics*, Bodvarsson, Luksetich and McDermott (2003) argue that the service-tipping relationship is stronger than previous research suggests. They claim that the relationship between tips and service is non-recursive. Service causes tips because customers reward better service with bigger tips. However, tips also cause service because servers reward customers known (or believed) to be big tippers with better service. This non-recursive relationship violates the assumptions underlying the Ordinary Least Squares (OLS) regression models used in previous research to assess the effects of service on tipping, which means that existing regression coefficients estimating those effects are biased. Bodvarsson, et. al. suggest that more appropriate analyses might produce evidence of a stronger

service-tipping relationship. They test this possibility by using two-stage least squares (2SLS) regression to analyze the data on 247 diners at a Mexican restaurant and report that service quality -- actually "predicted service quality" -- had a substantial impact on tip percentages.

Although I read Bodvarsson, et al's (2003) article with interest, I did not find it persuasive. In this paper, I provide a critical commentary on their arguments, analyses, and conclusions. First, I point out some logical problems with their criticism of the existing literature. Then, I challenge the validity of the instruments in their 2SLS regression analyses. Finally, I reanalyze their data to draw more appropriate conclusions about what the data say concerning the service-tipping relationship.

Problems with the Argument

Bodvarsson, et al (2003) argue that a non-recursive relationship between service and tipping causes the OLS regressions in the existing tipping literature to under-estimate the strength of the causal impact of service on tipping. Their argument is not logical because they hypothesize a positive feedback loop in the service-tipping relationship – i.e., good service begets big tips and big tips beget good service. This positive feedback loop means that OLS regressions should over-estimate, not under-estimate, the causal impact of service on tipping. Thus, if anything, their argument about the non-recursive relationship between service and tipping makes the existing evidence of a weak relationship between these variables even more compelling.

A second problem with Bodvarsson, et. al.'s (2003) argument is that tips cannot cause service in the existing tests of the service-tipping relationship, because those tests are cross-

sectional and tips come after service has been delivered. Bodvarsson, et. al. try to get around this problem by arguing that actual tips are correlated with anticipated tips, which can and do affect service. In essence, the authors are arguing that percent tip must share error variance with service because its' correlate -- anticipated percent tip -- does. However, this argument is not valid. In fact, the authors implicitly acknowledge this in their own statistical analyses. Their use of predicted percent tip as an instrumental variable for percent tip in Equation 2 is based on the assumption that one variable need not share error variance with service just because its correlate does. More generally, all 2SLS regressions are built on the assumption that one variable (the instrument) need not share error variance with another (the dependent variable) just because the first variable's correlate (the endogenous variable) does.

Although Bodvasson, et. al.'s (2003) argument about the source of feedback in the service-tipping relationship is not viable, there is another source of feedback that should be acknowledged – namely, that tips may affect customers' ratings of service rather than the service itself. Existing tests of the service-tipping relationship usually involved service ratings obtained after the customers tipped. Consistent with self-perception theory in psychology (Bem, 1972), it is possible that during the rating task, consumers inferred their attitudes toward the service from their just completed tipping behavior. This is the only source of reverse causality likely to bias existing, cross-sectional tests of service effects on tipping. However, self-perception theory suggests that customers will rate the service in a manner consistent with the tips they left, so this source of reverse causality (like that proposed by Bodvarsson, et. al.) should strengthen rather than weaken the observed service-tipping relationship. Once again, the possibility of a positive feedback loop between tipping and service (or service ratings) makes the existing evidence of a weak relationship between these variables more rather than less compelling.

Problems with the Instruments

Bodvarsson, et. al. (2003) used 2SLS regression to assess the effects of service on tip percentages. First, they dichotomized service quality – service rated 5 out of 5 points was coded as 1 otherwise it was coded as 0 -- and used binomial logistic regression to produce a continuous predicted value for this variable. Then they used this predicted value along with other independent variables in a regression with tip percentage as the dependent variable. They found a sizeable, positive and statistically significant effect of predicted service quality on percentage tips. According to their analysis, receiving the highest rated service increased tips by 18.74 percent of the bill. On the face of it, this result is implausible because tip percentage had a mean of 14.3 with a standard deviation of 7.58. Given that most of the less than perfect service ratings were 3 or 4 out of 5 points, receiving top rated service could not really have increased tip percentages by more than two standard deviations! Given their implausibly large coefficient and the logical problems with their arguments for using 2SLS regression in the first place, Bodvarsson, et. al.'s findings must be viewed with skepticism. In order to more carefully evaluate their anomalous finding, I contacted Orn Bodvarsson and asked what variables were included in the first stage logistic regression equation used to obtain the measure of predicted service quality.

