ONLINE APPENDIX

ADVERTISING AS INSURANCE OR COMMITMENT? EVIDENCE FROM THE BP OIL SPILL*

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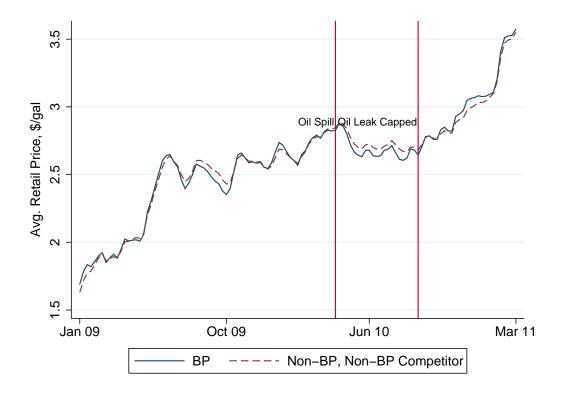justine_hastings@brown.edu

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Section 1: Additional Results from Main Analysis

Figure A1: AVERAGE WEEKLY PRICE (LEVEL) FOR BP AND CONTROL STATIONS
JANUARY 2009 TO MARCH 2011

Notes: Source: OPIS. The figure displays average weekly prices for BP and non-BP competitor stations in our sample of 7,503 stores. See text and appendix for details on our sample construction.

TABLE A0: FIRST STAGE RESULTS FOR TABLE 5, BP AD SPENDING 2SLS RESULTS

	Price Difference		*Sales Difference*	
VARIABLES	BP Adspend Demeaned	BP*(BP Adspend Demeaned)	BP Adspend Demeaned	BP*(BP Adspend Demeaned)
BP	1.310***	0.824***	1.324***	0.849***
	(0.110)	(0.045)	(0.114)	(0.048)
Green Index	-0.263***	0.000	-0.272***	0.000
	(0.024)	(0.010)	(0.025)	(0.011)
BP*(Green Index)	0.118	-0.145***	0.160*	-0.112***
	(0.083)	(0.034)	(0.086)	(0.036)
Income, Demeaned	0.003	-0.000	0.002	0.000
	(0.030)	(0.012)	(0.003)	(0.001)
BP*(Income, Demeaned)	0.189**	0.192***	0.018**	0.020***
	(0.077)	(0.032)	(0.008)	(0.003)
Spot TV Ad Price, Demeaned	0.012***	-0.000	0.012***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
BP*(Spot TV Ad Price, Dm.)	0.003***	0.014***	0.002***	0.014***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.486***	-0.000	-0.475***	-0.000
	(0.045)	(0.018)	(0.047)	(0.020)
# Observations	5,002	5,002	4,582	4,582
Shea's Partial R-squared	0.687	0.817	0.690	0.817
Angrist-Pischke F-Stat	6348	11579	5831	10443
AP F-stat p-value	0.000	0.000	0.000	0. 000

Notes: Source: OPIS, Sierra Club, R.L. Polk, the U.S. Green Building Council, and U.S. Census. The sample is restricted to stations with available data on Green Index, household income, and BP advertising expenditures. Columns (1) and (2) report the first stage estimation results for the 'price effects' regression; Columns (3)-(4) do so for the 'sales effect' regressions of Table 5. The specification controls for Green Index, demeaned median household income, and instruments for demeaned cumulative BP advertising expenditures during the 'Beyond Petroleum' campaign years for the BP Corporation, BP fuels, and environmental issues. Expenditures are in $millions, with mean $1.5 and std. $3.4 mil. The instruments are the metropolitan-area average TV spot advertising price (across industries) over period 2007-2008, and the spot price interacted with a BP dummy. The Green Index is sum of z scores for four variables: the hybrid share of vehicle registrations at the zip-code level in 2007, Sierra Club membership, the number of LEED-registered buildings per capita and contributions to Green Party committees. Zip-code income is in 2000 U.S. $thousands. Significance at 1%***, 5%** and 10%*.

TABLE A1: BP STATION MARKET SHARE IMPACTS BY AD SPENDING

VARIABLES	Above Median Ad Spend BP Station Share	Below Median Ad Spend BP Station Share
Jan '09	-0.001	0.003
	(0.002)	(0.002)
Feb '09	-0.001	0.003
	(0.002)	(0.002)
Mar '09	-0.001	0.003
	(0.002)	(0.002)
Apr '09	-0.001	0.002
	(0.002)	(0.002)
May '09	-0.001	0.004*
	(0.002)	(0.002)
June '09	-0.003*	0.002
	(0.002)	(0.002)
July '09	-0.002	0.003
	(0.002)	(0.002)
Aug '09	-0.001	0.001
	(0.001)	(0.002)
Sep '09	-0.001	0.001
	(0.001)	(0.002)
Oct '09	-0.000	0.002
	(0.001)	(0.002)
Nov '09	-0.000	0.002
	(0.001)	(0.001)
Dec '09	0.001	0.001
	(0.001)	(0.001)
Jan '10	0.001	0.000
	(0.001)	(0.001)
Feb '10	0.000	-0.000
	(0.001)	(0.001)
Mar '10	0.001	-0.000
	(0.001)	(0.001)
May'10	-0.000	-0.000
	(0.001)	(0.001)
Jun'10	-0.000	-0.000
	(0.001)	(0.001)
Jul'10	0.000	-0.000
	(0.001)	(0.001)

