Advertising, Reputation and Environmental Stewardship: Evidence from the BP Oil Spill

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Presented by Deirdre Sutula

Can public goods be provided by the private market?

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- Morgan and Minor (2011) find that CSR activities provide insurance against PR disasters

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Beyond Petroleum

- From 2000 - 2008, BP conducted $200 million "green" advertising campaign

- Subsequently seen as a "green" company and the "greenest" oil company

- Campaign won Gold Effie award and PR Week awards for "Campaign of the Year"

- Corpwatch called the campaign "Beyond Preposterous"

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Deepwater Horizon

- Deepwater Horizon oil rig in the Gulf of Mexico was leased by BP

- April 20, 2010: suffered from explosions, eventually burned down

- BP was not able to stop the flow of oil until July 12

- Over 200 million gallons of oil was leaked

- Sep 2014: Federal judge found BP responsible due to gross negligence

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Research Questions

- Did consumers punish BP for the spill?

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  - intensity Beyond Petroleum campaign
  - measures of environmental preferences
- Study how consumer response varies across:
  - time
  - level of green preference
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- Also use weekly gasoline spot price data from the Energy Information Administration

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- Authors track 2000-2008 BP advertising by location to measure consumer exposure

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  - per capita Sierra Club membership (2010)
  - number of LEED-registered buildings by zip code (2011)
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Impact on Prices and Volume

$$y_{it} = \alpha_i + \beta^1 during_t + \beta^2 post_t + \theta^1 during_t * BP_i + \theta^2 post_t * BP_i + \varepsilon_{it}$$

$$y_{it} = \text{station price or fleet sales}$$

$during$ and $post =$ indicators for during or after spill

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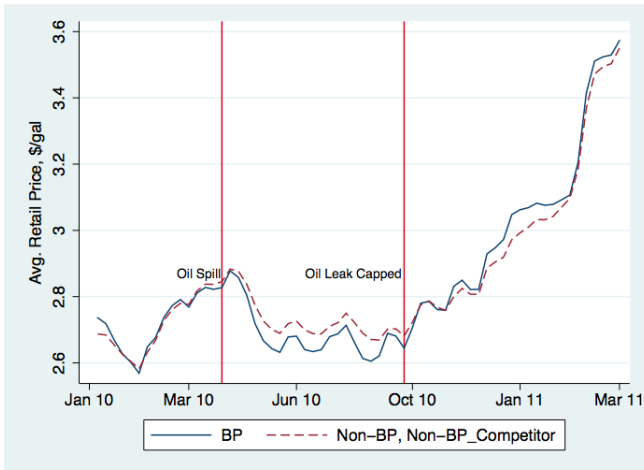
Results: Impact on Prices and Volume

TABLE 1: OIL SPILL IMPACT: BASIC DIFFERENCE ESTIMATES

VARIABLES	(1) Average Net Price	(2) Ln (Ave. Fleet Sales)	(3) Weekly Net Price	(4) Ln(Weekly Fleet Sales)
During-spill	0.072**	0.019**	0.071**	0.032**
	(0.001)	(0.004)	(0.001)	(0.003)
Post-spill	-0.062**	-0.025**	-0.062**	-0.021**
	(0.001)	(0.005)	(0.001)	(0.004)
BP*During-spill	-0.042**	-0.036**	-0.042**	-0.040**
	(0.002)	(0.009)	(0.002)	(0.008)
BP*Post-spill	0.025**	-0.027*	0.025**	-0.027**
	(0.002)	(0.011)	(0.001)	(0.009)
Observations	21,421	19,430	763,985	695,166
Adjusted R-squared	0.933	0.965	0.741	0.852
S.E.cluster	station	Station	station	station
Weight	price observation	quantity observation	price observation	quantity observation
# stations	7,503	6,735	7,503	6,735

Notes: Source: OPIS. The sample for price and quantity data 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 "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 effects. Standard errors are clustered by station. Significance at 1%**, 5%*.

Results: Impact on Prices

FIGURE 1
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.

Results: Impact on Prices and Volume

TABLE 2: OIL SPILL IMPACT BY MONTH

VARIABLE	Weekly Net Price (1)	Ln(Weekly Fleet Sales) (2)
BP*late_Apr'10	-0.011**	0.003
	(0.002)	(0.010)
BP*May'10	-0.041**	-0.030**
	(0.002)	(0.009)
BP*Jun'10	-0.049**	-0.063**
	(0.002)	(0.010)
BP*Jul'10	-0.044**	-0.049**
	(0.002)	(0.009)
BP*Aug'10	-0.061**	-0.067**
	(0.002)	(0.010)
BP*Sep'10	-0.029**	-0.010
	(0.002)	(0.010)
BP*Oct'10	-0.005**	-0.024*
	(0.002)	(0.010)
BP*Nov'10	0.021**	-0.040**
	(0.002)	(0.010)
BP*Dec'10	0.052**	-0.044**
	(0.002)	(0.011)
BP*Jan'11	0.049**	-0.031**
	(0.002)	(0.011)
BP*Feb'11	0.022**	0.012
	(0.002)	(0.011)
BP*Mar'11	0.028**	-0.033**
	(0.002)	(0.011)
Observations	763,985	695,166
Adjusted R-squared	0.839	0.860
Fixed Effects	station	Station
S.E.cluster	station	Station
Weight	price observation	quantity observation
# stations	7,503	6,735

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%*.

