"A Definition at Last, But What Does it All Mean?"*

Newspaper Coverage of Organic Food Production and its Effects on Milk Purchases

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Abstract

This paper estimates the effects of media coverage in organic food production and the National Organic Program on food purchases. Information from several independent data sources is complied into a unique data set that directly links national and local newspaper coverage to fluid milk consumption. An analysis of weekly store-level scanner data in a difference-in-differences approach suggests average increases in organic milk sales relative to conventional milk sales of 5% during weeks for which relevant news coverage is observed. Increases in intensity of news coverage, measured by the number of articles in a given week, are further found to increase the relative difference in sales. Increases in media coverage affect organic milk sales at a diminishing rate, however, and media effects dissipate quickly in the weeks following news coverage. Differentiating by media context further suggests that product category specific coverage doubles observed increases in sales as compared to general coverage. Critical coverage does not result in significant effects on organic milk sales. Furthermore, local news coverage seems to have a relatively higher impact than national news coverage.

Introduction

The myriad of words and symbols printed on food packages keeps growing in complexity and diversity. But what motivates consumers to pay attention to the intricacies of food labels and to ultimately alter their purchase decisions? In this paper, I present an empirical analysis of the effects of media coverage in organic production and the National Organic Program (NOP) on food purchases.

The NOP was initiated as a direct consequence of the Organic Foods Production Act in the 1990 Farm Bill, calling for regulation of the production, handling, and marketing of organically produced agricultural products. Its implementation in October 2002 introduces a uniform national standard and new labeling guidelines. It also adds the USDA organic seal to food packages.

While previous research suggests that information-based policies can achieve the issuing agency's goals, newspaper readership might be an important determinant of consumer response (e.g. Shimshack et al, 2007). Empirical studies of the effects of information-based policies on food choices have mainly focused on nutritional labeling and education (e.g. Ippolito and Mathios, 1990; Mojduszka and Caswell, 2000; Mathios, 2000; Teisl, Bockstael and Levy, 2001). Critical news coverage of regulatory challenges (Nestle, 2002) and the "Food News Blues" in general (Newsweek, 2006) might be one possible explanation for mixed results found in these studies. In this context, Ippolito and Pappalardo (2002) suggest that regulatory rules and enforcement policies might have induced firms to move away from reinforcing nutritional or health claims. Empirical studies of consumer level responses to advertising further suggest significant effects on purchasing decisions (e.g. Ackerberg, 2001) and experimental research (Cain, Loewenstein, and Moore, 2005) points out that people do not sufficiently take the incentives and motives of the information source into account when evaluating information. I attempt to isolate media coverage from information interdependencies of regulatory changes and changes in product advertising.

Research linking media effects to economic outcomes has mainly focused on the impact of media expansion and media bias on political attitudes and outcomes (e.g. Stroemberg, 2004, Gentzkow and Shapiro, 2004; DellaVigna and Kaplan, 2007). This literature suggests that media content plays a powerful role in leading to socially desirable outcomes. Other studies address the effects of news coverage on health behaviors such as drug use and cancer prevention (Viswanath et al., 2006; Stryker, 2003). In contrast, this research directly links newspaper coverage to consumers' product choice and

isolates media effects from changes in product attributes.[1] I focus on fluid, unflavored milk sales as milk can be viewed as a relatively standardized and ubiquitously processed commodity and permits abstracting from brand and taste preferences when comparing organic versus conventional products. In addition, some identified newspaper articles directly address organic milk and allow investigating framing effects within this specific product category. By combining news coverage with demographic information and newspaper circulation data, I can further analyze potential differences in news effects according to audience differences. Finally, I can discuss the role media plays in promoting socially desirable outcomes, such as environmentally conscious consumption choices.[2] More specifically, this research addresses the following questions: (i) Did media coverage of organic food production and the NOP influence consumer purchases? (ii) Do media effects vary by national versus local newspaper coverage? (iii) Do media effects differ depending on positive versus negative portrayal, and framing within specific product categories (e.g. media coverage directly related to organic milk production or consumption)? (iv) Do media effects differ based on differences in the circulation of newspapers as well as demographics of readers and shoppers?

A unique scanner data set is provided by a major supermarket chain in the U.S. I combine these data with information from several independent media data sources, newspaper circulation measures, and socio-demographic census information. Time-series and cross-sectional variation in media coverage allows identifying an average treatment effect in a difference-in-differences approach (DD) commonly used in the policy evaluation literature (see Meyer, 1995; Bertrand, Duflo, and Mullainathan, 2004).

I find average increases of 5% in organic milk sales relative to conventional milk sales during the weeks for which I observe relevant news coverage. Increases in intensity of news coverage, measured by the number of articles in a given week, further increase the relative difference in sales. Increases in media coverage affect organic milk sales at a diminishing rate, however. Media effects also dissipate quickly in the weeks following news coverage, indicating that consumer attention might be relatively short-lived. Differentiating by context of observed articles suggests that product category specific coverage almost doubles when compared to general coverage. Furthermore, local news coverage seems to have a relatively larger impact than national news coverage. On the other hand, critical or negative national or

[1] With regards to voting behavior for instance, isolation of media effects and actual changes in attributes are not easily separable as candidates and programs change over time and are influenced by media and voter opinion. Product characteristics do not change for my application as none of the milk products that were labeled as organic before the introduction of the NOP left the market or were sold as conventionally produced milk products afterwards.

[2] *"Organic food is produced by farmers who emphasize the use of renewable resources and the conservation of soil and water to enhance environmental quality for future generations" (USDA, NOP 2002).*

local news coverage does not result in significant changes in organic milk sales. Finally, differences in media effects due to differences in the socio-demographic composition of readers and shoppers could not be detected .

The literature on consumer preferences for organic and non-biotech food is dominated by attitudinal surveys, choice experiments and experimental auctions (see Marks, Kalaitzandonakes and Vickner, 2003 for an overview). Results differ and range from substantial price premiums and distinct consumer preferences to no detectable preferences or avoidance of conventional or biotech products (e.g. Roe and Teisl, 2007, Batte et al., 2003; Huffman et al., 2003). Market-based studies have focused on organic milk as milk is often viewed as the gateway to organic purchases.[3] Glaser and Thompson (2000) identify price premiums as high as 103%, and high own-price elasticities for organic milk products. The consumer segment buying organic milk portrays significant valuation for organic production, and to a lesser extent, for the rBGH-free[4] production (Dhar and Foltz, 2005). Dimitri and Venezia (2007) observe a shift in the distribution of organic products from natural food stores to conventional channels such as supermarkets, and significant regional variation in price premiums for organic milk. Differences in income, educational and ethnical background, region and age of household are associated with households purchasing organic milk, but socio-demographic differences did not explain differences in average share of milk expenditure allotted to organic milk and frequency of purchases among those households. While 36% of households are frequent purchasers, media coverage could explain the observed infrequent purchases by the remaining households. Related previous research also suggests that food labels are needed for market segmentation of rBGH-free and organic milk to take place (Kiesel, Buschena and Smith, 2005). While the NOP introduced mandatory certification, the display of the USDA organic seal is voluntary. Utilizing cross-sectional variation in the display of the seal, Kiesel and Villas-Boas (2007) found an increased willingness to pay for organic milk products carrying the seal and concluded that consumer valuation exceeded the costs associated with the implementation of the NOP. This paper extends this research and contributes to a more comprehensive policy evaluation of the NOP.

My results suggest that newspaper coverage reinforced consumer preferences for organic milk and increased organic milk purchases temporarily. These findings are economically relevant when considering the $24.8 billion organic food industry (OTA, 2010). They might also provide insights

[3] Consumers that do not buy any other organic products purchase organic milk (DuPuis, 2000).
[4] rBGH stands for the genetically modified Bovine Growth hormone.

regarding effectiveness of information-based interventions and labeling regulations in general, however. Adding this market-based approach to the existing literature suggests that current and future regulation on specialty foods should pay closer attention to media portrayal of the regulatory changes in order to achieve their policy goals. While positive media portrayal can capture consumer attention and motivate short-term adjustments to purchasing behavior, information-based interventions combined with incentive-based approaches such as price changes might be needed to ensure long-term behavioral changes.

The next section describes the data sources in more detail and provides descriptive statistics. Section 3 introduces the econometric framework and identification strategy, and section 4 summarizes the results. The paper concludes in section 5.