Aug'10	-0.000	-0.002
	(0.001)	(0.002)
Sep'10	-0.002	-0.003
	(0.001)	(0.002)
Oct'10	-0.001	-0.005**
	(0.001)	(0.002)
Nov'10	-0.001	-0.006**
	(0.001)	(0.002)
Dec'10	-0.002	-0.005**
	(0.001)	(0.002)
Jan'11	-0.002	-0.005**
	(0.001)	(0.002)
Feb'11	-0.002	-0.004*
	(0.001)	(0.002)
Mar'11	-0.003**	-0.005*
	(0.001)	(0.002)
Observations	15,687	6,912
Adj. R-squared	0.964	0.960
Fixed effects	Zip	Zip
S.E. cluster	Zip	Zip

Notes: Sources: OPIS and Kantar Ad$pender. Dependent variable is the share of stations in a zip-month selling BP-branded gasoline. The regressions are estimated separately for zip codes in metro areas with above and below median BP ad spending during the Beyond Petroleum campaign years of 2000-2008. We include zip code fixed effects in the specification. Standard errors are clustered by zip. Significance at 1%**, 5%*.

Section 2: Specification Checks

TABLE A2: UNFILTERED DATA BASIC OIL SPILL IMPACTS

VARIABLES	(1) Average Net Price	(2) Ln(Ave. Fleet Sales)	(3) Weekly Net Price	(4) Ln(Weekly Fleet Sales)
During	0.059**	0.029**	0.059**	0.047**
	(0.000)	(0.001)	(0.000)	(0.001)
Post	-0.049**	-0.019**	-0.049**	-0.012**
	(0.000)	(0.002)	(0.000)	(0.001)
BP*during	-0.025**	-0.036**	-0.024**	-0.043**
	(0.001)	(0.004)	(0.001)	(0.003)
BP*post	0.017**	-0.017**	0.017**	-0.021**
	(0.001)	(0.004)	(0.000)	(0.004)
Observations	228,455	208,659	7,707,300	7,215,198
Adjusted R-squared	0.947	0.965	0.773	0.853
Fixed Effects	Station	Station	station	Station
S.E. cluster	Station	Station	station	Station
Weight	price observation	quantity observation	price observation	quantity observation
# stations	81,402	72,875	81,402	72,875

Notes: Source: OPIS. The sample covers the period from January 2009 to March 2011. Columns (1) and (2) report estimates from specifications in which the dependent variable is set to the individual station's average net price and average log-quantity computed over the "pre-," "during-," and "post-" spill periods. Columns (3) and (4) report estimates when the dependent variable is set to the individual station's weekly net price and log-quantity. Each specification regresses the dependent variable on an indicator variable for the during-spill period, a dummy for post-spill period, and their interactions with a dummy for BP gas station. All models control for station fixed effects. Standard errors are clustered by station. Significance at 1%**, 5%*.

TABLE A3:UNFILTERED DATA OIL SPIL IMPACTS BY MONTH

Variable	Weekly Net Price	Weekly Fleet Sales
	(1)	(2)
BP*late_Apr'10	0.000	-0.003
	(0.001)	(0.004)
BP*May'10	-0.027**	-0.032**
	-0.001	(0.003)
BP*Jun'10	-0.030**	-0.064**
	(0.001)	(0.004)
BP*Jul'10	-0.028**	-0.054**
	(0.001)	(0.004)
BP*Aug'10	-0.039**	-0.062**
	(0.001)	(0.004)
BP*Sep'10	-0.007**	-0.019**
	(0.001)	(0.004)
BP*Oct'10	0.001*	-0.028**
	(0.001)	(0.004)
BP*Nov'10	0.014**	-0.046**
	(0.001)	(0.004)
BP*Dec'10	0.031**	-0.029**
	(0.001)	(0.004)
BP*Jan'11	0.031**	-0.020**
	(0.001)	(0.004)
BP*Feb'11	0.017**	0.024**
	(0.001)	(0.004)
BP*Mar'11	0.018**	-0.021**
	(0.001)	(0.004)
Observations	7,707,300	7,215,198
Adjusted R-squared	0.859	0.858
Fixed Effects	Station	Station
S.E. cluster	Station	Station
Weight	price observation	quantity observation
# stations	81,402	72,875

Notes: Source: OPIS. The sample for price and quantity data covers the period from January 2009 to March 2011. The dependent variables in Columns (1) and (2) are weekly net price and log-quantity respectively. Each of these dependent variables is regressed on post-spill month dummies and their interactions with a dummy for BP gas station. All models control for station effects. Standard errors are clustered by station. Significance at 1%**, 5%*.

TABLE A4: UNFILTERED DATA BASIC OIL SPILL IMPACTS AND RVP REGULATION

VARIABLE	Average Net Price	Ln(Ave. Fleet Sales)	Weekly Net Price	Ln(Weekly Fleet Sales)
	(1)	(2)	(3)	(4)
during	0.075**	0.033**	0.075**	0.051**
	(0.001)	(0.003)	(0.001)	(0.002)
Post	-0.065**	-0.027**	-0.065**	-0.020**
	(0.001)	(0.004)	(0.000)	(0.003)
BP*during	-0.065**	-0.060**	-0.064**	-0.065**
	(0.001)	(0.009)	(0.001)	(0.007)
BP*post	0.018**	-0.043**	0.019**	-0.045**
	(0.001)	(0.01)	(0.001)	(0.008)
Observations	56,296	50,510	1,984,578	1,743,183
Adjusted R-squared	0.899	0.962	0.645	0.850
Fixed Effects	Station	Station	Station	Station
S.E. cluster	Station	Station	Station	Station
Weight	price observation	quantity observation	price observation	quantity observation
# stations	21,149	18,679	21,699	19,159