The logistic regression model used to obtain the instrumental variable (predicted service quality) included server sex, alcohol consumption (Y/N), percentage of customers who were male, customers' patronage frequency, meal (lunch or dinner vs other), weekend (Y/N), coupon use (Y/N), food rating, number of food and drink items served, dining party size, average price of items ordered, and the interaction of server and customer sex. Five of these variables -- server

sex, alcohol consumption, number of food and drink items served, coupon usage, and dining party size – were excluded from the second stage regression of tip percentage on the explanatory variables and, therefore, are the key instruments for service quality. For Bodvarsson, et. al.'s instrumental variable (predicted service quality) to be valid, these five instruments must be unrelated to the error in tip percentages and must be jointly correlated with service (Wooldridge, 2003).

The error in tip percentages cannot be observed, so there is no way to directly test the first requirement of valid instruments. However, previous research has found significant relationships between percentage or bill-adjusted tips and server sex (Davis, Schrader, Richardson, Kring & Kiefer, 1998), alcohol consumption (Conlin, Lynn & O'Donohue, 2003; Lynn, 1988), number of items served (Lynn & McCall, 2000b), coupon usage (Lynn, 1988), and dining party size (Conlin, et. al., 2003). Moreover, there are plausible reasons for believing that these relationships are causal. Server sex may directly affect tipping because most tippers are male and sexual attraction should lead males to tip waitresses more than waiters. Alcohol consumption may increase tipping because it reduces consumers' abilities to process the cues that would ordinarily inhibit exorbitant tips. The number of items served may increase tips because tips are supposed to be a reward for server effort. Coupon usage may decrease tip percentages because coupon using customers may refuse or forget to tip on the full, undiscounted bill size. Dining party size may positively affect tipping because it increases the tippers' concerns about impression management. Thus, there are good reasons to believe that Bodvarsson, et al's (2003) instruments do share error variance with tip percentages, which means that they are of questionable validity.

The second requirement of valid instruments – that they be related to the endogenous variable - can be tested. One of Bodvarsson, et al's (2003) instruments – server sex – was weakly correlated with service quality ($r = -.15$, $n = 247$, $p < .02$); the others were not (all r's between -.08 and .02, all p's > .24). More importantly, a replication of the binomial logistic regression of service quality on all the variables Bodvarsson et. al. used to obtain the instrumental variable (predicted service quality) indicated that none of the five instruments significantly predicted unique variance in service quality (see Table 1). Furthermore, a comparison of the model χ^2 when the five instruments were included and the model χ^2 when they were not ($\chi^2_{\text{difference}}(5) = 4.87$, $p > .25$) indicated that those instruments did not explain unique variance in service quality, even when considered jointly. [Note: One incorrect observation with 0 customers but 8 males in the dining party was omitted from these analyses.] This failure of Bodvarsson, et. al.'s instruments to explain unique variance in service quality, along with the likelihood that those instruments have a direct causal impact on tipping, means that those instruments are not valid. Thus, the regression coefficient that Bodvarsson, et. al. report for predicted service quality is not a good indication of how much service affects tipping.

Re-Analysis of the Data

Bodvarsson, et. al.'s (2003) data contains no variables that would be good instruments for service quality. Therefore, I assessed the effects of service on tipping in an OLS regression of percentage tips on rated service quality and the other explanatory variables in Bodvarsson, et. al.'s model. In that analysis, the binomial measure of service quality had a regression coefficient of 1.5, which was not significant (partial $r = .08$, $t(245) = 1.27$, $p > .20$). At best, this data suggest

that receiving top rated service increases tips by 1.5 percent of the bill amount. That estimate is in line with previous research (see Conlin, et. al., 2003) and is substantially less that the increase of 18.7 percent of the bill amount that Bodvarsson, et. al. claim. Moreover, it is possible that a positive effect of tips on research participants' ratings of service inflated the regression coefficient for service quality. If so, the causal impact of service on tipping is even smaller than this modest coefficient suggests. Thus, contrary to Bodvarsson, et al's claim, their data provide no basis for questioning the weak service-tipping relationship found in the existing literature.

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Table 1. Binomial logistic regressions of service quality on various explanatory variables (246 diners).

Explanatory Variable*	Model 1	Model 2
Server Gender	-1.076	---
Alcohol Consumption	.164	---
Coupon Usage	-.436	---
Number of Items Served	-.051	---
Group Size	-.103	---
Customer Gender Mix	-.003	-.003
Meal	.360	.267
Weekend	-.773**	-.718
Food Quality	2.096***	2.013
Patronage Frequency	-.207	-.179
Average Price	-.141	-.094
Server X Customer Gender	.015	-.010
Constant	-6.957***	-7.337
Nagelkerke R^2	.384	.364
Model χ^2	80.116***	75.250***

Notes: * Variables in bold were not used as explanatory variables in the analysis of tip percentage – they are the key instruments for service quality, ** $p < .05$, *** $p < .001$.