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This paper adopts the hedonic price model to study the impact of attributes on beer prices in the U.S. beer market. The price of beer is modeled as a function of beer characteristics. Our primary purpose is to investigate the attributes that lead to premium beer prices. Understanding factors that influence the price of a particular commodity like beer provides important insights into price determination and the strategic interaction among firms. We hypothesize that beer prices are influenced by both physical and reputation attributes because beer is a highly differentiated product. Results show that consumers put a premium on the country of origin label as well as other characteristics of beer.

Hedonic Prices and Country of Origin Bias in the U.S. Brewing Industry

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I understand that my thesis will become part of the permanent collection of Oregon State University library. My signature below authorizes release of my thesis to any reader upon request.

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Ruttana Ruttanajarounsub, Author

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I. Introduction

One of the central questions in industrial organization and price theory is what factors influence product price. This is a classic question, and there are a number of models designed to resolve this crucial question. The hedonic price model is the prominent approach to analyze this question via product attributes.

The U.S. Brewing industry is a large industry where total sales were $94 billion in 2006 and average annual production was 198 million barrels in the past decade (Brewers Almanac 2007).[1] Beer has a wide variety of attributes, much like wine, cheese, and distilled spirits. Similar to other specialty food products, the distinctive attributes of beer might be difficult to directly appraise and value until it is consumed. The aroma and flavor of a particular beer cannot be known until it

[1] For the data on US beer sales and production, see the Beer Institute website (http://www.beerinstitute.org).

is consumed. This situation is characterized by imperfect information and is the primary reason why the pricing of specialty food products may depend on reputation, which can be used as a quality signal.

Beer prices vary considerably from brand to brand. The natural question that arises is what factors determine the price of beer. This paper adopts the hedonic price model to study the impact of attributes on beer prices in the U.S. Our primary purpose is to investigate attributes that add a premium on beer prices. Understanding factors that influence the price of beer provides important insights into price determination and strategic interaction among firms. We hypothesize that beer prices are influenced by both physical and reputation attributes because beer is a highly differentiated specialty food product.

The paper is organized in the following manner. Section II provides a review of the literature on the hedonic price model and the theoretical foundations of the paper. Section III discusses an empirical issue of the hedonic price model. Next, section IV describes the data used in this paper and discusses the attributes employed in our model. In section V, we discuss the estimation results, and in section VI, a sensitivity analysis is performed. Section VII concludes the paper.

II. The Hedonic Price Model

The hedonic price model states that goods are valued according to their specific attributes. Hedonic price analysis decomposes explicit market prices into implicit prices of individual product characteristics.

The application of hedonic models was pioneered by Rosen (1974). In Rosen's model, product prices are a function of the hedonic prices of attributes, which are empirically estimated as the relationship between the observed prices of products and the specific amounts of individual attributes associated with them. Rosen's approach has been widely used in the literature on housing, public economics, environmental economics, labor markets, marketing, and industrial organization. Hedonic methods have been applied to problems as diverse as determining the value of clean air, estimating price indexes, and measuring the value of a product's reputation in online auctions.

Rosen's approach to estimating a hedonic demand system consists of two stages. In the first stage, the prices of goods are regressed on the goods' characteristics. The coefficients in this regression are often interpreted as implicit prices, or as the consumer's marginal willingness to pay for each characteristic. Rosen also proposed the second stage that involved regressing the marginal prices of each characteristic at the bundles actually purchased by consumers, onto the characteristics of the good and consumer demographic variables. This second stage was intended to recover a demand function for each characteristic. However, it was later discovered (Brown and Rosen (1982), Epple (1987), Bartik (1987)) that the second stage regression had a simultaneity problem because consumers with a high preference for a certain characteristic would naturally purchase bundles that contained large amounts of this characteristic. This simultaneity problem causes inconsistent estimates in the second stage.

Epple (1987) suggests that this problem can be solved if data are available on many markets in which tastes can be assumed to be the same. However, data of this kind has proven difficult to find and, as a result, Rosen's second stage is not widely used today.

Rosen's (1974) paper provides a framework to analyze our problem. Following Rosen's model, we demonstrate how beer prices are influenced by product attributes, which are valuable to consumers and are costly to producers.