Notes: Source: OPIS. The sample for price and quantity data covers the period from January 2009 to March 2011. Sample restricted to states meeting the standard summertime Reid Vapor Pressure (RVP) 9.0 psi limit. The coefficients reported are from regressions of BP retail price and log-quantity on the during-spill dummy, the dummy for post-spill period, and the interactions of these indicator variables with a dummy for the BP gas station. Columns (1) and (2) report estimates from specifications in which the dependent variable is set to the individual station's average net price and average log-quantity computed over the "pre-," "during-," and "post-" spill periods. Columns (3) and (4) report estimates from specifications in which the dependent variable is set to the individual station's weekly net price and log-quantity. All models control for station effects. Standard errors are clustered by station. Significance at 1%**, 5%*.

Notes on Table A5: Determinants of Advertising Spot Prices

To help provide context for our instrumental variable strategy in Section 4.2, we examine the determinants of industry-wide TV advertising spot prices. Specifically, we focus on the quantity-weighted average spot television price from 2007-2008 across metropolitan areas.[39] We compute these spot prices from Kantar Media Ad$pender data as described in Section 3.2. Table A5 provides the results from our cross-sectional analysis of (logged) spot prices.

Column 1 focuses on the impact of (logged) population density on spot prices. Our estimates suggest that a one percent increase in metropolitan population density increases spot prices by 0.61 percent. Columns 2 through 4 present results after adding additional measures of metropolitan area characteristics. Notably, this analysis does not detect any evidence that spot prices depend on BP's market share, the gasoline market HHI or the density of gas stations.[40] We do find that metropolitan area average household income has a positive association with spot prices: a one percent increase in average household increases spot prices by 0.73 percent. Notice that the estimated impact of population density remains positive in each specification, although this elasticity attenuates as additional controls are added into the regression.

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[39] We match the Kantar data, which are at the Designated Market Area (DMA) level, to zip codes using the county-DMA correspondence provided by Gentzkow and Shapiro (2008), in conjunction with a county-zip correspondence from the U.S. Department of Housing and Urban Development

[40] Column 3 does report a precisely estimated elasticity of spot prices with respect to station density; however, this result is not robust to addition of mean household income to the specification in column 4.

TABLE A5: DETERMINANTS OF ADVERTISING SPOT PRICES

	Dependent Variable: Log of MSA TV Spot Price			
	(1)	(2)	(3)	(4)
Log of Population per sq. mile	0.611***	0.603***	0.654***	0.528***
	(0.0814)	(0.0829)	(0.0904)	(0.106)
Log of BP Share of All Stations		-0.488	-0.192	-0.113
		(0.449)	(0.466)	(0.432)
Log of Gas Market HHI		0.725	0.305	0.126
		(0.688)	(0.660)	(0.660)
Log of Stations per sq. mile			-3.355**	-2.162
			(1.418)	(1.499)
Log of Mean Household Income				0.736***
				(0.246)
Constant	1.978***	1.996***	1.797***	-5.799**
	(0.520)	(0.520)	(0.548)	(2.465)
Observations	91	91	91	91
R-squared	0.505	0.516	0.536	0.573
Avg. Spot Price	273.9			
Spot Price S.D.	270.1			

Notes: All variables are measured at the MSA level. The table reports OLS estimates on the relationship between MSA TV spot prices and various MSA characteristics. Spot prices are computed using Kantar Ad$pender data. We use OPIS data to compute (1) the BP share of all stations, (2) gasoline market Herfindahl-Hirschman Index (HHI) and (3) stations (non-BP) per square mile. We use Census data for population and income measures. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Notes on Tables A6-A7: Advertising Results Robustness to Additional Controls

Table A6 provides the results of repeating the specification of Table 5 with added controls for BP stations' market share, defined as the share of stations in a DMA in our sample selling BP-branded gasoline in the pre-spill period. The market share has a mean (median) of 9.1% (7.8%), and a standard deviation of 9.2 percentage points. Similarly, Table A7 provides the results of repeating the specification of Table 5 with added controls for the density of competing gasoline stations, defined as the number of non-BP gas stations in our sample divided by the number of square miles in a given zip code. This measure of density has a mean (median) of 0.79 (0.45) non-BP stations per square mile and a standard deviation of 1.01.

The results indicate that there is no change in the estimated price difference coefficient on the interaction of DMA-level BP ad spending and being a BP station after including market share or station density controls. The coefficient for advertising impact on sales remains imprecisely estimated in both specifications. The results from Table A6 further suggest that the oil spill affected BP prices significantly more in areas with lower pre-spill BP market share. The predicted oil spill impact on BP prices in markets with a one-standard deviation higher pre-spill BP advertising is approximately equal to the predicted oil spill impact in markets with a 2.4 percentage point higher pre-spill BP station share. (Note that a standard deviation of advertising expenditures is $3.4 million.) The results in Table A7 show that there is no detectable impact of (non-BP) station density on the oil spill impact on BP prices or quantities.

