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Media effects on sustainable food consumption. How newspaper coverage relates to supermarket expenditures.

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Is media effective in promoting sustainable consumption of food? How newspaper coverage relates to supermarket expenditures

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Abstract

Information provision is often considered to have an important role to play in changing consumers' choices. However, there is still no consensus on the mechanisms by which information might influence specific consumer expenditures, especially in relation to environmentally friendly food products. This paper explores whether the public debate on sustainable consumption in UK broadsheets and tabloids relates to observed consumers' expenditures. It does so by relating the number of published articles on selected sustainability topics to consumers' food expenditure in Tesco supermarkets from May 2009 to May 2011, using regression analysis. We selected only regular Tesco shoppers who frequently buy the Sunday editions of the analyzed newspapers. Results indicate only sparse and inconsistent correlations suggesting that the impact of information is only minimally effective: the number of newspaper articles positively relates to expenditures mainly when consumers can shift between products (e.g. from general products to organic, fair trade or sustainably sourced food); but no consistent effects are observed when media target a change in more general food categories (e.g. a reduction in food of animal origin). Content analysis of a subsample of published articles on organic food shows that the framing of the news is

important: change is positively related to information proposed uncritically; and negatively to information contextualized as a highly structured debate.

Keywords: Consumer expenditures; Media readership; Scanner data; Sustainable Consumption; Food; Mixed Methods

1. Introduction

An increasing body of literature addresses the role of media on public opinion, attitudes and behavioral change in relation to climate change, and particularly to sustainable consumption. This interest arises because media are considered an important setting for the reconstruction of environmental discourses (Corbett and Durfee, 2004), and have a strong influence on people's perception of environmental problems (Sampei and Aoyagi-Usui, 2009). At the same time, media have an acknowledged role in building consumers' culture (Michaelis, 2001) through the reinforcement of fashionable trends and the promotion of role models (Michaelis, 2002; Buenstorf and Cordes, 2008). Finally, media exert a substantial influence on the acquisition of consumption knowledge by determining the information that reaches consumers (Buenstorf and Cordes, 2008; Vigar *et al.*, 2011).

Because of their role in information provision, media sources are generally believed to have some effects in directing consumer choices and behavior. Most policy interventions aiming at targeting consumption are framed around what Shove (2010: 1274) polemically calls the ABC models: in order to influence consumers' choices (C), which are outcomes of specific behaviours (B), policy needs to modify individuals' attitudes (A). Under this paradigm, if media are effective in influencing how people explicitly feel about the environment (their explicit attitudes, or consumer's stated intentions) we should expect some variation in people's choices and behaviours. The acknowledged limit of this approach consists in the observed inability of pro-environmental attitudes to translate into environmentally friendly choices and sustainable behaviours. This problem is known as "attitude-behaviour gap" (LaPiere, 1934; Blake, 1999, DEFRA, 2008), and has been studied in several disciplines from different perspectives, sometimes focusing on the lack of correspondence between explicit and implicit attitudes (Beattie *et al.*, 2009), more often by considering the constraints of contextual factors on people's choices (the C in Shove's description, which refers to the context in the dominant models that Shove criticizes).

The problem identified by Shove consists in the fact that by focusing on choices, and attitudes influencing them, earlier models have identified many external and impeding contextual factors, forming an arbitrary and inefficient list (Shove 2010, 1275). A whole direction of research have thus shifted the attention from attitudes to practices (Warde, 2005): here the focus is not on what people think, believe, or value, but on what people do, or declare they do, in their everyday life (see for example Hards, 2012), and the consequences that the outcome of habits and routines (no matter if intentional or unintentional) have for the environment. Therefore, the context here is not anymore an external factor which acts as a barrier for environmentally friendly choices, but it is a complex cultural, material and technical system which embeds and shapes people's practices (Warde and Southerton, 2012; Southerton *et al.*, 2011; Shove, 2010; Warde, 2005; Southerton *et al.*, 2004). Important for the scope of this article, consumption can now be considered as "a moment in almost every practice" (Warde, 2005: 137). Consumption in this sense is not restricted to its market sense, as in purchases of goods, but as a process of both appropriation and usage of every element that is needed to perform a practice.

