IS SHOPPING AT WALMART AN INFERIOR GOOD? EVIDENCE FROM 1997-2010

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We test the relative income elasticity of shopping at Walmart and Target using quarterly data from 1997-2010. We seek to isolate the effects of income changes by controlling for price level, retail space, and measures of time. In contrast to Basker (2011), we find that the income elasticity of Walmart shopping , while lower than Target's, is positive, indicating that shopping at both stores is normal rather than inferior. (JEL D12, L81)

I. INTRODUCTION

Walmart is often offered up as an example of a company that performs particularly well during recessions. The common narrative is that Walmart offers a low-price shopping experience that consumers value more during a recession than they do when their incomes are higher[1]. This would seem to be a textbook example of what we economists call an inferior good. A good or service is "inferior" in the economic sense if consumers buy more of it when their incomes fall, other things equal. Put another way, a good or service is inferior if its income elasticity of demand is less than zero.

Note that this is different than simply analyzing financial performance during recessions. It would not be enough, for example, to note that Walmart's earnings rise when incomes fall, as earnings could rise for many reasons. The ideal test would hold prices and supply factors constant so as to isolate the effect of income on demand. In this paper we construct such a test to determine the income elasticity of demand for shopping at Walmart and its close competitor, Target.

[1] For example, "Wal-Mart flourishes as Economy Turns Sour" Bustillo and Zimmerman, Wall Street Journal, November 2008 and "McDonalds, Walmart Beat Market Gloom" Andrzej Zwaniecki, IIP Digital, December 2008.

II. LITERATURE REVIEW

There are a number of studies which examine income elasticity of individual goods. Ito, Peterson, and Grant (1989) attempt to determine the income elasticity of rice in Asian countries. They compare percent changes in real GDP per capita to the percent changes in rice consumption from 1971 to 1985 in fourteen different Asian countries. They found negative income elasticity for rice in economically advanced Asian countries and positive income elasticity for rice in less advanced countries holding own price and substitute prices constant. They suggest that rice becomes an inferior good as the living standards of Asian countries rise.

Garrett and Coughlin (2009) examine income elasticity for lottery tickets using county-level panel data for three states in order to determine the relationship between income elasticity and tax-burden. They found that regressively of lottery sales varied both over time and relative to income levels in different states.

Studies which examine income elasticity for aggregated goods are less common. Freedman (2003) looks at changes in health care expenditures over time and compares them to changes in disposable personal income to determine income elasticity for health care. Using state level data to determine the relationship between disposable personal income and health care expenditures, they find that health care has positive income elasticity, implying that health care is a normal good.

Lu, Thompson, and Tu (2010) analyzed the differences in income elasticities of computers and packaged software with respect to governments, businesses, and individual consumers. They

found that computers and packaged software were inferior goods to government agencies, necessary goods for firms, and luxury goods to households.

Our study has much in common with Basker (2011), who also sought to compare income elasticity for Walmart and Target. Using data from 1997-2006, Basker used the natural log of the real aggregate wage income as reported by QCEW and the natural log of real quarterly revenues per store for Target and Walmart as the measure of changes in consumption.

We perform a similar test to estimate the income elasticities for shopping at Walmart and Target with several differences. First, we have identified the need to control for changes in the relative sizes of each the stores. Without this control, expansions of retail space due to building larger stores during a recession could be mistaken for income inferiority. For example, Walmart and Target have both introduced superstore versions of their previous retail outlets. If a regular store is converted to a supercenter, the number of stores does not change but retail space increases. Second, we exclude revenues from store credit cards from Target's quarterly revenue data, as they are not part of purchases, but rather are the proceeds from interest charges and fees. Finally, we extend the timeframe of the study to include the most recent recession.

III. DATA AND METHODOLOGY

We use quarterly sales revenue data from the first quarter of 1997 through the first quarter of 2010, giving us 53 quarters of data for both companies. Since Walmart and Target sell a variety of goods, quantity demanded cannot be defined in the typical way as the number of units purchased. Instead, we use real quarterly revenues, measured in 2010 dollars. Since sales could

increase (decrease) due to an increase (decrease) in either the number or size of stores, we use the percentage change in revenue per square foot. This way, we are measuring the effect of changes in consumer demand rather than changes in the scale of the company. All information about Walmart at Target's revenues and square footage[2] was taken from their quarterly and annual filings with the Securities and Exchange Commission.