Consumers purchase one unit of a differentiated good (beer) described by a vector of n attributes, $y = (y_1, y_2, ..., y_n)$. Consumers maximize utility, U, subject to a budget constraint, where utility is a function of a composite good, x, and the purchase of one unit of the differentiated good which is identified by a $1 \times n$ vector of characteristics. That is, consumers maximize $U(x, y)$ subject to a budget constraint, $m = x + p(y)$, where m is income and $p(y)$ is the price of beer. The price of the composite good, x, is normalized to one, and the market is assumed to be competitive so consumers take prices as given. The maximization problem can be formulated as follows:

$$\max_{\{y,\, x\}} \quad U(y, x) \qquad s.t. \quad m = x + p(y) \tag{1}$$

Solving the first order conditions yields:

$$\frac{\partial U / \partial y_i}{\partial U / \partial x} = \frac{\partial p}{\partial y_i}, \qquad \text{for all attributes } i = 1, ..., n \tag{2}$$

Utility is maximized when the marginal rate of substitution between a characteristic of beer, y_i, and the composite good is equal to the marginal price of y_i. Individuals will consume a component characteristic (as revealed through their purchase of y) to the point where the relative value of that characteristic, or the marginal willingness to pay, is equal to its marginal price. Specifically, for a given level of income, individuals will choose a product with a set of characteristics and price which maximize their utility.

On the supply side of the market, producers maximize their profits, π, by choosing an amount (T) of the product, which consists of component characteristics, $y_1, y_2, ..., y_n$, to produce. Total revenues are equal to $T\,p(y)$. Again, markets are assumed to be competitive and firms take prices as given. Costs of production are $c\,(T, y; \beta)$, where β is a vector of parameters describing variables in the cost-minimization problem. Hence, the profit function is $\pi = T\,p(y) - c\,(T, y; \beta)$. Firms maximize profits by choosing the optimal quantities of the attributes. The maximization problem is as follows:

$$\max_{\{y\}} \quad \pi = T\,p(y) - c\,(T, y; \beta) \tag{3}$$

Solving the first order conditions yields:

$$\frac{\partial p}{\partial y_i} = \frac{\partial C / \partial y_i}{T}, \quad \text{for all attributes } i = 1,\ldots,n \tag{4}$$

where $\partial C/\partial y_i$, is the marginal cost of producing y_i.

In (4), the profit-maximizing level of production occurs where the per unit marginal cost of producing a characteristic, y_i, is equal to the marginal price of that attribute.

From (2) and (4), the following relationship holds:

$$\frac{\partial p}{\partial y_i} = \frac{\partial U / \partial y_i}{\partial U / \partial x} = \frac{\partial C / \partial y_i}{T} \tag{5}$$

The price of the characteristic y_i represents both the relative value consumers place on the characteristic, as well as the per unit marginal cost of production of the characteristic. In other words, the price of y_i represents optimal behavior by both sides of the market. This relationship indicates that the consumption and the price of the good depend on the quantities and prices of product attributes.

III. The Empirical Issue of the Hedonic Price Model

A major empirical issue pertaining to the hedonic price model is the choice of functional form. There are several functional forms such as linear, semi-log, and log-log forms that can be applied to the hedonic price model. Despite having a long history, the theory of hedonic pricing provides very little guidance on the choice of the proper functional form (Butler, 1982).

Diewert (2001) provides an interpretation of the hedonic function based on consumer theory, ignoring the producer side of the market. Using a representative agent approach, he derives a variety of functional forms, and notes which of these are consistent with consumer theory, yet are sufficiently flexible to incorporate

new characteristics. While there is no one preferred functional form, he notes that the linear hedonic function is not consistent with homothetic preferences. The semi-log model has an advantage compared to the log-log model in that the semi-log model can deal with situations where one or more characteristics are equal to zero, whereas the log-log model cannot. Because our data contains dummy variables and in order to be consistent with the consumer theory, the log-linear functional form is preferred in our analysis.

Building upon the work of Rosen (1974) and Diewert (2001), we will assume that product price is a log-linear function of product characteristics:

$$\log (P_j) = \alpha + \beta Y_j + \lambda A_j + \varepsilon_j \qquad (6)$$

where the subscript $j = 1, \ldots, J$ identifies an individual brand and Y_j is a vector of attributes of brand j. The dependent variable, log (P_j), is the logarithm of the price of brand j. A_j refers to advertising expenditure. The matrix Y contains product characteristics. The summary list of variables is provided in table 1.

This analysis is also referred to as the first-stage hedonic price function. The derivative of this function with respect to a component price represents the second-stage hedonic price function and can be used to estimate the demand for a component. Such estimation would require data on individual consumer characteristics, which is beyond the scope of this paper.