Data Sources and Descriptive Statistics

To implement the analysis, I combine information compiled from several independent data sources. The main data set consists of weekly store-level data on fluid milk purchases in Northern California (including some stores in Nevada and Hawaii based on distributional considerations of the grocery chain rather than geographic boundaries) provided by one of the largest U.S. grocery store chains, available for all 52 weeks in 2002. This data set includes 257 stores, 229 of which are located in California, with store locations mapped in Figure 1. The density of stores varies from 2 stores per zip code in more rural areas such as Healdsburg to 16 stores per zip code in urban areas such as San Francisco. The provided zip code is also used to merge store-level sales with socio-demographic statistics of potential consumers provided by the United States Census Bureau from the 2000 Census.[5]

Data on news coverage of the NOP and organic production is obtained from three sources—LexisNexis™, Proquest®, and NewsLibrary.com—through an individual keyword search (e.g. organic food, NOP, USDA organic seal). Four national papers—*The Wall Street Journal, The New York Times, Washington Post, and USA Today*—as well as 10 local papers—*San Francisco Chronicle, Oakland Tribune, Sacramento Bee, Modesto Bee, Fresno Bee, San Jose Mercury News, Monterey County Herald, Alameda Times Star, The Daily Review (Hayward), and San Mateo County Times*—were searched.[6] Each returned article was reviewed for relevance, portrayal, and direct significance to the product

[5] In order to extract variables of interest, an automated script is utilized. Socio-demographic variables included in the analysis are summarized as part of Table 1, which provides complete summary statistics.

[6] The Reno Gazette Journal was also searched for the analysis of control stores in Reno, but no relevant newspaper coverage was detected over the investigated time period.

category. I observed local and national news coverage in 16 weeks (9 weeks prior to the NOP) summarized in Figure 2 and differentiated the number of articles in local versus national outlets.[7] These articles were further grouped into either critical or supportive/neutral coverage as well as category specific coverage (two articles in the national press specifically focused on milk consumption in week 33 and 36).[8] And finally, store-level data was merged with circulation measures compiled by the Audit Bureau of Circulations (ABC) based on the stores' zip code.[9] Table 1 summarizes cross-sectional and time-series variation in local newspaper coverage after matching store-level information with these available circulation measures. In the last column, I report the weeks for which I observe local coverage at the specific paper. As I only observe variation in newspaper coverage for the *San Francisco Chronicle* and *Oakland Tribune* across stores and weeks, the analysis utilizing circulation measures focuses on these two major local papers only.

Organic milk was offered in only one subcategory in the store-level data: fat-free, half-gallon milk. By focusing on this subcategory only, comparisons across brands are limited to the inclusion of private label conventional milk for most stores.[10] In addition, while 225 of the 229 California stores carried organic milk during 2002, organic milk was consistently available in 181 stores only as illustrated in Figure 3. I restrict my analysis to stores that carried organic milk for the entire time period and discuss possible sample selection in the result section.

Despite these data limitations, the data set is representative of organic milk demand as a whole during the analyzed time period. While overall milk sales in 2002 amounted to $133.49 million in the data, half gallon milk contributed $31.55 million or 23.6%, and the analyzed fat free category amounted to sales of $8.94 million or 6.7% of total sales. Organic milk sales amounted to $1.20 million or 0.9% of total sales.[11] This is in keeping with previous studies which reported that organic milk accounted for less than 1% of total milk sales in 2002 (e.g. Dhar and Foltz, 2005, Schultz, 2006, Dimitri and Venezia, 2007[12]).

[7] This graph does not differentiate between supportive/neutral and critical coverage, or category specific coverage.
[8] A complete list of headlines, dates, and corresponding weeks of included news coverage are reported in Appendix A.
[9] Local Publishers submit circulation claims to ABC every 6 month, with circulation numbers used in our analysis reported in March 2003. The reported gross total circulation numbers for mid-week editions of the papers is used. For one zip code and one local paper circulation measures were not available in the ABC data.
[10] Only 5 stores carry an additional branded fat free half gallon alternative. This limited cross-sectional variation is consistent with findings in the existing literature that private conventional labels dominate the market (e.g. Dhar and Foltz, 2005, Schultz, 2006, Dimitri and Venezia, 2007).
[11] The trend of total organic milk sales is also graphed in Figure 2 in addition to newspaper coverage.
[12] Dimitri and Venezia (2007) report a market share estimate of 6% for 2005 that includes cream, acknowledging that the market share for milk alone is less than that. Accounting for reported annual growth rates of 25% and an increase in supply and distribution organic milk further discussed in their paper makes our observed market share for 2002 reasonable.

The resulting final data set consists of 9412 observations. Descriptive statistics of key variables are summarized in Table 2. Quantities of organic milk sold in a given week vary from 1 to 232 units depending on the store, while quantities of conventional milk vary from 66 to 1527 units. Therefore conventional sales are 339 units, or 83.1%, higher on average. Prices for fat-free, half-gallon organic milk range from $2.49 to $3.99, while conventional milk ranges from $1.37 to $2.29, resulting in an average price difference of $1.51. These prices and price premiums are consistent with national averages for organic as well as conventional milk (see Dimitri and Venezia, 2007). Furthermore, variation of conventional milk prices is almost exclusively limited to variations of base level prices across stores, while variation of organic milk prices are due to base level variations across stores as well as price promotions. Promotions on organic milk affect all stores uniformly as these stores are within the same pricing division, and appear more frequently in the second half of 2002.[13] This increase in frequency might be an indication of structural change and adjustments to changes in consumer demand, possibly due the implementation of the NOP.

Econometric Specification

To assess the impact of media coverage on consumer purchases, I specify the treatment variable as the presence of media coverage in a given week. As I cannot observe what sales of organic milk would have been at a given week in the absence of media coverage, identification of an average treatment effect (ATE) depends on the definition of relevant control groups and rests on the assumption that average differences in outcomes for treated and control groups with the same values for covariates are attributable to the treatment. This assumption is satisfied when treatment assignment and the potential outcomes are independent (Imbens, 2004). As I observe repeated cross sections—weekly store-level sales—I follow a difference-in-differences-approach (DD) commonly used in the policy evaluation literature (see Meyer, 1995; Bertrand, Duflo, and Mullainathan, 2004). DD allows for comparisons of means of the outcome of interest with or without treatment while holding observable covariates constant. I define the ATE as the mean difference in sales of organic milk relative to sales of conventional milk in weeks with and without media coverage. The control structure is twofold: temporal, as I compare sales in weeks with and without newspaper coverage over the range of 2002; and

[13] The price reported in the data is an average price across all observed sales for a specific product during this week. Depending on the type of promotion (e.g. club card specials) it will vary across stores based on the percentage of consumers that bought milk under this promotion.

cross-sectional, as I compare sales across geographic regions with varying of local newspaper coverage, and circulation measures.[14]

Let $Q_{i,t} = q_{org,i,t} - q_{conv,i,t}$, be the difference between organic and conventional milk sales at a given store *i* and week *t*, measured in the number of half-gallons (quantity) sold in each category. I estimate a double difference form rather than the standard DD estimation and transform both quantity measures into logs ($log\_Q_{i,t}\ is\ defined\ as\ \log(q_{org,i,t}) - \log(q_{con,i,t})$).[15] This specification allows me to interpret and compare regression results in terms of average percentage effects across stores rather than differences in sales in levels. Initially, I pool all news coverage and estimate the following base reduced form specification:

$$log\_Q_{i,t} = \alpha_i + \beta_0 * P_{i,t} + \beta_1 * trend_t + \delta * news_t + u_{i,t} \quad (1)$$

Store fixed effects, α_i are included to capture unobserved, time-invariant heterogeneity across stores and allow for a shift of average differences in sales for each store. The price variable, $P_{i,t}$ is transformed into differences ($P_{i,t} = p_{org,i,t} - p_{conv,i,t}$). The primary variable of interest, *news,* defining the treatment effect is constructed as a weekly dummy variable that equals one if I observe coverage at a given week, and zero otherwise. The coefficient on *news*, δ, measures the ATE as the average percentage difference in organic versus conventional sales between weeks with and without media coverage. Alternatively, I also define this variable as a count of articles at a given week to investigate effects of increases in intensity of news coverage. When including the treatment variable as a count, I further add a second order term to allow for non-linear effects of an increase in news coverage. And finally, a time trend is included to capture a general increase of organic milk sales that might be independent of media coverage.