TABLE A6: ROBUSTNESS TO CONTROLS FOR BP MARKET SHARE

	(1)	(2)	(3)	(4)	(5)	(6)
	First Stage		*Second Stage*	*First Stage*		*Second Stage*
VARIABLES	BP Adspend Demeaned	BP*(BP Adspend Demeaned)	Price Diff.	BP Adspend Demeaned	BP*(BP Adspend Demeaned)	Sales Diff.
BP	-0.288*	0.911***	-0.026***	-0.229	0.968***	-0.026
	(0.167)	(0.074)	(0.005)	(0.177)	(0.079)	(0.020)
Green Index	-0.198***	0.000	0.005***	-0.205***	0.000	-0.002
	(0.022)	(0.010)	(0.001)	(0.024)	(0.011)	(0.003)
BP*(Green Index)	0.055	-0.143***	-0.006***	0.098	-0.107***	0.010
	(0.077)	(0.034)	(0.002)	(0.081)	(0.036)	(0.009)
Income, Demeaned	0.005*	-0.000	-0.000	0.006**	0.000	0.000
	(0.003)	(0.001)	(0.000)	(0.003)	(0.001)	(0.000)
BP*(Income, Demeaned)	0.014**	0.019***	0.001***	0.014*	0.020***	-0.002**
	(0.007)	(0.003)	(0.000)	(0.007)	(0.003)	(0.001)
BP market share, Demeaned	24.044***	0.000	-0.354***	24.063***	-0.000	-0.266**
	(0.874)	(0.386)	(0.027)	(0.916)	(0.410)	(0.114)
BP*(BP market share, Dm.)	-25.039***	-0.995	0.419***	-25.505***	-1.442*	0.462**
	(1.604)	(0.708)	(0.044)	(1.689)	(0.757)	(0.190)
Spot TV Ad Price, Demeaned	0.010***	-0.000		0.010***	-0.000	
	(0.000)	(0.000)		(0.000)	(0.000)	
BP*(Spot TV Ad Price, Dm.)	0.004***	0.014***		0.003***	0.014***	
	(0.000)	(0.000)		(0.000)	(0.000)	
Ad spending, Demeaned			0.000			0.001
			(0.000)			(0.002)
BP*(Ad spending, Demeaned)			0.003***			-0.001
			(0.001)			(0.003)
Constant	1.200***	0.000	0.045***	1.198***	-0.000	-0.004
	(0.074)	(0.033)	(0.002)	(0.078)	(0.035)	(0.009)
Observations	5,002	5,002	5,002	4,582	4,582	4,582
R-squared	0.728	0.817	0.122	0.730	0.817	0.005

Notes: Source: OPIS, Sierra Club, R.L. Polk, the U.S. Green Building Council, and U.S. Census. The sample is restricted to stations with available data on Green Index, household income, and BP advertising expenditures. The estimates mirror those of Table 5, with added controls for BP's pre-spill market share, defined as fraction of stations in the DMA in our sample selling BP-branded gasoline (mean 0.091). Columns (1) and (2) report the first stage results for the 'price effects' regression; Columns (4)-(5) do so for the 'sales effect' regressions, and Columns (3) and (6) report the resulting IV regression results. The specification controls for green index, demeaned median household income, BP market share, and instruments for demeaned cumulative BP advertising expenditures during the 'Beyond Petroleum' campaign years for the BP Corporation, BP fuels, and environmental issues. Expenditures are in $millions, with mean $1.5 and std. $3.4 mil. The instruments are the metropolitan-area average TV spot advertising price (across industries) over period 2007-2008, and the spot price interacted with a BP dummy. The Green Index is sum of z scores for four variables: the hybrid share of vehicle registrations at the zip-code level in 2007, Sierra Club membership, the number of LEED-registered buildings per capita and contributions to Green Party committees. Zip-code income is in 2000 U.S. $thousands. Significance at 1%***, 5%** and 10%*.

TABLE A7: ROBUSTNESS TO CONTROLS FOR STATION DENSITY

VARIABLES	(1) BP Adspend Demeaned	(2) BP*(BP Adspend Demeaned)	(3) Second Stage Price Diff.	(4) BP Adspend Demeaned	(5) BP*(BP Adspend Demeaned)	(6) Second Stage Sales diff.
	First Stage	First Stage		First Stage	First Stage	
BP	1.157***	0.677***	-0.044***	1.180***	0.698***	-0.029**
	(0.112)	(0.045)	(0.003)	(0.117)	(0.048)	(0.012)
Green Index	-0.258***	0.000	0.005***	-0.272***	0.000	-0.002
	(0.025)	(0.010)	(0.001)	(0.026)	(0.011)	(0.003)
BP*(Green Index)	0.163**	-0.094***	-0.007***	0.212**	-0.060*	0.011
	(0.083)	(0.034)	(0.002)	(0.087)	(0.036)	(0.009)
Income, Demeaned	-0.000	-0.000	0.000	0.002	0.000	0.000
	(0.003)	(0.001)	(0.000)	(0.003)	(0.001)	(0.000)
BP*(Income, Demeaned)	0.007	0.007**	0.000**	0.006	0.008**	-0.002**
	(0.008)	(0.003)	(0.000)	(0.008)	(0.003)	(0.001)
Station Density, Demeaned	-0.042	0.000	-0.001	-0.001	0.000	-0.000
	(0.046)	(0.018)	(0.001)	(0.048)	(0.020)	(0.005)
BP*Station Density, Demeaned	-0.690***	-0.732***	0.001	-0.708***	-0.709***	-0.013
	(0.133)	(0.054)	(0.003)	(0.138)	(0.057)	(0.013)
Spot TV Ad Price, Demeaned	0.012***	-0.000		0.012***	0.000	
	(0.000)	(0.000)		(0.000)	(0.000)	
BP*(Spot TV Ad Price, Dm.)	0.003***	0.015***		0.003***	0.015***	
	(0.000)	(0.000)		(0.000)	(0.000)	
Ad spending, Demeaned			-0.001***			-0.000
			(0.000)			(0.001)
BP*(Ad spending, Demeaned)			0.004***			0.000
			(0.001)			(0.002)
Constant	-0.480***	-0.000	0.069***	-0.482***	-0.000	0.014***
	(0.045)	(0.018)	(0.001)	(0.048)	(0.020)	(0.005)
Observations	5,002	5,002	5,002	4,582	4,582	4,582
R-squared	0.689	0.824	0.075	0.692	0.824	0.003