IV. Data and Beer Attributes

The U.S. beer market is a highly concentrated market dominated by Anheuser-Busch, a world leading producer of beer. In recent years, competition from imported brands has become increasingly important. For example, the market share of imported beer has risen from 6.5% in 1996 to 13.8% in 2006.[2] While imported brands are far from homogenous, the unifying feature of imported brands is that they sell for a substantial price premium.[3] Consumers can choose from various brands of beer (domestic and imported beer) as well as a variety of types of beer and their different attributes.

Beer Attributes

Important characteristics of beer are color, alcohol content, and product quality. In this study, characteristics are delineated as follows.

Mass Produced Beer

The traditional mass producing brewers are focused on the production of the light lager style beer, called "regular domestic beer" or "lager." The mass producers make beer with a high concentration of adjuncts, yielding a paler and lighter-flavored beer.[4] For example, rice or maize can be mixed with malted barley to reduce costs. Mass production and the reduction of the quality of the ingredients reduce production costs and inevitably create a lighter taste. Hence, on average

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[2] *Beer Industry Updates 2007.*
[3] Tremblay and Tremblay (2005).
[4] Tremblay and Tremblay (2005).

we might expect the price of the mass produced beer to be cheaper or carry a negative premium relative to microbrewery beer, the benchmark category in this study. Microbrewery beer is chosen as a benchmark because its price lies between the price of domestic mass produced beer and the price of imported beer (see Table 2).

Stout Beer

Stout is a strong ale brewed with more hops and black malt than regular domestic beer. Stouts originate from Ireland, with Guinness being the most popular stout maker. There are several kinds of stout beer produced and several classifications differentiate one type from another. Irish stout is also called a dry stout in which the dryness comes from the use of roasted malted barley, pale malt, moderate to high hop bitterness, and good attenuation. For added creaminess, flaked malted barley may be used and for more complexity, a small percentage of soured beer is added. Because stout is stronger and made from more ingredients than lager, we expect that there is a positive premium associated with stout beer.

Ice Beer

Ice beer is made with a special process which creates a more concentrated beer. Ice beer has about 10-20% more alcohol than regular domestic lager. The essential method of making ice beer is to bring the beer down to a low temperature where it slowly forms ice crystals; all of these are normally processed in the conditioning tank. Later on, producers simply remove the ice crystals from

the beer. This creates a beer with a higher volume ratio of alcohol to water. Due to the special method in producing ice beer, we expect ice beer to be highly priced.

Advertising

The US brewing industry is a well established market, and the qualities of regular domestic beer are well known to U.S. consumers. Thus, in this marketing environment, one would expect that advertising will attract few new customers to the market and have little effect on market demand. In this setting, the likely effect of beer advertising is convincing consumers to switch brands. The literature on advertising pertaining to the beer market suggests that there are both persuasive and informative content of advertising. Beer advertising also can be used as a signal for quality.[5]

Imported Beer

Brewing beer is an important tradition in many countries around the world. From country to country, region to region, the many styles, colors and tastes can become very complex. The water source, the choice of barley malt and hops, and also the brewing techniques of each region give us the unique beers we find in the "Import Category." Most of the recipes date back centuries. Most imported brands are darker, more bitter in flavor, and have higher alcohol contents and calories than regular domestic beer. Thus, we expect that being an imported beer should have an impact on beer price. Nevertheless, it is not clear whether this impact

[5] See Bagwell (2005) for a complete discussion of the possible market effects of advertising.

would be positive or negative. However, countries with more experience in brewing could signal high quality and command a price premium.

Beer Data

The data used in this paper are obtained from *Import Specialty Insights* (2003) and *Beer Industry Updates* (2003), published by Beer Marketer's INSIGHTS. The data contains 23 brands of domestic and imported beer from 2000 to 2002. The sample consists of 69 observations. The beers covered in the current sample are U.S. domestic beer and imported beer from the following countries: Germany, Netherlands, England, Ireland, Canada, and Mexico. The list of brands, their key characteristics, and their country of origin are reported in Table 1.

The data set includes the price of beer, level of advertising and other key characteristics of beer. The price is measured as the average supermarket price. The supermarket data are provided by Information Resource Inc. (IRI) from its sample of large supermarkets (over $2 million in annual sales) across the U.S. All prices are inflation-adjusted by the CPI to 2000 dollars. Price trends by segment of malt beverages are reported in Table 2.