In addition to estimating an average treatment effect of media coverage, I am interested in differences based on supportive/neutral versus critical coverage, local versus national paper coverage and category specific articles. Critical coverage of organic production should either not affect sales or reduce sales of organic milk relative to conventional milk. One would also expect category specific coverage to have a bigger impact on sales, as consumer attention is directly drawn to milk and benefits from organic milk

[14] I also searched for relevant Television coverage using Vanderbilt Television News Archive, but could only indentify coverage on the day the NOP went into effect.

[15] In the standard estimation, both differences are identified by the inclusion of dummy variables and an interaction of dummy variables. Due to my data limitation of two available products only in the investigated category in most stores, this specification cannot be employed as it would result in multicollinearity. Both specifications are conceptually identical.

production. And there is no clear prior hypothesis of the relative magnitude of local versus national news effects. Taking these differences in specific treatment effects into account, I estimate the following differentiated specification:

$$log\_Q_{i,t} = \alpha_i + \beta_0 * P_{i,t} + \beta_1 * trend_t + \delta_1 * newsmilk_t + \delta_2 * natnews_t + \delta_3 * natnews\_crit_t \; +$$

$$+\delta_2 * locnews_t + \delta_3 * locnews\_crit_t + u_{i,t} \qquad (2)$$

In addition, local news can be separated out by specific newspaper and interacted with circulation measures. Circulation measures are transformed into percentage measures by using total population numbers extracted from the Census data. Finally, I investigate if socio-demographic differences across zip codes result in significant differences in the magnitude of media effects for both national and local coverage by interacting the variables measuring media effects with a vector of demographics (D) such income measures (median income, house values and rental contracts), age distribution (percentage over the age of 65) and differences in composition of ethnic groups (percentage of Whites).

Empirical Results

The econometric approach compares average differences in weekly organic milk sales with, and without, media coverage. One of the advantages of using a DD approach is that it allows for a graphical presentation of results. As a first step, Figure 2 graphed total organic sales overlaid with observed media coverage. Sales of organic milk seem to primarily increase when we observe national news coverage, possibly suggesting that national media coverage is more effective than local coverage. The big spike of local coverage in week 28 did not seem to affect aggregated store sales much. But local papers are small when considering their range and circulation as this spike results from a simultaneous print of a 3 part feature on organic production and regulatory changes in the *Oakland Tribune*, *Daily Review*, the *San Mateo County Times*, and the *Alameda Times Star* due to joint ownership of these papers. Due to my focus on the article count, national coverage in week 40 to 43 did not result in a significant increase in total sales as I observe critical coverage rather than supportive/neutral in the national papers in these weeks.

Overlaying this graph with variation in the mean organic milk price across stores (Figure 4) however, suggests that observed increases in organic sales are strongly correlated with price promotions. Not

accounting for other covariates, such as price promotions might falsely overstate the importance of news coverage.[16]

I begin the regression analysis of media effects by first pooling all observed media coverage and investigating the effects of increased intensity, as well as dissipation, over time. Then, I differentiate media effects based on content, portrayal, source, and circulation. Finally, I add differences in the socio-demographic composition of readers and shoppers. As identification of treatment effects in the DD approach critically depends on the assumption of exogeneity of treatment effects, I also restrict the analysis to weeks prior to the implementation of the NOP first.[17]

Pooled media effects

I begin the regression analysis of the effects of media coverage by estimating equation (1). Table 3 reports the results from a regression including store fixed effects, price differences, a linear time trend, and a dummy variable equaling one for weeks in which we observe media coverage. I find an average treatment effect (ATE) across alternative news sources (local and national news paper coverage and independent of possible differences in portrayal) of 5.1%. This base specification is also included in all subsequent tables as column (1) to provide a reference point. This effect indicates that quantity sales of organic milk relative to conventional milk are significantly higher (5.1%) during weeks with observed relevant news coverage. In the second column, the reported treatment variable is defined as a count variable rather than a dummy variable. This specification also includes a squared term to capture for possible non-linear effects. Again, I find a significant increase of organic milk sales due to media coverage suggesting that each additional article increases sales by 4.8%, but at a decreasing rate. Both regressions also suggest that consumers are very responsive to price changes. As prices are recorded in dollars, a one dollar decrease in the difference in prices between organic and conventional milk at a given week results in a significant 76.8% increase in organic sales relative to conventional sales. The average price difference observed in the data amounts to $1.55, such that a one dollar decrease corresponds to a price change of 64.5%. Transforming the estimated price effects into a 1% decrease in

[16] When contacting the product category manager of the supermarket, I was not able to confirm that price promotions are potentially coordinated with media coverage, especially during the week of the category specific national coverage in week 33 and 36.

[17] Previous research (e.g. Kiesel and Villas-Boas, 2007, Dimitri and Venezia, 2007) indicates that the implementation of the NOP and the USDA organic seal displayed on packages increased demand for organic products. Therefore, the independence or exogeneity assumption might not be satisfied during the week of the implementation of the NOP, as well as the weeks following these regulatory changes. Regression specifications comparing effects of media coverage prior and post implementation are discussed as additional robustness checks.

the price difference therefore results in an estimated 1.19% increase in organic sales relative to conventional milk sales.[18] This observed price sensitivity is consistent with supermarkets adding private label organic product varieties. While these changes in the market structure might have been partially motivated by cost savings, they might also be targeted at capturing these consumer segments that are price sensitive.[19] Even though not reported individually here, store fixed effects capturing unobserved, time-invariant heterogeneity across stores, allow for a shift of average differences in sales for each individual store and are statistically significant for almost all stores included in the regression analysis. And finally, the positive coefficient on the time trend suggests a small but gradual weekly increase in demand for organic milk of 0.3%.

Another interesting aspect of estimating media effects relates to the longevity or dissipation of these effects over time. Table 4 reports results for a regression specification that in addition to the news dummy also includes up to three lags for observed media coverage. These results suggest a significant decrease during the week directly following observed news coverage, while no significant increase or decrease is detected in the subsequent weeks.[20] While the estimated 4.8% decrease in the week following the news coverage could be explained by the shelf life of milk—having bought milk in a given week makes consumers less likely to buy milk the following week—one could expect repeated purchases by consumers affected by news coverage in the following weeks, if media-induced organic milk purchases resulted in a permanent change of purchasing patterns. These results therefore do not support a permanent change in purchasing patterns due to news coverage. It is worth noting, however, that the decrease in sales in the week after the observed media coverage does not fully offset the increase observed during the week of coverage. Furthermore, these findings are not driven by serial correlation in sales across weeks in general, as including up to three lags of the dependent variable does not reproduce the same pattern and does not affect the magnitude or significance of the lagged media effects. Including these lags allows me to additionally test if my results are driven by a correlation in sales and conclude that serial correlation in the error terms is not driven by serial correlation in the dependent variable. These results seem consistent with previously reported findings that of the households that buy organic milk, only 36% purchase organic milk frequently, while the remaining portion of consumers

[18] As I follow a reduced form approach, I merely control for price sensitivity. These results cannot be interpreted as price elasticities.
[19] Endogeneity concerns regarding prices are discussed in section 5.1.
[20] Weeks with only critical coverage are excluded from those regressions.

only pay infrequent attention to organic production (Dimitri and Venezia, 2007). Media coverage could explain these infrequent purchases.

Local versus national newspaper effects, category specific and critical coverage

Table 5 reports regression results for differentiated rather than pooled media effects (equation 2). I classify news coverage according to category specific coverage (only observed in national papers), versus more general national and local newspaper coverage, and separate critical national and local coverage from supportive/neutral coverage. In this specification, category specific news coverage yields the highest significant increase (10.7%) in organic sales relative to conventional sales at a given week. General national news coverage significantly increases organic sales by 4.5% relative to conventional sales, while the effect of local coverage is estimated at 7.0%. This difference in magnitude is statistically significant, indicating a relative bigger impact of local coverage over national coverage.