Notes: Source: OPIS, Sierra Club, R.L. Polk, the U.S. Green Building Council, and U.S. Census. The sample is restricted to stations with available data on Green Index, household income, and BP advertising expenditures. The estimates mirror those of Table 5 with added controls for the density of non-BP gas stations per square mile at the zip code level (mean 0.79). Columns (1) and (2) report the first stage results for the 'price effects' regression; Columns (4)-(5) do so for the 'sales effect' regressions, and Columns (3) and (6) report the resulting IV regression results. The specification controls for green index, demeaned median household income, BP market share, and instruments for demeaned cumulative BP advertising expenditures during the 'Beyond Petroleum' campaign years for the BP Corporation, BP fuels, and environmental issues. Expenditures are in $millions, with mean $1.5 and std. $3.4 mil. The instruments are the metropolitan-area average TV spot advertising price (across industries) over period 2007-2008, and the spot price interacted with a BP dummy. The Green Index is sum of z scores for four variables: the hybrid share of vehicle registrations at the zip-code level in 2007, Sierra Club membership, the number of LEED-registered buildings per capita and contributions to Green Party committees. Zip-code income is in 2000 U.S. $thousands. Significance at 1%***, 5%** and 10%*

Notes on Tables A8-A9: Robustness to Spot TV Only

The results discussed in Section 4.2 of the text focus on BP advertising expenditures since we are aggregating over many forms of advertising media (e.g., television or print). Alternatively, our data also allow us to conduct our analysis by focusing on television advertisements only. Table A8 presents results for demeaned BP Spot TV advertising expenditures, and Table A9 focuses on Spot TV units (in hundreds of ads) during the 'Beyond Petroleum' campaign years for the BP Corporation, BP fuels, and environmental issues. Columns 1 and 2 report OLS results for station prices and quantity sold, respectively. Columns 5 and 8 provide the second-stage results where we use metro area television spot prices to instrument for BP advertising units. The results for station prices (in column 5) again show that advertising helped mitigate the impact of the oil spill: an additional 100 TV advertising units above the mean increased station prices by 0.1 or 0.3 cents per gallon (OLS and IV, resp., Table A9). An additional \$1 million in spot TV advertising expenditures increased BP stations' prices after the spill by 0.4 or 0.6 cents per gallon (OLS and IV, resp., Table A8). The impact on quantities is not precisely estimated which mirrors the result we obtain for all advertising expenditures.

Notes on Tables A10-A11: Robustness to Controlling for Alternative Forms of Advertising

Section 4.2.2 of the text explains that there are two possible issues that may alter the interpretation of our results. First, it may be the case that during-spill advertising is correlated with pre-spill advertising. To address this concern, we show that the effect of pre-spill BP advertising is robust to controlling for advertising *during* the oil spill. Second, an additional concern is that other forms of advertising may have affected consumer demand for BP stations, particularly local and ancillary product advertising (e.g., for individual BP service stations and their convenience stores). To address this issue, we create an additional measure to control for these other types of advertising. The ad measures are specifically constructed as follows: *Step 1*: We use all Kantar advertising data for 2000-2008 for which BP is listed as 'Ultimate Owner.' *Step 2*: We drop all advertisements for which the 'advertiser' (entity paying the ad) is clearly not related to BP or BP gas stations, namely Arco and individual Arco stations as well as Amoco and individual Amoco stations (as these are excluded from the analysis), Castrol and Castrol brands (Lube Express), and a handful of other entities mainly related to BP chemicals manufacturing. *Step 3*: As previously noted, our core corporate advertising measure includes all ads for (i) BP Corporation, (ii) BP fuels and oils, and (iii) explicitly environmental advertisements such as for solar systems or explicit 'Beyond Petroleum' announcements run during 2000-2008. *Step 5:* All remaining ads are included in our new control variable,

consisting of advertisements related to BP-affiliated convenience stores and products, individual service stations, ancillary product services, and miscellaneous items such as BP credit cards. As a suggestive test of the importance of the Beyond Petroleum corporate branding has green advertising per se, we interact these different advertising measures with a dummy variable for whether stations are located in "green zips," defined as zip codes whose green index scores above the median. The results are displayed in Table A11. Column (1) replicates the benchmark advertising results. Column (2) adds local and ancillary product advertising measures. Column (3) repeats the benchmark results with the green zip dummy instead of the green index variable as measure for environmental preferences, and with green zip interactions. Finally, Column (4) adds interactions with local and ancillary product advertising. The results confirm that the estimated protective benefit of our core corporate branding measure is robust to controlling for other BP station-related advertising. In addition, though noisy, the point estimates suggest that the impact of the likely environmentally-themed core corporate advertising was larger at stations in high-green-preference markets, whereas the impact of local and ancillary product ad spending was stronger in low-green-preference markets.