We use two different measures of income: the percentage change in quarterly real GDP per capita; and disposable income per capita, both from the Bureau of Economic Analysis. We also include a regression using QCEW to recreate Basker's work[3]. To obtain the ceteris paribus effect of income, we also include several controls. The inclusion quarterly indicators to account for retail sales patterns is straightforward. Controlling for price, however, is not, as both Walmart and Target sell a wide variety of goods and services with presumably autonomous price changes. Since we are looking at goods and services in aggregate, we use the Consumer Price Index (Bureau of Labor Statistics) to adjust all dollar figures for inflation. We also include a time trend control. Table 1 provides summary statistics for each of these variables.

[2] Prior to 2004, Walmart did not report their square footage on a quarterly basis but only on an annual basis. They did however; report their stores by store type quarterly. To obtain square footage estimates an average square footage by store type for each year was applied to the number of stores in each quarter missing square footage data. For example, in January 2003, Walmart had 1,258 Supercenters with an average of 186,495.23 square feet. This average was multiplied by the number of Supercenters in the three preceding quarters to obtain the number of total square feet in Supercenters for that quarter. The same was done with regular Discount Centers and Walmart's, more recent, Neighborhood Markets to obtain a total count on Walmart's square feet per quarter prior to 2004 when actual data was available by quarter. When applying this methodology to quarters with actual square foot data, we find that the difference between the simulated square foot information and actual square foot information does not exceed 2%. Target reports actual information quarterly.

[3] The authors would like to thank Basker for providing her original data and do-file.

TABLE 1

Summary Statistics

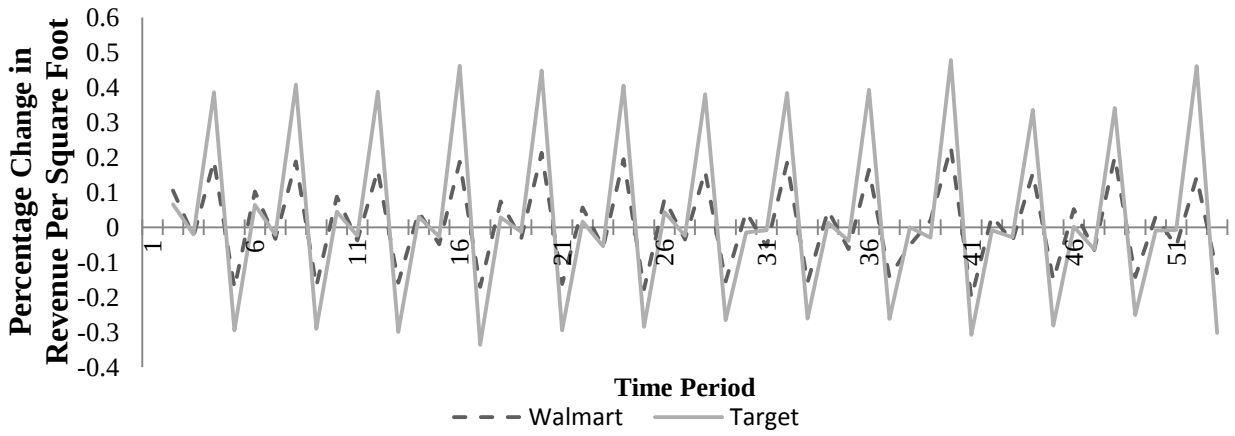
Variable	Description	Mean	Std. Dev.	Min	Max
Consumer Price Index	Bureau of Economic Analysis Consumer Price Index. Quarterly price index for all consumer goods.	187.6	18.8	159.9	218.47
Walmart: Revenue Per Store	Quarterly Revenue per Store in Millions	14.19	3.11	7.88	19.58
Walmart: Revenue Per Square Foot	Quarterly Revenue per Square Foot	101.34	11.48	73.48	121.27
Target: Revenue Per Store	Quarterly Revenue per Store in Millions	8.46	1.76	5.66	12.95
Target: Revenue Per Square Foot	Quarterly Revenue per Square Foot	69	12.01	52.29	100.33
Quarterly Census of Employment and Wages	Bureau of Labor Statistics quarterly count of employment and wages reported by employers in billions.	1252.5	197.45	888.91	1605.85
GDP	Bureau of Economic Analysis quarterly Gross Domestic Product Per Capita	39429	5749.13	29947	47666
Disposable Income	Bureau of Economic Analysis quarterly Disposable Income Per Capita	29330.2	4493.04	21932	36022

n=53

Figure 1 shows our dependent variable over time. Not surprisingly, both Walmart and Target show significant seasonality in revenue changes. We also see much more variation in percentage change in revenue per square foot for Target.