I also make use of cross-sectional variation in local media coverage and additional circulation measures. Due to limited local news coverage and circulation of smaller local papers reported in Table 1, the analysis in this regard focuses on the *Francisco Chronicle* and *Oakland Tribune* only. Table 6 reports results for regression specifications addressing news featured in the *San Francisco Chronicle* and *Oakland Tribune*.[21] I observe circulation measures for the *San Francisco Chronicle* ranging from 0.2% to 34.1% of the total population reported for each store zip code. At a maximum of 12.9% of the total population, circulation measures for the *Oakland Tribune* are significantly lower and can be matched to 50 stores included in the analysis, only. The second column (specification 6) adds a dummy variable for both the *San Francisco Chronicle* and *Oakland Tribune* respectively. Controlling for national media coverage, a relevant article in the *San Francisco Chronicle* in a given week does not result in statistically significant differences of organic milk sales relative to conventional sales; however, a relevant article in the *Oakland Tribune* results in an 11.1% increase of organic sales relative to conventional sales compared to weeks with no coverage. The next column adds interactions with circulation measures and suggests that an additional increase in circulation by 1% results in an increase in sales of organic milk by an additional 0.3% for the *San Francisco Chronicle*. Interestingly, the coefficient on the *San Francisco Chronicle* dummy not interacted with circulation is negative and significant, suggesting that sales of organic milk would have been lower on average in the absence of media coverage during these weeks compared to other weeks, and that stores with a circulation of 14.4%

[21] This regression excludes two additional stores since adjusting circulation numbers by the total number of population reported in the census resulted in circulation measures higher than 100% for those stores.

or higher experience increases in organic milk sales as a result of coverage in the *San Francisco Chronicle*. These results point to economies of scale or network effects only realized once local papers reach a certain circulation and offer an explanation why the average effect for the *San Francisco Chronicle* was insignificant. No significant differences are detected for differences in circulation measures for the *Oakland Tribune* possibly a result of the relatively low circulation measures and limited variation, or by joint ownership of some of the local papers.[22] As the Northern California division of this supermarket chain also includes a limited number of Nevada stores, I use those stores as an additional control and robustness check. Shoppers in those stores where not likely to have read either the *San Francisco Chronicle* or *Oakland Tribune* and where not exposed to news coverage on organic production or the NOP in their local papers. Regression results for those stores are reported in the last column of Table 6. As expected, the inclusion of local media coverage in the *San Francisco Chronicle* and *Oakland Tribune* resulted in no significant effects on sales of organic milk, strengthening the significance of the findings for the California stores.

And finally, I investigate whether differences in socio-demographic composition of readers and shoppers across zip codes result in cross-sectional variation of media effects. I interact the treatment variable with median income, median contract rent and median house values as proxies for income differences, the percentage of the population over 65 as a control for differences in age composition; the percentage of White as a control for differences in ethnical composition; and population size to differentiate between more urban and more rural areas. I estimate pooled as well as differentiated regression specifications, and include linear as well as non-linear functional forms. However, I fail to detect significant differences in media effects based on these socio-demographic characteristics, possibly due to the aggregated nature of these variables. With regards to organic preferences, previous studies confirm this limited explanatory power of socio-demographic characteristics (see Dimitri and Venezia, 2007 and Kiesel and Villas-Boas, 2007).

Diagnostics and Additional Robustness Checks

As I am utilizing a panel data set tracking weekly milk sales across stores for 52 weeks, I also address the time-series character of the data by performing tests regarding stationarity and serial correlation. Performed Dickey-Fuller tests (1979) for stationarity allow rejecting the null hypothesis of a unit root process for all price series only. The quantity series were found to be trend stationary, corrected for by

[22] The *Oakland Tribune*, the *Daily Review*, the *San Mateo County Times*, and the *Alameda Times Star* are all owned by *The Alameda Newspaper Group (ANG)*, and the same articles appear in all of those local papers simultaneously at times.

the inclusion of a linear time trend (Wooldridge, 2003). Another related concern utilizing time series and the primary critique of difference-in-differences estimators applied to time series and panel data is possible bias due to serially correlated error terms as well as serial correlation in the independent variable itself (Bertrand, Duflo, and Mullainathan, 2004). I test for serial correlation using a generalization of the Durbin-Watson test (Wooldridge, 2002) and reject the null hypothesis of no first order autocorrelation. I report Newey-West corrected standard errors with a maximum of three lags for all regression specifications.[23] As an additional robustness check, I adapt a procedure of random inference testing based on generated placebo treatments (suggested by Bertrand, Duflo, and Mullainathan, 2004). Table 7 reports comparisons between estimated news effects from the pooled regression specification and estimated effects for four random draws of a time series of placebo news coverage during 9 weeks (based on the number of weeks in which I observe media coverage). I also report how many weeks of the randomly drawn weeks coincide with actual weeks of media coverage observed in the data. Two of the randomly generated placebo news series resulted in a negative treatment effect, one of which is statistically significant at the 1% significance level. The other two placebo series resulted in positive effect, significant, but lower in magnitude for one placebos series that included two of the actual weeks.

As I am restricting the above reported analysis to include stores that had organic milk available over the entire time period, one might also be concerned about selection bias regarding the socio-demographic composition of the neighborhoods in which these stores are located. I address this concern by estimating a probit regression of inclusion of a given store in the analysis, based on observable socio-demographics. The results reported in Table 8 indicate some significant differences in the stores included in the analysis, neither of which seems to clearly suggest a systematic bias. Nevertheless, as an additional robustness check, I follow the Heckman two-step approach by including the estimated computed inverse mills ratio based on the first stage's regressions in the second stage—the regression addressing media effects (Heckman, 1979, Wooldridge, 2002). Results of this adjustment are reported in Table 9. While the coefficient on the inverse mills ratio supports selection bias, the findings on media effects are neither quantitatively nor qualitatively affected.[24] The adjustment for selection bias did affect

[23] This procedure corrects for serial correlation of unknown form in the error terms (Newey and West, 1987) and the inclusions of a maximum of 3 lags is motivated by the maximum shelf life of milk. Including a maximum of the total number of weeks (T-1) as a lag structure, does not significantly change the results, however.

[24] Including the inverse Mills ratio results in a negative and significant estimate of -.73, but does not alter the magnitude and significance of the remaining variables of interest.

the estimated fixed effects in this regression, however, suggesting that store fixed effects did account for differences in socio-demographic composition of neighborhoods.

And finally, as I am regressing quantity measures on price, one might be concerned about possible endogeneity of prices. Retailers consider all product characteristics and account for changes in demand when setting prices. This introduces a simultaneity problem in that the quantity demanded might affect prices, or prices and quantities are affected by unobserved variables simultaneously. In both cases, prices are correlated with the disturbances included in the regression specification. However, while our data exhibits considerable variation in quantities sold for both conventional and organic milk, prices of conventional milk almost exclusively vary across stores, not across weeks. Hence, prices for conventional milk were not adjusted due to demand shocks during the time period investigated. In addition, for organic milk prices, one would expect to see a price increase for organic milk after the implementation of the USDA organic seal due to an expected increase in demand. I do not observe increases in the price of organic milk for that time period. However, time-invariant variations in demand for organic milk relative to conventional milk, as well as price differences across stores, are captured by store-fixed effects. Finally, price promotions for organic milk are uniform across all stores. And while some of the price reductions do seem to coincide with news coverage, I observe cross-sectional variation in local newspapers. At least for local coverage, my assumption that price promotions and news coverage are exogenous seems plausible.

Alternative specifications and estimation over entire sample

The reported results above seem further qualitatively robust to a number of alternative specifications such as the definition of the dependent variable as the ratio of organic sales over total sales, estimation in levels and regression using organic sales only. As the inclusion of the price difference also restricts the price effects to be symmetric (a decrease in organic milk price versus increase in conventional milk price), I further estimate specifications that only include organic prices. I focused on the results presented above, as consumers are faced with two alternatives at a given store and the difference in prices between these two alternatives, rather than individual prices, should matter.