Despite the strong indication that sustainable development will not be achieved by simply modifying consumers' purchases, but requires a restructuring of the entire system of provision and usage of resources (Southerton *et al.*, 2004; Southerton *et al.*, 2011), the ABC approach still informs policymakers targeting behavioural change in environmental consumption (e.g. European Commission, 1999; DEFRA, 2008). In what seems to be the mainstream approach (for some notable exceptions see Southerton *et al.*, 2011), consumers are surveyed on a large scale, segmented according to their explicit attitudes and reported behaviours on specific issues (see e.g. Barr and Gilg, 2006) and targeted appropriately using different strategies (for instance eco-labelling, information campaigns, media coverage). This is the case, for example, of food consumption, where information has focused especially on the kind of products which have more or less environmental impact. By informing consumers on the greenest available choices, assuming the positive attitudinal

disposition toward sustainable consumption, public interventions aim at modifying the patterns of consumers' purchases, and consequently reduce the environmental impact of overall food consumption.

The limits of such interventions are essentially that there is no consensus on how information effectively impacts over food consumption. On one hand it is not clear how information is perceived by consumers. As highlighted by Eden et al. (2008), consumers adopt "knowledge fixes" regarding sustainable food (in relation to, for example, buying ethical or local products), which are perceived through several proxies (visual and spatial cues, information on labels). Furthermore, their conceptualization of 'good' food might not necessarily match the way they consume it (Eden et al., 2008: 1054). On the other hand, as we previously mentioned, purchase is only one aspect of consumption: the environmental impact of food consumption depends much more on the system of distribution, provisioning, usage and waste of food. It is embedded in the "practical, collective, sequential, repetitive and automatic aspects of consumption" (Warde and Southerton, 2012: 6), where free individual choice, in terms of what people buy, has very little to explain.

Consequently, large studies that survey people's opinion and expect to change their habits by implementing targeted information strategies tend to have a low probability of success: it is by ethnographically looking at the points in which emerging practices anchor themselves to the contextual spaces of other sets of normalised practices that we discover extremely useful elements for designing policies. Once we are able to locate practices within their daily spatial and temporal environment we can also facilitate or constrain the infrastructures that shape them (Shove and Southerton, 2000). However, in a recent paper Southerton et al. (2012) criticise the dominance of qualitative approaches in the study of practices by pointing out that although extremely important in disentangling the determinant factors that lock together everyday activities, a contextualised micro analysis fails to account for changes in the performances and distribution of practices and lacks the

power of generalization. For these reasons, it misses the opportunity to speak to policy makers on the same scale of quantitative studies.

The goal of the paper is to address this specific limit by testing the effects of information provision on consumers' food expenditures on a large scale, whose effectiveness is at the core of the critiques of the ABC models advanced from the theory of practices. While previous studies show some correlations of information over public opinion and explicit attitudes (Mazur and Lee, 1993; Nisbet and Myers, 2007; Sampei and Aoyagi-Usui, 2009; Scruggs and Benegal, 2012), we want to see if media information can be related to consumers' food expenditures, and if so, how it is related. If we find no dependency between information and purchases, results give strength to the critiques of the ABC models that aim at modifying consumers' purchases by simply informing them on the sustainability of products. If we find some dependency, we want to understand under which conditions information may be useful for changing expenditures patterns. In order to address these questions we adopt a mixed method explanatory sequential design (Creswell et al. 2008): quantitative analysis is employed to observe how the coverage of news targeting sustainable food consumption in printed UK media (broadsheet and tabloids[1]) relates to food expenditures in Tesco supermarkets over a two-year period; qualitative analysis is subsequently used on a subsample of the data, selected for its significance, to explain quantitative results by producing a set of interpretative hypothesis.