Data on advertising expenditures comes from Competitive Media Reporting Inc's Ad dollar summary report, which tracks spending in 11 different media. These data include media-related music, sports, and special events

spending by brand and brewer.[6] Advertising expenditures are adjusted by the PPI to 2000 dollars. The price index data are obtained from the Bureau of Labor Statistics, U.S. Department of Labor. Each variable employed in this study is described in Table 3.

V. Estimation Results and Discussion

Table 4 reports hedonic regression results for the U.S. beer market, using Ordinary Least Squares (OLS). Model 1 is a regression of the log price of beer on a constant, advertising, import dummy, and other dummy variables indicating characteristics of beer (namely Dice, Dstout and Dmassproduct). Again, the reference category is microbrewery beer.

The model is estimated using Ordinary Least Squares. Given the cross section nature of the data, a test for heteroscedasticity was also conducted (White, 1980). We fail to reject the null hypothesis of homoscedasticity at 5% significance level so there is no evidence of heteroscedasticity.

The regression results show a statistically insignificant relationship between the import dummy and the price of beer while other beer characteristic dummy variables are statistically significant at 1% level and have the expected signs. Advertising is statistically insignificant in this model.

This result suggests that being an imported beer does not add a positive premium on beer prices. In other words, it is not generally true that imported beer

[6] Employing advertising expenditure per case of beer may yield different result. However, due to limitation on data, this paper employs total advertising expenditure.

necessarily has a higher price than microbrewery beer. Nevertheless, imported beers from a specific group of countries may command a premium. Specifically, beers from the countries with more brewing experience (Germany, Netherlands, Ireland and England) may command a quality premium. In the sample, these are brands brewed in countries not neighboring the U.S. (non-neighboring countries). Hence, we speculate that consumers are willing to pay more for beer labeled from these specific countries.

Model 2 tests this hypothesis. It includes a new dummy variable, which equals 1 if the beer is from one of the more experienced brewing countries (Germany, Netherlands, Ireland, and England) and 0 otherwise.[7] The results from model 2 indicate a significant positive non-neighboring country of origin effect. The effects of other variables are similar to those in model 1.

In model 3, we further investigate our analysis by controlling for the characteristic differential of beer imported from different groups of countries. If consumers are genuinely biased toward the countries of origin, we should observe a positive premium for beer imported from non-neighboring countries (German, Netherlands, Ireland and England) and a negative premium for beer imported

[7] Ideally the result would become more distinct if we include the individual country dummies. However, the data limitation prevents us from doing so, and the best possible alternative is to define a non-neighboring country dummy variable.

With regards to transportation costs, brewing companies may have beer production in more than one countries to reduce transportation cost while still be able to label the bottles of their beer imported. For example, Guinness, the Irish beer is produced in Canada to reduce transportation cost yet maintain the premium of an imported beer in the U.S. beer market.

from neighboring countries (Canada and Mexico). So, the dummy variable for countries neighboring the U.S. (Dneighbor) is added in model 3. This variable takes the value 1 if the beer is from either Mexico or Canada and 0 otherwise. The results of this model strengthen the argument for the country of origin bias. It significantly shows that beer imported from non-neighboring countries has a positive impact on the price. That is, the price is higher on average by 10.68 % for beer imported from non-neighboring countries relative to U.S. microbrewery beer. In addition, it indicates that beer imported from neighboring countries constitutes a negative impact on the price. That is, the price is lower on average by 15.57% for beer imported from neighboring countries. All other dummy variables are still statistically significant with signs as expected and advertising is still insignificant.

The results from regression models 1, 2 and 3 indicate that advertising does not impact beer prices significantly. The reason underlying this result may come from the fact that advertising does not increase market demand. Rather it merely shifts the demand from one brand to another, which is consistent with the argument that the beer market is mature. In models 4, 5 and 6, we drop advertising but maintain all other variables parallel to models 1, 2 and 3. Dropping advertising does not alter our findings, so the results are robust to the exclusion of advertising.

VI. Sensitivity analysis

In addition to excluding advertising, we now perform sensitivity analysis to alternative functional forms. The log-log and linear specifications are implemented and reported in Table 5 to check whether alternative specifications yield different results.