TABLE A8: ROBUSTNESS CHECK: SPOT TV ADVERTISING EXPENDITURES

VARIABLES	(1) Price Diff.	(2) Sales Diff.	(3) First Stage BP Ad Units, Dm.	(4) First Stage BP*(BP Ad Units, Dm.)	(5) Second Stage Price Diff.	(6) First Stage BP Ad Units, Dm.	(7) First Stage BP*(BP Ad Units, Dm.)	(8) Second Stage Sales Diff.
BP	-0.040***	-0.029***	0.563***	0.139***	-0.042***	0.570***	0.144***	-0.026**
	(0.003)	(0.011)	(0.065)	(0.026)	(0.003)	(0.067)	(0.027)	(0.011)
Green Index	0.006***	-0.001	-0.141***	-0.000	0.005***	-0.147***	0.000	-0.002
	(0.001)	(0.003)	(0.014)	(0.006)	(0.001)	(0.015)	(0.006)	(0.003)
BP*(Green Index)	-0.007***	0.009	-0.080	-0.222***	-0.006***	-0.065	-0.212***	0.010
	(0.002)	(0.008)	(0.049)	(0.019)	(0.002)	(0.051)	(0.020)	(0.008)
Income, Demeaned	-0.000	0.000	-0.007***	0.000	0.000	-0.006***	-0.000	0.000
	(0.000)	(0.000)	(0.002)	(0.001)	(0.000)	(0.002)	(0.001)	(0.000)
BP*(Income, Demeaned)	0.001***	-0.002**	0.016***	0.009***	0.001***	0.015***	0.009***	-0.002**
	(0.000)	(0.001)	(0.005)	(0.002)	(0.000)	(0.005)	(0.002)	(0.001)
Ad Spend, Demeaned	0.001**	0.001			-0.002***			-0.000
	(0.000)	(0.001)			(0.000)			(0.002)
BP*(Ad Spend, Demeaned)	0.004***	-0.000			0.006***			-0.001
	(0.001)	(0.003)			(0.001)			(0.003)
Spot TV Ad Price, Demeaned			0.008***	0.000		0.008***	0.000	
			(0.000)	(0.000)		(0.000)	(0.000)	
BP*(Spot TV Ad Price, Dm.)			0.002***	0.010***		0.002***	0.010***	
			(0.000)	(0.000)		(0.000)	(0.000)	
Constant	0.066***	0.013***	-0.424***	-0.000	0.068***	-0.426***	0.000	0.014***
	(0.001)	(0.004)	(0.026)	(0.010)	(0.001)	(0.028)	(0.011)	(0.004)
Observations	5,088	4,662	5,002	5,002	5,002	4,582	4,582	4,582
R-squared	0.076	0.002	0.755	0.864	0.070	0.757	0.865	0.003
Shea's Partial R-squared			0.691	0.794		0.692	0.794	
Angrist-Pischke F-Stat			9426	18183		8631	16542	
AP F-Stat p-value			0.000	0.000		0.000	0.000	

Sources: OPIS, Sierra Club, the U.S. Green Building Council, the U.S. Census and Kantar Media. The dependent variable is price difference in columns (1) and (5), and log-quantity difference in columns (2) and (8). The specification controls for Green Index, demeaned median household income, and demeaned BP Spot TV advertising spending (in millions of US$) during the 'Beyond Petroleum' campaign years for the BP Corporation, BP fuels, and environmental issues (mean 0.7, std. 2.2). The price difference is the average net price in the during-spill period minus that in the pre-spill period. The log-quantity is the log average quantity in the during-spill period minus that in the pre-spill period. Columns (3)-(4) and (6)-(7) provide the first-stage results for IV regressions with demeaned average spot TV advertising price as instrument. We calculate the Green Index by summing z scores for four variables: the hybrid share of vehicle registrations at the zip-code level in 2007, Sierra Club membership, the number of LEED-registered buildings per capita, and contributions to Green. Zip-code income is in 2000 US$. Standard errors in parentheses. ** $p<0.01$, * $p<0.05$.