I also extended the analysis to include the entire time period available in the data. I first address possible effects of the actual USDA organic seal on packages by estimating the same specification, but including a NOP dummy equaling one for week 42—the week during which the NOP became into effect, and

alternatively, including a dummy variable equaling one for all weeks thereafter.[25] Table 10 summarizes these regression results. The results indicate that sales for organic milk compared to sales of conventional milk actually significantly decreased during the week the NOP went into effect and thereafter. This result is somewhat counterintuitive and contrary to findings in earlier studies (e.g. Kiesel, Villas-Boas, 2007). One possible explanation might be shortages in supply, or necessary adjustments to changes in the demand and distribution of organic milk that resulted in a limited availability of organic milk. During week 42, the number of stores in which organic milk is available, decreases for instance (see Figure 3). This argument could be supported by the results for selection bias. Stores excluded from the analysis have a higher median income, which seems somewhat counterintuitive. An alternative explanation might be that the NOP, in addition to product choice, also affected the store choice of consumers. This is especially likely considering the limited assortment of organic products in mainstream supermarkets during this time. This explanation is also supported by the findings in previous studies that include several distribution channels (Kiesel and Villas-Boas, 2007, Dimitri and Venezia, 2007). In order to test this argument, we investigate this possible structural change by estimating an unrestricted specification that does not constrain coefficients to be equal before and after the regulatory change. Comparisons of the restricted and unrestricted model allows us to reject the hypothesis of equal coefficients for the price variable, media effects, and time trend individually by using t-tests as well as in combined F-tests at the 1% significance level.[26] Estimating media effects prior and post NOP regulation separately results in a positive and significant 4.5% increase in the quantity of organic half-gallon fat-free milk sold relative to conventional milk in the same category prior to the NOP, an estimate consistent with our previously discussed results. The unrestricted model also results in a large and significant decrease of organic sales due to media coverage after the NOP went into effect. As a general trend from our observations of news content, media coverage tended to be more critical after the regulations went into effect. When we further differentiate news coverage by local versus national news coverage, the level of criticism presented, as well as category specific coverage, I recover a positive significant effect of local and national news coverage. The estimated treatment effects for local coverage slightly increase in magnitude compared to treatment effects prior NOP and decrease in magnitude for national coverage. Estimated negative and significant effects for critical coverage post

[25] In contacting milk processors, I verified that processors tried to ensure their products were carrying the USDA seal on the day the NOP went into effect. Different processors followed different strategies in this regard as display of the seal is voluntary, but the processor included in this analysis did post the USDA seal.

[26] These tests are equivalent to Chow tests for structural change (Chow, 1960, Wooldridge, 2003).

NOP remain unchanged and very large in magnitude for both national and local papers. The results might be explained by the fact that identification of these effects rests on two weeks only—week 42 and week 50. As discussed previously, reductions in sales in week 42 might result from supply shortages.[27] Week 50 might similarly be affected by supply shocks as the number of stores in which organic milk is available drops during this week (see Figure 3). A similar argument can be made for national coverage. Here, identification is based on three weeks, one of which includes the week spanning Christmas day and New Years Eve.[28]

Conclusions

This paper provides an empirical analysis of the effect of media coverage of organic production and regulatory changes on milk consumption. By combining data from several sources, I create a unique data set. I utilize time-series and cross-sectional variation in observed media coverage to identify media effects on actual purchases of organic fluid milk. A difference-in-differences approach (DD) allows for comparisons of means of differences in weekly sales of organic compared to conventional half-gallon, fat-free milk with and without news coverage. Following this reduced-form approach, my results suggest that media coverage significantly affects consumer purchases. Pooling news coverage to estimate an average treatment effect across newspapers, suggests average increases in organic milk sales relative to conventional milk sales of 5% during weeks for which relevant news coverage is observed. When accounting for increases in intensity of news coverage (measured by the number of articles in a given week), the results further suggest increases in the media effect due to an increased intensity. Each additional article increases organic sales at a decreasing rate, however. I also find that these media effects dissipate quickly in the weeks following news coverage, suggesting that news coverage motivates infrequent organic milk purchases, rather than a permanent change in consumption patterns. This finding seems consistent with previously reported findings: Only a small percentage of households (e.g. 36% reported in Dimitri and Venezia, 2007) bought organic milk products frequently during this time period. And finally, category specific news coverage resulted in significantly higher observed

[27] The dummy variable capturing the change in labeling regulation is dropped in an alternative specification due to collinearity such that this effect is absorbed in the media dummy variable.

[28] As our identification of media effects partly relies on time-series variation, we cannot include weekly time fixed effects to absorb these seasonal effects. However, as we regress organic milk sales relative to conventional milk sales, we account for seasonal patterns that affect the demand for milk in general. As households might be more income constrained during the holidays, one could possibly expect a bigger decrease on organic milk relative to conventional milk during this time period. Alternatively, consumers might be preoccupied during this busy time and less responsive to news coverage.

increases in sales than general coverage on organic production, while critical national and local coverage did not result in significant changes in organic milk sales prior to the implementation of the NOP.

An additional comparison of media effects both before and after implementation of the NOP suggests a structural change in consumer demand for fluid milk, possibly resulting from effects on consumers' store choice in addition to product choice. I actually detect a smaller difference in sales of organic versus conventional milk post-NOP implementation, which is inconsistent with previously reported results based on multiple grocery outlets.

While the analysis prior to the implementation of the NOP consistently suggests that newspaper coverage significantly alters consumer purchases towards organic milk, the analysis post-NOP highlights data limitations of this study. Availability of organic milk across stores varies significantly, especially post implementation, potentially a result of shortages and adjustments in the supply chain for organic milk. In addition, while I detect significant media coverage around the actual implementation of the NOP, I cannot separate the media effect from the policy effect and the effect of adding the USDA organic seal to milk cartons for this time period. As this limitation directly relates to the identification assumption in the DD approach, I place a higher emphasis on the results from a restricted sample that focuses on a time period prior to the NOP.

Differentiating the media effect based on local versus national newspaper coverage might also provide indirect support for two propositions discussed in the existing literature: Media content can play a powerful role in leading to socially desirable outcomes, and diffuse ownership can diversify viewpoints (see Gentzkow and Shapiro, 2006). Certification of organic milk under the NOP emphasizes the use of renewable resources and the conservation of soil and water to enhance environmental quality for future generations. And the significant effects for both, local and national news, but a relatively larger effect for local news indicates that consumers are relying on a number of news sources.

And finally, possibly due to the aggregate nature of the data, I find no significant differences in media effects based on socio-demographic differences. This limited explanatory power of socio-demographic differences across zip codes is consistent with results reported in previous studies (see Dimitri and Venezia, 2007 and Kiesel and Villas-Boas, 2007).

Admittedly, this analysis is limited in scope. It looks at sales within a major U.S. supermarket chain only and focuses exclusively on milk purchases. The limited availability of organic milk product varieties in mainstream grocery outlets prior to the NOP did further restrict the analysis to half-gallon, fat-free milk.

Nevertheless, the presented results highlight the need for more comprehensive policies and policy evaluations, considering media effects and interdependencies between information-based interventions and changes in alternative information source. Adding this market-based approach to the existing literature suggests that a positive media portrayal and media presence can capture consumer attention and support behavioral changes promoted by information-based policies for specialty foods. However, consumer attention seems to be short-lived and permanent changes might only be achieved through a constant information flow and/or a combination of information provision and other incentive-based policies.

As I find no significant or negative effect for critical news coverage in the context of organic food production, these results might also point to a possibly explanation of mixed results reading effectiveness of nutritional labeling policies previously published. The effectiveness of policies introduced under the Nutritional Labeling and Education Act might have been limited by the “Food News Blues” (Newsweek, 2006). In light of the ongoing obesity epidemic and the need for more comprehensive and effective regulatory strategies that encourage a shift to healthier food consumption, this area will be the main focus of future research extensions.