The focus on printed media stems from their important contribution in distributing public knowledge (Bell, 1994; Wilson, 2000). While consumers use a variety of information sources (e.g. television and internet, see Nerlich and Koteyko, 2009; Gavin and Marshall, 2011), printed media are still considered the most credible source of information, percolating the credibility over the online version of broadsheets and tabloids (Kang *et al*., 2011), where people tend to read the same titles both online and offline (Chyi and Lasorsa, 2002). Several studies have observed and tested the relation between the debate on climate change in media and public opinion on environmental issues,

and the second section of this paper reviews them. But most of these studies observe people's reported attitudes and opinions on general environmental issues, leading to a lack of research on the influence of food-related information[2] over observed purchases in specific markets.

The existing literature in cultural and media studies established that media discourses are multifaceted, and are transmitted and perceived differently from different audiences (Hall, 1980; Liebes and Katz, 1990). Furthermore, the frame of the news has an impact on how people decode the message (Hall, 1980; Scruggs and Bengal, 2012). Therefore we should expect that discourses on different topics impact audiences differently, but we do not know how information relates to consumers' purchases: are there some topics that prove to be more effective in influencing food purchases over time? And if so, how are they framed compared to unsuccessful topics? The first research question is addressed using regression analysis (specified in the second section) while content analysis is adopted to observe in detail the framing and content of news. The third section describes the data used in the analysis, where we connect the number of articles dedicated to environmentally friendly food categories in four printed media in UK with corresponding monthly grocery expenditure data from Tesco, the largest UK retailer (DEFRA, 2011). Section four presents the results of the quantitative analysis, which we accompany with a qualitative content analysis of a subsample of articles discussing organic food. In section five, we summarize reflecting on the implications of our results. Section six concludes.

2. Literature review: information, public opinion and consumer purchases

The academic literature on the provision of environmental news and its influence over public opinion is vast. Part of the debate concentrates on how news related to climate change are constructed and framed in newspapers, for example by observing the periodicity of the focus on climate change in media (Brossard *et al.*, 2004; McComas and Shanahan, 1999; Downs, 1972); the discrepancies between scientific consensus (Oreskes, 2004); and the misrepresentation of scientific work (Boykoff and Boykoff, 2004; Boykoff, 2008; Antilla, 2005; Freudenburg and Muselli, 2010).

Substantial attention has been given to the role of newspapers ideologies (Carvalho 2005; 2007), and journalistic norms (Boykoff and Boykoff, 2004; 2007; Boykoff, 2007) over reported issues, but also to the spatial and national localization of the perception of environmental problems (Grooch, 1996). Importantly, research have revealed how the skeptic coverage of climate change can manufacture uncertainty (Gavin and Marshall, 2011; Dunlap and McCright, 2010); have explored the rhetorical use of new concepts like carbon compounds (Nerlich and Koteyko, 2009); or the international coverage of political initiatives like the EU climate package (Uusi-Rauva and Tienari, 2010).

In general, this literature concentrates on broad environmental issues. Discourse analysis has been the primary tool for the qualitative identification of dominant patterns of discussion framing the environmental debate in the news (Doulton and Brown, 2009; Gavin and Marshall, 2011), and for the analysis of the underlining political, economic, cultural, and infrastructural content (Sonnet *et al.*, 2006; Uusi-Rauva and Tienari, 2010; Gavin and Marshall, 2011). In some cases quantitative techniques have been used to test the influence of information over opinion pools. Scholars have found a strong relationship between the amount of media coverage of climate change and shifts in public opinion (Nysbet and Myers, 2007), although with a short-lasting influence mainly due to the competition of other issues in the media arena (Sampei and Aoyagi-Usui, 2009). Some authors found that public opinion can be negatively influenced by contradictive media coverage, and other factors, like economic crises, might equally play an important role (Scruggs and Benegal, 2012). Finally, the content of the news seem to have less effect on public awareness of environmental problems than the mere number of published articles (Mazur and Lee, 1993). In other words, the more consumers are exposed to an environmental problem, no matter how contradictive the debate is, the more they declare to be aware.