For comparison purposes, Table 5 indicates the results from models 3 and 6. Models 3' and 6' are parallel to models 3 and 6 except that the dependent variables are price instead of log price. These linear specification results are similar to the results under log-linear specification. Models 3" and 6" report the log-log specification, with only advertising in logs, all other variables are the same as that in models 3 and 6. In this case, advertising now has a positive and significant effect. Thus, the effect of advertising appears to be sensitive to functional form. All other results are similar to previous specifications. These results confirm that the country of origin bias affects the price of beer.

VII. Conclusion

This paper examines factors that influence the price of beer in the US market. We apply hedonic price analysis to the U.S. beer market to study consumers' perceptions and valuations of various attributes of beer. Results show that consumers put a premium on the country of origin. Specifically, consumers are willing to pay a positive premium for beer from non-neighboring countries with experienced brewers (Germany, Netherlands, Ireland, and England) as compared to U.S. microbrewery beer. On the other hand, beers from neighboring countries (Canada and Mexico) carry a negative premium compared to U.S. microbrewery beer. Moreover, the results indicate that stout beer and ice beer receive a positive premium, while mass produced beer receives a negative premium. These main results are confirmed for several alternative specifications.

The implications of our results can be summarized as follows. First, beer is a highly differentiated product. Some consumers prefer ice and stout beer and are willing to pay a premium compared to U.S. microbrewery beer. Producers can use this information to match their production environment and methods to the most appropriate specialty market segment. This is important for firms in lieu of marketing strategies in which firms can adjust their brand portfolio to match consumer preferences.

Second, country of origin plays a key role in price determination. If the beer is imported from non-neighboring countries (Germany, Netherlands, Ireland, and England), it carries a positive premium relative to U.S. microbrewery beer so

producers may be able to charge a higher price in order to maximize profit. On the other hand, beer from neighboring countries (Canada and Mexico) carry a negative premium, so producers of beer from these countries should be aware of this unfavorable country of origin bias and adjust the pricing strategies accordingly or change product characteristics in order to increase competitiveness.

Third, this analysis suggests implications with respect to resource allocation. Implicit prices can be used to evaluate long term investment decisions against their costs of implementation in order to redirect resources towards attaining a profitable mix of product attributes. For future research if richer datasets can be obtained, other econometric techniques such as semi parametric or nonparametric approaches may be applied to confirm the results.

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Table 1

U.S. and Imported Beer: List of Brands

Brand	Important Characteristic	Country of Origin
Amstel Light	Imported	Netherlands
Bass Pale Ale	Imported	England
Beck's	Imported	Germany
Budweiser	Mass-produced	U.S.
Budweiser Light	Mass-produced	U.S.
Busch	Mass-produced	U.S.
Corona Extra	Imported	Mexico
Corona Light	Imported	Mexico
Guinness Draught	Imported Stout	Ireland
Heineken	Imported	Netherlands
Labatt Blue	Imported	Canada
Labatt Blue Light	Imported	Canada
Michelob	Mass-produced	U.S.
Michelob Light	Mass-produced	U.S.
Modelo Especial	Imported	Mexico
Natural Light	Mass-produced	U.S.
Pete's Wicked Ale	Microbrewery Beer	U.S.
Rolling Rock	Mass-produced	U.S.
Sam Adams	Microbrewery Beer	U.S.
Shiner Bock	Microbrewery Beer	U.S.
Smirnoff Ice	Domestic Ice Beer	U.S.
St. Pauli Girl	Imported	Germany
Tecate	Imported	Mexico

Table 2

Price Trends by Segment of Malt Beverages

	Average price per case		
Segment	2000	2001	2002
Imports	23.55	23.15	22.79
Microbrewery Beer	21.81	21.67	21.81
Mass-produced Beer	16.58	16.57	16.53

Sources: Beer Industry Update (2003) and Import Specialty Insights (2003).

Note: The price is the average supermarket price, measured in dollars per case of 24, 12-ounce containers.

Table 3

U.S. and Imported Beer Data: Definitions, Means and Standard Deviations of Variables

Variable	Definition	Mean (Std. Dev.)
Price	Average supermarket price per case of beer ($)	20.8571 (5.2715)
Dice	Dummy variable for ice beer (= 1 if ice beer; = 0 otherwise)	0.0435 (0.2054)
Dstout	Dummy variable for stout beer (= 1 if stout beer; = 0 otherwise)	0.0435 (0.2054)
Dmassproduct	Dummy variable for mass produced beer (= 1 if mass produced beer; = 0 otherwise)	0.3478 (0.4798)
Dimport	Dummy variable for imported beer including beer from German, Netherlands, Ireland, UK, Canada and Mexico (= 1 if imported beer; = 0 otherwise)	0.5217 (0.5032)
Dnonneighbor	Dummy variable for non-neighboring countries including German, Netherlands, Ireland and UK (= 1 if beer from non-neighboring countries; = 0 otherwise)	0.2609 (0.4423)
Dneighbor	Dummy variable for neighboring countries including Canada and Mexico (= 1 if beer from neighboring countries; = 0 otherwise)	0.2609 (0.4423)
Adv	Advertising Expenditure ($)	20746.19 (35474.02)