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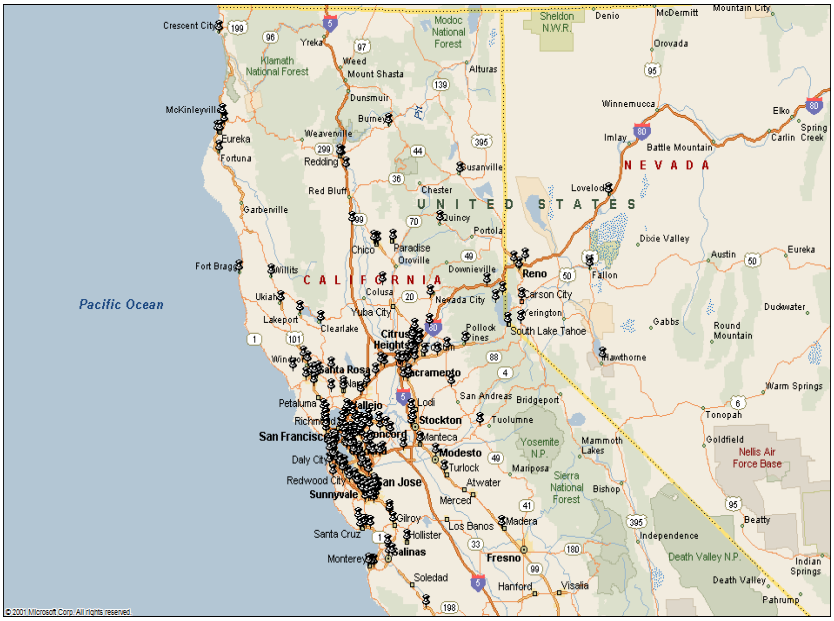
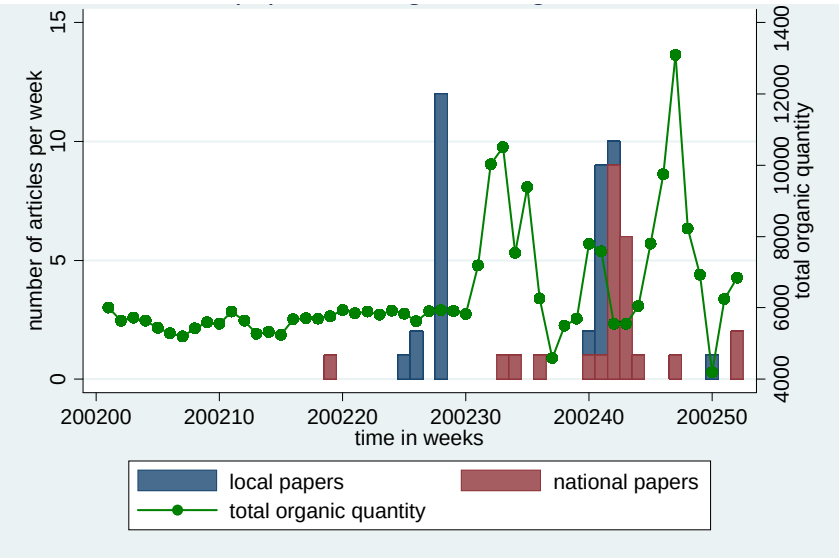
Figure 1: Location of stores included in the scanner data



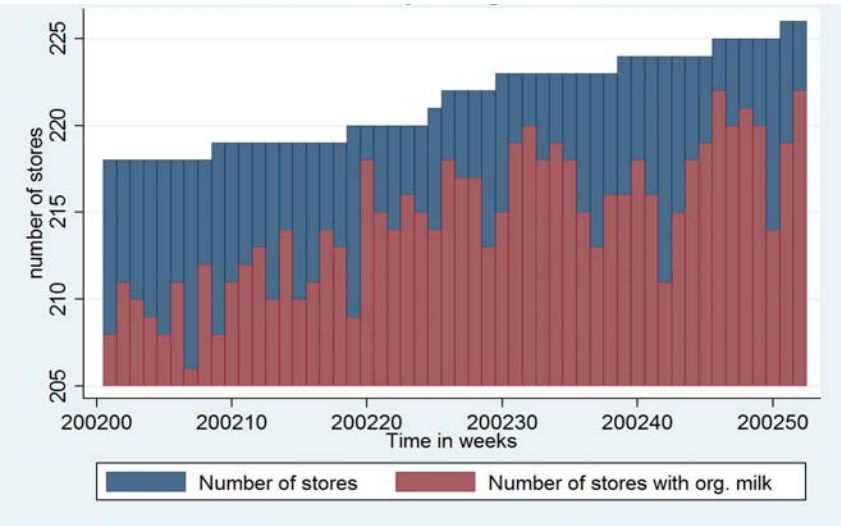
Note: This figure maps all the stores included in the data according to their store adress. In addtion to 229 stores located in Northern California, 8 stores are located in Nevada. The remaining stores are located in Hawaii and not mapped here.

Figure 2: Newspaper coverage and total organic sales



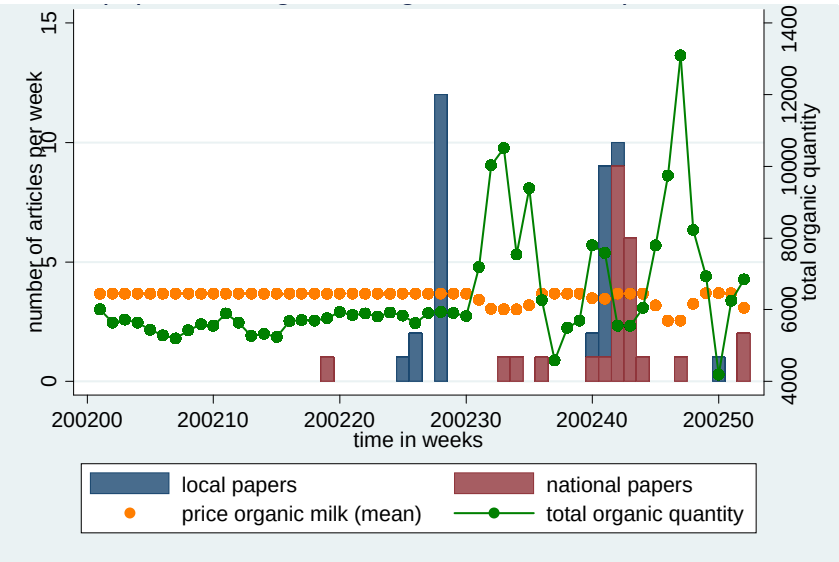
Note: This figure summarizes the correlation between variation in total organic sales and observed newspaper coverage. Newspaper coverage is displayed as a count of the number of articles per week, with no differentiation for content (e.g. critical versus supportive coverage).

Figure 3: Availability of organic milk across stores



Note: This figure illustrates significant variation in the number of stores that report greater than zero sales of organic milk . I cannot differentiate if these missing observations result from limited availablity of organic milk in these stores, or indicate no purchases during these weeks. I therefore restrict the analysis to stores that report positive organic milk sales for all weeks.

Figure 4: Newspaper coverage, total organic sales, and price variation



Note: This figure adds variation in organic milk prices to Figure 2 in order to motivate the regression analysis. Not accounting for other covariates such as price would likely overemphazise the media effect.

Table 1: Variation in local newspaper circulation and news coverage

Local paper circulation matched with stores and news covergae		
paper	**number of stores**	**weeks with news coverage**
San Francisco Chronicle	179	200225
		200226
		200228
		200241
Oakland Tribune	50	200228
		200240
		200241
Sacramento Bee	31	200242
		200245
Modesto Bee	2	200242
		200250
Fresno Bee	1	200242
San Jose Mercury News	102	200242
Monterey County Herald	8	200242
The Daily Review (Hayward)	8	200228
San Mateo County Times (Alameda Times Star)	8	200228

Note: The above statistics summarize the number of stores in zip codes for which I observe positive circulation measures in the ABC data. I also report during which weeks I observe coverage of organic production and the NOP in these local papers. One local paper, the *Alameda Times*, was not included in the ABC data.

Table 2: Summary statistics of final data set

Summary Statistics					
Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Scanner data					
price organic milk	9412	3.537692	0.3092561	2.495882	3.99
net sales organic milk	9412	123.575	100.4969	3.35	723.24
quantity organic milk	9412	35.3181	29.39137	1	232
price conventional milk	9412	1.989057	0.1131372	1.37	2.29
quantity conventional milk	9412	374.3574	183.7072	66	1527
price difference	9412	1.548635	0.3181393	0.3099999	2.037778
quantity difference	9412	-339.0393	166.5415	-1417	-29
log (quantity difference)	9412	-2.572852	0.6536174	-5.733341	-0.4234834
stores	9412	103.3536	62.55997	1	229
week	9412	26.5	15.00913	1	52
Socio-demographic data					
population total	155	33053.13	17087.41	2951	91177
median income	155	64552.63	22054.74	24346	145425
median rent	155	1005.078	264.3284	495	2001
Median house value	155	379709.5	193790	109300	1000001
Pecentage White	155	0.7107351	0.1642097	0.259237	0.9706246
Percentaqe over 65 of age	155	0.128199	0.0546383	0.0395373	0.5141721
Media coverage data					
news (dummy)	9412	0.2884615	0.453071	0	1
local & national news (dummy)	9412	0.0576923	0.2331731	0	1
national news (dummy)	9412	0.2115385	0.4084209	0	1
local news (dummy)	9412	0.1346154	0.3413304	0	1
San Francisco Chronicle circulation	154	181.2936	873.8977	58	8877
Oakland Tribune circulation	154	12.25769	168.7309	0	5167
Oakland Tribune (dummy)* circulation (%)	154	0.0401164	0.5281767	0	12.87291
San Francisco Chronicle (dummy)* circulation (%)	154	0.6455555	4.166203	0	152.0291

Note: Selective summary statistics for the combined data set are reported above. Circulation (%) indicates the percentage of newspapers sold compared to potential market size (population) For the San Francisco Chronicle, creating this measure results in two zip codes with higher than 100% circulation measures. Excluding these two zip codes results in a maximum circulation measure of 34.1% rather than the 152% reported above.