Results: Including Green Preferences

TABLE 4: IMPACT OF OIL SPILL AS A FUNCTION OF GREEN PREFERENCES

DEP. VARIABLE:	(1) Price Diff	(2) Sales Diff	(3) Price Diff	(4) Sales Diff	(5) Price Diff	(6) Sales Diff
BP	-0.043**	-0.036**	-0.041**	-0.036**	-0.041**	-0.033**
	(0.002)	(0.009)	(0.002)	(0.010)	(0.003)	(0.010)
Pct hybrid, Demeaned			0.008**	-0.003		
			(0.002)	(0.009)		
BP*(Pct hybrid, Demeaned)			-0.012*	0.039		
			(0.005)	(0.021)		
Income, Demeaned			-0.000	0.000	-0.000	0.000
			(0.000)	(0.000)	(0.000)	(0.000)
BP*(Income, Demeaned)			0.001**	-0.002*	0.001**	-0.001
			(0.000)	(0.001)	(0.000)	(0.001)
Green Index					0.006**	-0.002
					(0.001)	(0.002)
BP*(Green Index)					-0.006**	0.013
					(0.002)	(0.008)
Constant	0.073**	0.016**	0.073**	0.017**	0.074**	0.016**
	(0.001)	(0.004)	(0.001)	(0.004)	(0.001)	(0.004)
Observations	6,388	5,868	6,388	5,868	6,388	5,868
Adjusted R-squared	0.050	0.002	0.057	0.003	0.070	0.002
# stations	6,388	5,868	6,388	5,868	6,388	5,868

Notes: Sources: OPIS, Sierra Club, the U.S. Green Building Council, the U.S. Census and Kantar Media. The sample is restricted to stations with available data on Green Index and household income. Columns (1) and (2) report the benchmark estimates from Table 2 for the sample of stations that has income, green index, and hybrid car share data available. The dependent variable is the individual station's price difference or log-quantity difference between the "pre" and "during" spill periods. Columns (3) and (4) add median household income and hybrid vehicle shares as control variables to the benchmark specification. Columns (5) and (6) add income and the Green Index to the benchmark. The Green Index is the 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%*.

Results: Including Advertising Exposure

DEPENDENT VARIABLE:	OLS ESTIMATES		OLS ESTIMATES		2SLS ESTIMATES	
	Price Diff	Sales Diff	Price Diff	Sales Diff	Price Diff	Sales Diff
	(1)	(2)	(3)	(4)	(5)	(6)
BP	-0.035**	-0.031**	-0.042**	-0.029*	-0.044**	-0.025*
	(0.002)	(0.010)	(0.003)	(0.011)	(0.003)	(0.012)
Green Index			0.006**	-0.001	0.005**	-0.002
			(0.001)	(0.003)	(0.001)	(0.003)
BP*(Green Index)			-0.007**	0.010	-0.007**	0.010
			(0.002)	(0.008)	(0.002)	(0.009)
Income, Demeaned			0.000	0.000	0.000	0.000
			(0.000)	(0.000)	(0.000)	(0.000)
BP*(Income, Demeaned)			0.001**	-0.002*	0.000*	-0.002*
			(0.000)	(0.001)	(0.000)	(0.001)
Ad spending, Demeaned			-0.000	0.000	-0.001**	-0.000
			(0.000)	(0.001)	(0.000)	(0.001)
BP*(Ad spending, Demeaned)			0.003**	0.000	0.004**	-0.001
			(0.000)	(0.002)	(0.001)	(0.002)
Constant	0.067**	0.013**	0.067**	0.013**	0.062**	0.014**
	(0.001)	(0.004)	(0.001)	(0.004)	(0.001)	(0.005)
# observations	5,088	4,662	5,088	4,662	5,002	4,582
# stations	5088	4662	5088	4662	5,002	4,582
R-squared	0.039	0.002	0.074	0.002	0.075	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. Columns (1) and (2) report the benchmark estimates from Table 2 for the sample of stations that has income, Green Index, and advertising data available. The dependent variable is the individual station's price difference or log-quantity difference. Columns (3) and (4) report results with added controls for Green Index, demeaned median household income, and 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 regressors of interests are the interactions of these variables with the dummy for the BP gas station. The price difference is computed as the average net price over during-spill period minus the average net price over pre-spill period. The log-quantity is computed as the log average quantity over during-spill period minus the log average quantity. Columns (5) and (6) report 2SLS estimates instrumenting BP advertising expenditures with metropolitan-area spot TV ad price over period 2007-2008. First stage results are in the Appendix. 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%*

Results: Change in Station Market Share

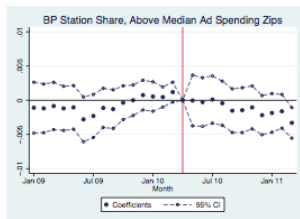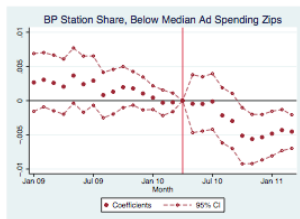FIGURE 3A: BP MARKET SHARE TIME-DUMMY COEFFICIENTS, ABOVE MEDIAN ADVERTISING SPENDING

FIGURE 3B: BP MARKET SHARE TIME-DUMMY COEFFICIENTS, BELOW MEDIAN ADVERTISING SPENDING

Notes: Sources: OPIS and Kantar AdSpender. This figure displays the coefficients on monthly time dummies --relative to the omitted April 2010 oil spill month-- from a regression of the share of BP stations in each zip code-month on these time dummies as well as zip code fixed-effects (see specification (3) from the text). The regression was estimated separately for zip codes in metro areas with above and below median BP ad spending during the Beyond Petroleum campaign years of 2008-2008. The corresponding regression results can be found in the Online Appendix.

Conclusions

- Consumers were willing to punish environmentally harmful firms, and punishment increased in "green" areas

- However, the punishment period was short

- Consumers did not punish for greenwashing. In fact, the greenwashing had an insurance effect.

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