Table 4

Hedonic price regression: Log-Linear Specification

Model	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Log(P)					
Constant	3.135031*** (0.057111)	3.023145*** (0.029137)	3.135317*** (0.047377)	3.136449*** (0.057734)	3.027463*** (0.029043)	3.136449*** (0.047831)
Adv	1.03E-06 (6.62E-07)	7.17E-07 (5.81E-07)	8.23E-07 (5.51E-07)	-	-	-
Dimport	-0.048205 (0.064750)	-	-	-0.038079 (0.065132)	-	-
Dnonneighbor	-	0.215224*** (0.048659)	0.101503*** (0.050363)	-	0.221388*** (0.048598)	0.112402*** (0.050502)
Dneighbor	-	-	-0.169216*** (0.058144)	-	-	-0.163479*** (0.058581)
Dice	0.605847*** (0.106191)	0.601193*** (0.093168)	0.602764*** (0.088093)	0.590566*** (0.106902)	0.590566*** (0.093144)	0.590566*** (0.088566)
Dstout	0.302898*** (0.103309)	0.154401*** (0.075102)	0.154922*** (0.079921)	0.301355*** (0.104444)	0.150874*** (0.075444)	0.150874*** (0.070753)
Dmass	-0.482055*** (0.073954)	-0.356248*** (0.049083)	-0.473119*** (0.061371)	-0.437762*** (0.069005)	-0.328776*** (0.043908)	-0.437762*** (0.057169)
Adj-R^2	0.604282	0.695392	0.727680	0.595505	0.692919	0.722365
Sample size	69	69	69	69	69	69
F-statistic	21.76787	32.04752	31.28435	26.02767	39.36003	36.38522

Notes: *** denotes statistically significance at the 1 % level
** denotes statistically significance at the 5 % level
* denotes statistically significance at the 10 % level
Standard errors are in parentheses

Table 5

Sensitivity analysis

Model	Log-Linear		Linear		Log-Log	
	(3)	(6)	(3')	(6')	(3")	(6")
Dependent variable	Log P		P		Log P	
Constant	3.135317*** (0.047377)	3.136449*** (0.047831)	23.07204*** (0.843295)	23.08721*** (0.844944)	2.985216*** (0.070651)	3.136449*** (0.047831)
Adv	8.23E-07 (5.51E-07)	-	1.10E-05 (9.81E-06)	-	-	-
Log(Adv)	-	-	-	-	0.025138*** (0.008952)	-
Dnonneighbor	0.101503*** (0.050363)	0.112402*** (0.050502)	2.575956*** (1.074441)	2.721961*** (1.068778)	0.051882*** (0.021723)	0.112402*** (0.050502)
Dneighbor	-0.169216*** (0.058144)	-0.163479*** (0.058581)	-3.340904*** (1.034951)	-3.264059*** (1.034840)	-0.211438*** (0.058548)	-0.163479*** (0.058581)
Dice	0.602764*** (0.088093)	0.590566*** (0.088566)	11.89734*** (1.568036)	11.73394*** (1.564532)	0.541584*** (0.102324)	0.590566*** (0.088566)
Dstout	0.154922*** (0.079921)	0.150874*** (0.070753)	4.211944*** (1.600563)	4.157711*** (1.603168)	0.132847*** (0.076994)	0.150874*** (0.070753)
Dmass	-0.473119*** (0.061371)	-0.437762*** (0.057169)	-8.464987*** (1.092390)	-7.991348*** (1.009901)	-0.519119*** (0.061857)	-0.437762*** (0.057169)
Adj-R^2	0.727680	0.722365	0.769742	0.768781	0.745019	0.722365
Sample size	69	69	69	69	69	69
F-statistic	31.28435	36.38522	38.88672	46.21873	33.62744	36.38522

Notes: *** denotes statistically significance at the 1 % level
** denotes statistically significance at the 5 % level
* denotes statistically significance at the 10 % level
Standard errors are in parentheses