Table 3: Pooled media effects

Pooled media effects (difference-in-differences) **dependent variable:** (log) quantity org milk -(log) quantity conv milk (by week, by store)		
independent variables:	(1)	(2)
price difference	-0.768 ***	-0.765 ***
	0.027	0.027
news (dummy)	0.051 ***	
	0.010	
		0.052 ***
news (count per week)		0.008
		-0.004 ***
$news^2$		0.001
time trend (linear)	0.003 ***	0.003 ***
	0.000	0.000
store fixed effects	yes	yes
weeks with actual news coverage	9	9
number of observations	7421	7421
F-statistic	112.52	114.69

Note: The first column reports results from the base line regression, measuring the average treatment effect of news coverage based on a dummy that equals one if I observe relevant coverage in either local, or national news during this week. In contrast, the second column measures the average treatment effect based on an actual count of articles with relevant coverage during this week and adds a squared term to allow for non-linear effects due to an increase in articles. Newey West corrected standard errors (with 3 lags) are reported and *, **, *** denote statistical significance at the 10%, 5%, and 1% significance level.

Table 4: Pooled media effects and dissipation of effects over time

Dissipation of media effects (difference-in-differences)			
dependent variable: (log) quantity org. milk -(log) quantity conv. milk (by week, by store)			
independent variables:	(1)	(3)	(4)
price difference	-0.768 ***	-0.748 ***	-0.730 ***
	0.027	0.027	0.028
news (dummy)	0.051 ***	0.052 ***	0.049 ***
	0.010	0.011	0.010
1st week after news (dummy)		-0.048 ***	
		0.014	
2nd week after news (dummy)		0.016	
		0.018	
3rd week after news (dummy)		-0.022	
		0.014	
lagged dep. variable (1st lag)			0.010
			0.006
lagged dep. variable (2nd lag)			0.008
			0.006
lagged dep. variable (3st lag)			0.018 ***
			0.006
time trend (linear)	0.003 ***	0.004 ***	0.003 ***
	0.000	0.001	0.000
store fixed effects	yes	yes	yes
number of observations	7421	7421	7421
F-statistic	112.52	115.24	109.52

Note: The first column reports results from the base line regression, measuring the average treatment effect of news coverage based on a dummy that equals one if I observe relevant coverage in either local or national news during this week. In contrast, the second column includes lagged dummies for the two weeks directly following the news coverage. The third column adds lagged terms of the dependent variable. Newey West corrected standard errors (with 3 lags) are reported and *, **, *** denote statistical significance at the 10%, 5%, and 1% significance level.

Table 5: Differentiated media effects (by local versus national coverage, category specific, and critical news coverage)

General, category specific, critical coverage (difference-in- difference)		
dep. variable: (log) quantity org. milk -(log) quantity conv. milk (by week, by store)		
independent variables:	(1)	(5)
price difference	-0.768 ***	0.756 ***
	0.027	0.028
news (dummy)	0.051 ***	
	0.010	
(national) news milk (dummy)		0.107 ***
		0.021
national news organic (dummy)		0.045 ***
		0.015
local news organic (dummy)		0.070 ***
		0.016
national news organic critical (dummy)		-0.002
		0.022
local news organic critical (dummy)		-0.046
		0.038
time trend (linear)	0.003 ***	0.003 ***
	0.000	0.000
store fixed effects	yes	yes
number of observations	7421	7421
F-statistic	112.52	122.88

Note: The first column reports results from the base line regression, measuring the average treatment effect of news coverage based on a dummy that equals one if I observe relevant coverage in either local or national news during this week. In contrast, the second column differentiates between local and national news, category specific milk (e.g. coverage that directly relates to milk), and critical coverage. Newey West corrected standard errors (with 3 lags) are reported and *, **, *** denote statistical significance at the 10%, 5%, and 1% significance level.

Table 6: Local media effects (*San Francisco Chronicle* and *Oakland Tribune*)

Local paper coverage (difference-in-difference)				
dependent variable: (log) quantity organic milk -(log) quantity conventional milk (by week, by store)				
independent variables:	(1)	(6)	(7)	(8)
price difference	-0.768 ***	-0.751 ***	-0.752 ***	-1.410 ***
	0.027	0.027	0.022	0.180
news (dummy)	0.051 ***			
	0.010			
San Francisco Chronicle		-0.019	-0.043 *	-0.026
		0.015	0.022	0.121
San Francisco Chronicle*circulation			0.003 *	
			0.002	
Oakland Tribune (dummy)		0.111 ***	0.115 ***	-0.028
		0.019	0.020	0.114
Oakland Tribune*circulation				
national news (dummy)		0.050 ***	0.050 ***	0.069
		0.012	0.012	0.060
time trend (linear)	0.003 ***	0.003 ***	0.003 ***	0.003
	0.000	0.000	0.000	0.003
store fixed effects	yes	yes	yes	yes
number of observations	7421	7421	7257	168
F-statistic	112.52	116.06	115.5	43.2

Note: The first column reports results from the base line regression, measuring the average treatment effect of news coverage based on a dummy that equals one if I observe relevant coverage in either local or national news during this week. The second column includes a dummy measuring coverage in the San Francisco Chronicle and Oakland Tribune, as well as national paper coverage. The third column additionally adds circulation measures. In the last column, we use the Nevada stores included in the data, rather than the California stores as a robustness check. Newey West corrected standard errors (with 3 lags) are reported and *, **, *** denote statistical significance at the 10%, 5%, and 1% significance level.

Table 7: Media effects versus generated placebo effects

Media and placebo effects (difference-in difference) **dependent variable:** (log) quantity organic milk -(log) quantity conventional milk (by week, by store)					
independent variables:	(1)	(10)	(11)	(12)	(13)
price difference	-0.768 ***	-0.767 ***	-0.772 ***	-0.769 ***	-0.772 ***
	0.027	0.047	0.027	0.027	0.027
news (dummy)	0.051 ***	-0.018 **	0.016	-0.005	0.021 **
	0.010	0.027	0.010	0.009	0.009
time trend (linear)	0.003 ***	0.004 ***	0.004 ***	0.004 ***	0.004 ***
	0.000	0.000	0.000	0.000	0.000
store fixed effects	yes	yes	yes	yes	
weeks with actual news	9	0	1	2	2
number of observations	7421	7421	7421	7421	7421
F-statistic	112.52	111.43	111.87	111.56	111.46

Note: The first column reports results from the base line regression, measuring the average treatment effect of news coverage based on a dummy that equals one if I observe relevant coverage in either local or national news during this week. The second to forth column report regressions results when we generate a random draw of nine weeks each to define placebo news dummies. The overlap with actual news coverage is reported as well. Newey West corrected standard errors (with 3 lags) are reported and *, **, *** denote statistical significance at the 10%, 5%, and 1% significance level.

Table 8: Investigating selection bias due limited availability of organic milk in some stores

Selection bias (Probit regressions) **dependent variable:** analyzed stores (coded as 1)		
independent variables:	marginal effects (a)	marginal effects (b)
population total	$1.08*10^{-6}$	
	0	
median income	$-8.40*10^{-6}$ ***	$-8.51*10^{-6}$ ***
	0	0
percentage of White	0.395 **	0.370 ***
	0.161	0.141
median house value	$1.17*10^{-6}$ ***	$1.50*10^{-6}$ ***
	0	0
median rental contract	0.0004 *	0.0004 *
	0.0002	0.0002
percentage over 65 of age	0.152	
	0.461	
number of observations	240	240
Pseudo R^2	0.278	0.275

Note: The dependent variable in these regressions equals one if the store is included in the regression analysis. 240 stores are included in the data, 181 of which are included in the regressions reported above. The first column includes all socio-demographic variables, while the second column re-estimates the regression excluding the insignificant variables. Robust and clustered (by store) standard errors are reported and *, **, *** denote statistical significance at the 10%, 5%, and 1% significance level.