The study of media coverage and public opinion has thus benefit from both qualitative and quantitative approaches, the first being able to disentangle the way in which news are framed,

information perceived, and opinions informed; the second generalizing the qualitative observation on a large scale and assessing the impact numerically. In this article we want to merge the two approaches and their peculiar strengths. First, we want to extend the existing literature by testing the conditional dependence between media coverage of food-related environmental issues against actual food expenditures, rather than against reported attitudes or public opinions. Following previous results based on public opinion studies, we explore whether a positive correlation between the number of published articles on a specific topic and the corresponding expenditures exists, and how long the relation might last (or might take to be observed).

To test for the conditional dependence of media articles on newspaper expenditures, we regress total expenditure (*sales*) on a product with environmental implication at time *t* with the number of article published on the subject (*media*) as

$$\ln(sales_t) = \beta_o + \beta_1 \cdot \ln(p_t) + \beta_2 \cdot \ln(foodexp)_t + \sum_{k=0}^{4} \delta_k \cdot media_{t-k} + e_t \qquad (1)$$

$$\ln(sales_t) = \alpha_o + \alpha_1 \cdot \ln(p_t) + \alpha_2 \cdot \ln(foodexp)_t + \gamma \cdot \sum_{k=0}^{4} media_{t-k} + e_t \qquad (2)$$

These two expenditure functions (see Varian, 1992) differ on assumptions related to information diffusion, explained below. Both equations adjust for total food expenditures (*foodexp*), and average price (p_t). Residuals are assumed to be temporally autocorrelated[3], where $e_t = (\rho \cdot e_{t-1} + \upsilon_t)$. The number of articles as media variable is consistent with research highlighting that public awareness on environmental issues relies primarily on quantitative coverage (number of articles) rather than qualitative (its content) (Mazur and Lee, 1993).

Rather than assuming only a contemporaneous relation between information and consumer expenditures, equations (1) and (2) allow for a slow assimilation process. Four monthly lags correspond to the duration of the impact of advertising on sales (Clarke, 1976). While advertising

differs from media as a less impartial source of knowledge, it can still be considered as a form of information supply (Nelson, 1974), and Clarke's estimates (1976) represent the best option in the absence of equivalent parameters for media. Importantly, equations (1) and (2) differ on the assumption made on media diffusion: equation (1) represents a flow model of information; equation (2) is a stock model (see e.g. Tichenoret *et al.*, 1970). Despite its importance, the distinction between flow and stock of knowledge from media tends to be marginal in the current academic literature. Media flow refers to the diffusion of articles over time, where information is gathered and progressively fades away. Media stock instead refers to articles with a consistent effect: information is stored immediately and lasts for a given period of time (four months in our case). Importantly, in a flow model the role of a specific article changes over the four months, while it remains constant in a stock model. Because the literature has not provided a complete understanding of which pattern is more realistic, we report results from both models, leaving the question of performance to future research.

Quantitative estimates from equations (1) and (2) assess the first research question by looking at the overall relation between media and expenditures, if any, paying attention to specific topics of discussion and their corresponding expenditure categories, but cannot explain differences in response patterns. Consequently, the second step is to investigate how the framing of the food-related environmental message might influences consumers. Media information tends to endorse specific privileged narratives about causes and solutions to environmental problems (Bourke and Meppem, 2000), and incorporates political objectives stemming from the biased stance of the newspaper (Brandenburg, 2006). At the same time, in contrast with Mazur and Lee's results (1993), other scholars have found that conflicting messages on scientific knowledge might have a negative effect on the public's view of objectivity and competence of scientific experts (Weber and Stern, 2011). We want to observe if the political standing of the media and their respective readers, and the specific framing of the news, relate not much to public opinions and attitudes, as observed in

Carvalho (2005; 2007), rather to consumers' expenditures. This second research question is studied performing content analysis of a subsample of those articles included in the quantitative analysis.