TABLE A9: ROBUSTNESS CHECK: SPOT TV ADVERTISING UNITS

VARIABLES	(1) Price Diff.	(2) Sales Diff.	(3) *First Stage* BP Ad Units, Dm.	(4) *First Stage* BP*(BP Ad Units, Dm.)	(5) *Second Stage* Price Diff.	(6) *First Stage* BP Ad Units, Dm.	(7) *First Stage* BP*(BP Ad Units, Dm.)	(8) *Second Stage* Sales Diff.
BP	-0.041***	-0.031**	7.337***	5.361***	-0.051***	7.419***	5.441***	-0.022
	(0.003)	(0.012)	(0.414)	(0.196)	(0.003)	(0.426)	(0.205)	(0.014)
Green Index	0.005***	-0.001	-0.801***	-0.000	0.005***	-0.836***	-0.000	-0.002
	(0.001)	(0.003)	(0.090)	(0.043)	(0.001)	(0.095)	(0.046)	(0.003)
BP*(Green Index)	-0.006***	0.009	-0.556*	-1.356***	-0.005**	-0.411	-1.247***	0.010
	(0.002)	(0.008)	(0.312)	(0.147)	(0.002)	(0.323)	(0.155)	(0.009)
Income, Demeaned	0.000	0.000	-0.003	0.000	0.000	0.002	0.000	0.000
	(0.000)	(0.000)	(0.011)	(0.005)	(0.000)	(0.012)	(0.006)	(0.000)
BP*(Income, Demeaned)	0.001***	-0.002**	0.145***	0.142***	0.000	0.141***	0.142***	-0.001*
	(0.000)	(0.001)	(0.029)	(0.014)	(0.000)	(0.030)	(0.014)	(0.001)
Ad Spend, Demeaned	-0.000***	0.000			-0.001***			-0.000
	(0.000)	(0.000)			(0.000)			(0.001)
BP*(Ad Spend, Demeaned)	0.001***	-0.000			0.003***			-0.001
	(0.000)	(0.001)			(0.000)			(0.001)
Spot TV Ad Price, Demeaned			0.023***	0.000		0.023***	0.000	
			(0.001)	(0.000)		(0.001)	(0.000)	
BP*(Spot TV Ad Price, Dm.)			0.001	0.024***		0.001	0.024***	
			(0.001)	(0.001)		(0.001)	(0.001)	
Constant	0.067***	0.013***	-1.975***	0.000	0.068***	-1.978***	0.000	0.014***
	(0.001)	(0.004)	(0.168)	(0.079)	(0.001)	(0.177)	(0.085)	(0.004)
Observations	5,088	4,662	5,002	5,002	5,002	4,582	4,582	4,582
R-squared	0.072	0.002	0.392	0.523	0.063	0.399	0.523	0.003
Shea's Partial R-squared			0.306	0.332		0.314	0.332	
Angrist-Pischke F-Stat.			1714	1935		1608	1748	
AP F-Stat *p*-value			0.000	0.000		0.000	0.000	

Sources: OPIS, Sierra Club, the U.S. Green Building Council, the U.S. Census and Kantar Media. The dependent variable is price difference in columns (1) and (5), and log-quantity difference in columns (2) and (8). The specification controls for Green Index, demeaned median household income, and demeaned BP Spot TV advertising units (in hundreds) during the 'Beyond Petroleum' campaign years for the BP Corporation, BP fuels, and environmental issues (mean 7.45, std. 10.8). The price difference is the average net price over during-spill period minus the average net price over pre-spill period. The log-quantity is the log average quantity over during-spill period minus the log average quantity over pre-spill period. Columns (3)-(4) and (6)-(7) provide the first-stage results for IV regressions with demeaned average spot TV advertising price as instrument. We calculate the Green Index by summing z scores for four variables: the hybrid share of vehicle registrations at the zip-code level in 2007, Sierra Club membership, the number of LEED-registered buildings per capita, and contributions to Green. Zip-code income is in 2000 US$. Standard errors in parentheses. Significance at 1%***, 5%** and 10%*.

TABLE A10: ROBUSTNESS TO CONTROLLING FOR DURING-SPILL ADS

VARIABLES	(1) Price Diff.	(2) Price Diff.	(3) Price Diff.	(4) Price Diff.
BP	-0.0418**	-0.0444**	-0.0293*	-0.0298**
	(0.00279)	(0.00277)	(0.0114)	(0.0115)
Green Index	0.00552**	0.00445**	-0.00136	-0.00157
	(0.000604)	(0.000603)	(0.00253)	(0.00256)
BP*(Green Index)	-0.00722**	-0.00580**	0.00954	0.00987
	(0.00207)	(0.00204)	(0.00848)	(0.00850)
Income, Demeaned	0.00000	0.000108	0.000275	0.000286
	(0.000000)	(0.000000)	(0.000307)	(0.000308)
BP*(Income, Demeaned)	0.000525**	0.000401*	-0.00167*	-0.00170*
	(0.000191)	(0.000190)	(0.000781)	(0.000786)
Pre-Spill Ad spending, Demeaned	-0.000323	0.00156**	0.000114	0.000472
	(0.000245)	(0.000292)	(0.00101)	(0.00122)
BP*(Pre-Spill Ad spending, Demeaned)	0.00343**	0.00257**	0.000177	0.000149
	(0.000479)	(0.000582)	(0.00195)	(0.00241)
During-Spill Ad spending, Demeaned		-0.00744**		-0.00142
		(0.000646)		(0.00271)
BP*(During-Spill Ad spending, Demeaned)		0.00329**		0.000000
		(0.00137)		(0.00569)
Constant	0.0668**	0.0696**	0.0135**	0.0140**
	(0.00106)	(0.00107)	(0.00442)	(0.00453)
Observations	5,088	5,088	4,662	4,662
Adjusted R-squared	0.074	0.099	0.002	0.001

Sources: OPIS, Sierra Club, the U.S. Green Building Council, the U.S. Census and Kantar Media. The dependent variable is price difference in columns (1)-(2) and log-quantity difference in columns (3) and (4). The specification controls for Green Index, demeaned median household income, and demeaned BP advertising expenditures during the 'Beyond Petroleum' campaign years for the BP Corporation, BP fuels, and environmental issues, and during the BP oil spill from May-October 2010. The price difference is the average net price over during-spill period minus the average net price over pre-spill period. The log-quantity is the log average quantity over during-spill period minus the log average quantity over pre-spill period. We calculate the Green Index by summing z scores for four variables: the hybrid share of vehicle registrations at the zip-code level in 2007, Sierra Club membership, the number of LEED-registered buildings per capita, and contributions to Green. Zip-code income is in 2000 US$. Standard errors in parentheses. Significance at 1%***, 5%** and 10%*.