Table 9: Media effects accounting for possible selection bias

Media effects accounting for selection bias (difference-in differences) **dep. variable:** (log) quantity organic milk -(log) quantity conventional milk (by week, by store)		
independent variables:	(5)	(9)
price difference	0.756 ***	-0.758 ***
	0.028	0.029
(national) news milk (dummy)	0.107 ***	0.106 ***
	0.021	0.021
national news organic (dummy)	0.045 ***	0.045 ***
	0.015	0.015
local news organic (dummy)	0.070 ***	0.071 ***
	0.016	0.023
national news organic critical (dummy)	-0.002	-0.004
	0.022	0.023
local news organic critical (dummy)	-0.046	-0.022
	0.038	0.039
time trend (linear)	0.003 ***	0.003
	0.000	0.000
inverse Mills ratio		-0.736 ***
		0.097
store fixed effects	yes	yes
number of observations	7421	7421
F-statistic	122.88	123.27

Note: The first column repeats results reported in Table 5 (column 2) and the second column adds the inverse Mills ratio to account for possible section bias. Including the inverse Mills ratio has an effect on the store fixed effects not separately reported here. Newey West corrected standard errors (with 3 lags) are reported and *, **, *** denote statistical significance at the 10%, 5%, and 1% significance level.

Table 10: Pooled media effect and possible structural change due to the implementation of the NOP

Possible structural change (difference-in-differences)								
dependent variable: (log) quantity organic milk -(log) quantity conventional milk (by week, by store)								
independent variables:	(1)	(14)	(15)	(16)	(17)	(18)		
						before NOP	after NOP	
price difference	-0.768 ***	-0.688 ***	-0.699 ***	-0.696 ***	-0.692 ***	-0.745 ***	-0.560 ***	
	0.027	0.017	0.016	0.016	0.017	0.026	0.021	
NOP week (dummy)		-0.120 ***			-0.091 ***		-0.049	
		0.027			0.028		0.031	
post NOP period (dummy)			-0.068 ***		-0.058 ***		0.068	
			0.014		0.015		0.147	
news (dummy)	0.051 ***			-0.001	0.003	0.045 ***	-0.209 ***	
	0.010			0.009	0.009	0.010	0.017	
time trend (linear)	0.003 ***	0.004 ***	0.005 ***	0.004 ***	0.005	0.004 ***	0.001	
	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
store fixed effects	yes	yes	yes	yes	yes	yes		
number of observations	7421	9412	9412	9412	9412	9412		
F-statistic	112.52	139.78	140.04	141.65	137.75	136.87		

Note: The first column reports results from the base line regression, measuring the average treatment effect of news coverage based on a dummy that equals one if I observe relevant coverage in either local or national news during this week. The second column includes an identifier for the week during which the NOP was implemented, while the third column includes an identifier for all weeks post implementation as well. The fourth column includes both identifiers, and the last column estimates weeks prior and post implementation separately. Newey West corrected standard errors (with 3 lags) are reported and *, **, *** denote statistical significance at the 10%, 5%, and 1% significance level.

Appendix A: News coverage included in the regression analysis

Week	Date	Source	Title
200233	08. 20.2002	The Wall Street Journal	Is that $5 Gallon Milk Really Organic?
200234	08. 26.2002		Would World Starve on Organic Farming
200236	09. 11.2002		Stamp of Approval from U.S. to Help Horizon Organic
200243	10. 25.2002		Taste—Review & Outlook: Hard to Swallow
200247	11.20.2002		Where Organic Beef Roam
200252	12.26.2002		The Organic Myth
200252	12.26.2002		Organic Food Aren't Necessarily the Healthiest Choice
200240	10. 9. 2002	The Washington Post	A Guide to New Organic Terminology
200243	10. 21.2002		The New Standards; What Does 'Organic' Really Mean?
200244	11.04.2002		Nothing Organic about Factory Farms
200219	05.08.2002	The New York Times	Study finds far less Pesticide Residue on Organic Produce
200241	10. 14.2002		Small Organic Farmers pull up Stakes
200242	10. 16.2002		A Definition at Last, but What Does It All Mean?
200242	10. 18.2002		Clearly Organic
200242	10. 20.2002		The 'Organic' Label: Who Wins at the Bank?; [Interview]
200242	10. 20.2002		Going Organic
200242	10. 20.2002		Eat, and buy organic
200242	10. 21.2002		Organic Gets an Additive: A U.S.D.A. Seal to Certify It
200242	10. 21.2002		A New Organic Era; [Editorial]
200243	10. 23.2002		Sharing the Organic Harvest
200243	10. 29.2002		How Foods Earns the Organic Seal
200252	12.25.2002		North of San Francisco, Cream Rises to the Top
200242	10. 16.2002	USA TODAY	USDA gives bite to organic label
200242	10. 21.2002		With new organic labels, each purchase equals a vote
200243	10.28.2002		Big Business Gobbling up Small Organic

			Farms
200243	10.29.2002		Healthy Food Turns up in Unusual Places
200225	06.22.2002	The San Francisco Chronicle	Organic Dairies feel squeezed; Lawsuit contests State Fees
200226	06. 27.2002		Bay Area tops State in Concern for Earth; More buy Organic, Recycle. Poll finds
200228	07.15.2002		Voices against Agribusiness
200241	10. 13.2002		Agribusiness goes organic, New law and growing appetite for wholesome foods bring mega growers to the Table
200241	10. 13.2002		Standards Grew out of Long Process
200228	07. 16.2002	The Oakland Tribune	Learning More About Organic
200228	07. 16.2002		Getting to the Root of Organic
200228	07. 16.2002		Its Easy being Green: Northern California enjoys Fruit and Organic Renaissance
200240	10. 6.2002		Organic Foods Definitely Worth Price
200241	10. 9.2002		USDA Organic Rule Takes Effect in 12 Days
200241	10. 9.2002		Why Organic Costs More
200241	10. 9.2002		Organic Rules: Government's New Standards Aim to Take Guesswork Out of Buying Organic
200242	10.16.2002	Sacramento Bee	Stamp of Approval What's Organic? Government Hopes New Rules on Labeling Will End the Confusion
200242	10.16.2002		What the Various Organic Terms Mean
200242	10.22.2002		Organic foods go Mainstream USDA's Label Rules Take Effect
200245	11.8.2002		Organic, Shmorganic
200242	10.22.2002	Modesto Bee	National Organic Food Standard Finally go Into Effect
200242	10.22.2002		Organic Market Tastes Change Uniform USDA Seals expected to Boost Profits
200250	12.12.2002		Small California Growers fear Being Squeezed from Market Due to Organic Boost
200242	10.21.2002	Fresno Bee	FDA Launches Stricter Standards for Organic Food Claims
200242	10.20.2002		New Labels help Buyers Federal Regulations

			will ensure Products meet Standards
200242	10.17.2002	San Jose Mercury News	'Organic' Label Frustrates Small Farmers
200242	10.22.2002		Federally Certified Organic Foods Make Way to Grocery Stores
200242	10.21.2002	Monterey County Herald	'Organic' Foods Law takes Effect
200228	07.16.2002	Alameda Times Star	Learning More About Organic
200228	07.16.2002		Getting to the Root of Organic
200228	07.16.2002		Its Easy being Green: Northern California enjoys Fruit and Organic Renaissance
200240	10.06.2002		Organic definitely worth the price
200241	10.09.2002		USDA Organic Rule Takes Effect in 12 Days
200241	10.9.2002		Why organic costs more
200228	07.16.2002	The Daily Review (Hayward)	Learning More About Organic
200228	07.16. 2002		Getting to the Root of Organic
200228	07.16. 2002		Its Easy being Green: Northern California enjoys Fruit and Organic Renaissance
200228	07.16. 2002	San Mateo County Times	Learning More About Organic
200228	07.16. 2002		Getting to the Root of Organic