FIGURE 1

Percentage Change in Revenue per Square Foot, 1999-2010



The equations to be estimated take the following form:

(1) $$\ln(revenue)_t = \beta_0 + \beta_1 \ln(income)_t + \beta_2 \ln(income)_t \cdot Walmart_t + \beta_3 Walmart_t + \beta_4 time_t + \beta_5 time_t \cdot Walmart_t + \beta_6 Q2_t + \beta_7 Q3_t + \beta_8 Q4_t + u_t$$

where t denotes quarters, *Walmart* is a dummy variable, ln(*income)* is the natural log of the income measure, ln(*income*)•*Walmart* is the interaction between income and Walmart, *time* is a simple time trend, (*time*)•*Walmart* is the interaction between time and Walmart, *Q2*, *Q3*, and *Q4*

are quarter indicators, and u is the error term. The parameters of interest are β_1 and β_2 which, combined, are our estimate of the demand elasticity for the retailer over our sample period.

IV. RESULTS

The results of our estimations using the 1997-2006 data are shown in Table 2 displays the results of ordinary least squares regression of equation (1). The five specifications include different combinations of revenue and income. Specifications (1) – (3) use Basker's definition of Revenue (log of real revenue per store) as the dependent variable; (4) and (5) use the log of real revenue per square foot. Specification (1) uses the aggregate quarterly wage as the income measure, while (2) and (4) use disposable income per capita, and (3) and (5) use GDP per capita.

Walmart's income elasticity of demand during this period is consistently lower than or equal to Target's, but it is not consistently negative. Walmart income elasticity is statistically lower than Target in the models using GDP per capita [Specifications (3) and (5)] and the aggregate quarterly wages (in dollars) data from QCEW [Specification (1)]. It is not significantly different from Target in the two specifications using disposable income per capita [Specifications (2) and (4)], and Walmart is a normal good in both of these regressions.

The finding that Walmart is an inferior good during this time period is not robust to changes in the measure of income. There does not appear to be substantial change from correctly omitting credit card revenue, nor from using revenue per square foot instead of revenue per store. Target is consistently found to be a normal good, though the magnitude is rather variable, ranging from .892 to 2.067.

Table 3 shows the same five models found in Table 2, but includes the data from Q1 1997 to Q1 2010. With the inclusion of this extra data, Walmart is a normal good in all specifications (between 0.337 and 1.855), and is statistically significant. Target remains a normal good, with estimated elasticities between 1.328 and 2.241. Walmart is generally less elastic than Target, though the difference is only statistically significant in models (1) and (5).

Specification (4) is our preferred model. This is not based on any particular statistical test, but simply because we think that disposable income per capita is the most appropriate income measure, and that revenues per square foot is the most appropriate dependent variable. This model suggests that Walmart is a normal good over the 1997-2010 period with an elasticity of 1.855. Admittedly, this is the highest of our estimates, but nonetheless we feel it is the most defensible specification. This same model also finds that Walmart was considered by consumers to be a normal good, during the 1997-2006 period, with income elasticity equal to 0.919.