TABLE A11: CORE CORPORATE VS. OTHER ADVERTISING AND GREEN ZIP TRIPLE INTERACTIONS

VARIABLES	(1) Price Diff.	(2) Price Diff.	(3) Price Diff.	(4) Price Diff.
BP	-0.042***	-0.039***	-0.034***	-0.031***
	(0.003)	(0.003)	-0.004	(0.004)
Green Index	0.006***	0.006***		
	(0.001)	(0.001)		
BP*(Green Index)	-0.007***	-0.007***		
	(0.002)	(0.002)		
Green Zip Dummy			0.003	0.002
			(0.002)	(0.002)
BP*(Green Zip Dummy)			-0.013**	-0.013**
			(0.005)	(0.006)
Income, Demeaned	0.000	0.000	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
BP*(Income, Demeaned)	0.001***	0.001***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Green Ad Spending	-0.000	-0.000	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
BP*(Corporate Ad Spending)	0.003***	0.002***	0.003***	0.001
	(0.000)	(0.001)	(0.001)	(0.002)
BP*(Corporate Ad Spending)*(Green Zip)			0.002*	0.002
			(0.001)	(0.002)
Local/Ancillary Product Ad Spending		-0.000		0.001**
		(0.000)		(0.000)
BP*(Local/Ancillary Product Ad Spending)		0.003		0.003
		(0.002)		(0.003)
BP*(Local/Ancil. Ad Spending)*(Green Zip)				-0.002
				(0.004)
Constant	0.067***	0.067***	0.065***	0.065***
	(0.001)	(0.001)	(0.002)	(0.002)
Observations	5,088	5,088	5,422	5,422
R-squared	0.075	0.076	0.063	0.065

Data sources: OPIS and Kantar Media. Dependent variable is the individual station's price difference which is defined as the average net price over the during-spill period minus the average net price during the pre-spill period. The advertising measures control for demeaned BP advertising expenditures during the Beyond Petroleum campaign years (2000-2008). "Corporate" advertising includes ads related to the BP Corporation, BP fuels, and environmental issues. "Local/Ancillary Product" advertising includes other BP service station related ads such as for convenience stores and products and individual service stations. The "Green Zip Dummy" equals one for stations in zip codes whose green index measure is above the median. Column (1) replicates the benchmark specification. Column (2) adds local/ancillary product ad spending. Column (3) uses the Green Zip Dummy instead of the Green Index to measure environmental preferences, and adds a benchmark interaction. Column (4) adds local/ancillary product ad spending and interactions. Significance at 1%***, 5%** and 10%*.

Section 3: Details and supporting materials

OPIS Data Details and Sample Construction

We filter the price data at the zip code level according to the following criteria.

1. We begin with the daily price observations for each store from 2007 to October 2010.[41] We then remove store-weeks without at least five days' worth of price observations. This removes about 10 percent of observations from the raw data.

2. Next, we require that each store have at least 3 years' worth of weekly observations. To further ensure the consistency of our stores, we also flag large one-day changes in prices indicative of an error in data ("Twinkie effect") in the price data and drop stores that are particularly affected by this error. Specifically, for each store we record the first and last day of operation in the data and require that each store have non-Twinkie price observations for at least 80 percent of these possible days.

3. With the remaining stores, we filter the data at the zip code level, keeping zips that have at least 5 distinct stores. We also require that each zip code have at least one observation (from at least one store) for every week from 2007-2010.

The above creates a list of usable zip codes from the pricing data. We have similar restrictions on the stores and zip codes used from the weekly quantity data as detailed below.

1. We begin with weekly quantity data from 2009 to December 2010. Within the weekly store quantity observations, we drop any store that is absent from the data for 3 months or more at some point in our data.

2. From this set of stores, we construct z-scores for each store's quantity by quarter. (We allow each store to have two extreme values by setting the two highest z-scores to missing). Next, we filter the data at the zip code level by removing any zip code and all its stores if that zip code has at least one store with a z-score below -3.0 or above 3.0 in any quarter of the data.

3. From this remaining set of stores, we drop any zip code that has fewer than 5 distinct stores.

4. Finally, we filter the data again to drop zip codes with implausibly high variation in quantity sold. We do this by computing the mean and standard deviation for quantity sold in each zip code. Next, we compute the ratio of the standard deviation over the mean. Calculating the mean of this ratio, we drop all zip codes above the mean.

The remaining zip codes comprise our list of usable zip codes from the quantity data. For the proceeding analyses, we restrict the data to observations from zip codes that meet the above criteria in

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[41] In our updated data, we have observations that extend up to March 2011. Using all of our price data (which span January 2007 to March 2011) and filtering based on various density criteria at the zip code level does not affect the main results presented in this paper.

both the price and quantity data. In total, this yields 1,338 usable zip codes. **Note that we pick good *zip codes* and re-introduce the "bad" stations within those zip codes for the analysis presented in the paper.**

TABLE A12: NUMBER OF STATIONS ACROSS SAMPLE CUTS

	Price Data #	Qty Data #	Both #
Stores in OPIS Raw Data	135,973	119,631	118,813
Stores Located in "Good Zips"	15,825	13,865	13,795
Stores Located in "Good Zips" and Not ARCO	14,167	12,575	12,519
Stores Located in "Good Zips", Not ARCO and Not BP Competitor	7,503	6,735	6,709
Stores Located in "Good Zips", Not ARCO, Not BP Competitor and Have Demographic Info	7,406	6,648	6,622