TABLE 2

Regression results using only the data from 1997 Q1 to 2006 Q4

	y = rev/store x = QCEW	y = rev/store x = DI/Capita	y = rev/store x = GDP/Capita	y = rev/sq.ft. x = DI/Capita	y = rev/sq.ft. x = GDP/Capita
ln (*income*)	0.892***	1.206*	1.656**	1.496**	2.067***
	(0.237)	(0.636)	(.701)	(0.601)	(.7047)
ln (*income*)**Walmart*	-1.208***	-0.110	-3.001***	-0.577	-3.12***
	(0.210)	(1.029)	(1.128)	(0.982)	(1.97)
Walmart	34.054***	1.503	32.265***	6.317	33.527***
	(5.871)	(10.615)	(11.99)	(10.138)	(11.661)
time	0.002*	0.001	-0.001	-0.007**	-0.008***
	(0.001)	(0.003)	(0.003)	(0.003)	(.003)
*time*Walmart*	0.011***	0.006	0.017***	0.004	0.013***
	(0.001)	(0.005)	(0.004)	(.004)	(.004)
Q2	0.055***	0.050***	0.048***	0.049***	.048***
	(0.015)	(0.012)	(0.013)	(0.012)	(.013)
Q3	0.025*	0.013	0.014	0.011	0.011
	(0.015)	(0.011)	(0.012)	(0.010)	(.011)
Q4	0.249***	0.262***	0.266***	0.265***	0.267***
	(0.022)	(0.019)	(0.019)	(0.019)	(.018)
Constant	-22.795***	-10.363	-15.736**	-11.121*	-17.647**
	(6.5602)	(6.560)	(7.449)	(6.200)	(7.487)
Walmart income elasticity	-0.316	1.096	-1.345	0.919	-1.053
N	80	80	80	80	80
R^2	0.9806	0.9713	0.9729	0.9571	.9601

Notes: Coefficient estimates from regression of the percentage change in revenue on the independent variables listed in the first column. Robust standard errors in parentheses.

*, *, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively

TABLE 3

Regression results using the data from 1997 Q1 to 2010 Q1.

	y = rev/store x = QCEW	y = rev/store x = DI/Capita	y = rev/store x = GDP/Capita	y = rev/sq.ft. x = DI/Capita	y = rev/sq.ft. x = GDP/Capita
ln (*income*)	1.328*** (0.189)	1.474** (0.626)	2.167*** (0.399)	2.241*** (0.488)	1.942*** (0.399)
ln (*income*)**Walmart*	-0.991*** (0.210)	-0.381 (1.023)	-.590 (0.599)	-0.386 (.699)	-1.195** (0.570)
Walmart	28.01*** (5.852)	4.289 (10.552)	6.647 (6.381)	4.357 (7.214)	13.086** (6.07)
time	-0.000*** (0.000)	-0.002 (0.003)	-0.004*** (0.001)	-0.010*** (0.002)	-0.008*** (0.001)
*time*Walmart*	0.009*** (0.001)	0.008* (0.004)	0.007*** (0.002)	0.002 (0.006)	0.005** (.002)
Q2	0.072*** (0.016)	0.049*** (0.012)	0.047*** (0.014)	0.043*** (0.011)	0.045*** (0.012)
Q3	0.050*** (0.016)	0.013 (0.011)	0.012 (0.012)	0.008 (0.009)	0.010 (0.010)
Q4	0.217*** (.022)	0.262*** (0.020)	0.251*** (0.019)	0.254*** (0.017)	0.257*** (0.017)
Constant	-34.936** (5.281)	-13.12** (6.460)	-20.933*** (4.248)	-18.793*** (5.034)	-16.311*** (4.129)
Walmart income elasticity	0.337	1.093	1.577	1.855	0.747
N	106	106	106	106	106
R^2	0.9663	0.9715	0.9640	0.9555	0.9532

Notes: Coefficient estimates from regression of the percentage change in revenue on the independent variables listed in the first column. Robust standard errors in parentheses.
*, *, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively

V. CONCLUSIONS

The idea that Walmart is "recession-proof," as touted in mainstream media during the recent recession, does not hold in our findings as Walmart has a positive income elasticity of demand. Our findings did, however, convince us that Walmart is recession proof in relative terms. Target's revenues are more sensitive to changes in income levels than Walmart's as demonstrated by the income elasiticities found here. In fact, our findings indicated shopping at Target is a luxury while shopping at Walmart is closer to a necessity. This was not overly surprising given the image and branding both Walmart and Target strive to uphold; however, it was very interesting to prove these strategies appear to be effective. Walmart's strategy is very beneficial in recessionary times as they experience relatively less negative effect on revenues. The downside of this is that Walmart's revenues will not benefit as much from economic booms. Target's revenues, on the other hand, will suffer relatively more during recessionary times but will also profit from economic expansions relatively more than their relatively "inferior" competition.

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