3. Material and methods: data collection

In our empirical analysis, we use supermarket data representing actual purchasing behaviors in specific categories of food consumption. The data refers to expenditures recorded in Tesco Clubcard dataset, a databank containing information on around 16.5 million UK cardholders. While the quantitative analysis refers to a large number of consumers, Tesco Clubcards owners are not necessarily representative of the UK population. Tesco stores are spread across the whole UK, with stores located in each postcode of the country and with an estimated market share of 30.7% in December 2011 (see e.g. http://www.guardian.co.uk/business/2010/dec/07/tesco-market-share-sales), providing a rich dataset with a diversified sample of consumers[4]. However, socio-economic characteristics are only provided when consumers enrol and are not frequently updated, not allowing a comparison with national statistics[5]. Also, the dataset does not account for provision of food from different retailers: data only describes expenditures of Tesco Clubcard holders in Tesco shops, without providing any information on items purchased elsewhere (e.g. farmers markets). Finally, the act of purchasing specific products does not imply their consumption: the data does not reveal if people actually eat what they buy or how much of it is wasted. Therefore, we cannot account for the exact environmental impact of food consumption. On the same line, academic research presents unclear results on whether some categories (e.g. fair trade or organic products) are effectively environmentally sustainable or not. Nevertheless, the dataset observes a varied range of expenditure classes (of newspapers and food), which can be connected to determine a high-resolution image of consumers over time, despite the limits on the generalization of our results.

We focus on selected food categories with environmental implication, which have been related to readerships of two UK broadsheets and two tabloids with opposite political stance. As we can observe consumers' purchases of broadsheets and tabloids during their food weekly shopping,

we can associate the expenditures for news with expenditures of other goods for registered loyalty-cardholders. We selected media sources focusing on four criteria. First, readership includes the two most popular broadsheets and tabloids in the UK (figure 1a and 1b). Second, we limit our attention to national press. Third, we exclude printed media with no Sunday edition (as discussed below). Finally, the analysis limits its focus on one liberal and one conservative broadsheet, as well as one liberal and one conservative tabloid, deriving the political stance from the "Voting by Newspaper Readership 2010" survey (table 1). These criteria identified ***The Daily Mail*** (conservative) and ***The Daily Mirror*** (liberal) as tabloids; and ***The Daily Telegraph*** (conservative) and ***The Guardian*** (liberal) as broadsheets. A caveat of the data is that it only analyzes a specific source of information (broadsheets and magazines), with no information on other sources like television, internet, or marketing campaigns. Also, it does not account for multiple readerships: while a non-significant effect could be caused by readership of different media with conflicting messages, we still capture the average impact of articles from a newspaper on the expenditures of their readers. Certainly, purchasing a newspaper does not necessarily imply reading it, and an insignificant coefficient could indicate that consumers buying that printed media have simply skipped the environmental information[6]. [HERE FIG 1A AND 1B]

[HERE TAB 1]

The four sources have been searched for articles related to sustainable food using the Lexisnexis library (http://www.lexisnexis.com). Keywords and food categories are based on SUSTAIN's principles of sustainable food (http://www.sustainweb.org/sustainablefood/). Through these principles we developed a series of text strings (table 2) and searched for the number of articles containing them. We covered the period February 2009 to May 2011 (lags refer to the period February-May 2009). We also included a general category covering 'sustainable food' to capture articles on sustainability that do not contain any other searched terms.

[HERE TAB 2]

Subsequently, we identified 18 grocery categories that could be viewed as targets of the articles containing the searched strings, specifically 16 food categories, one aggregate food index, and one washing liquid (table 3). All categories have been defined and designed by us to ensure relevance for the corresponding media searching strings. Dunnhumby Ltd (the data manager) provided monthly food expenditures for each of these categories (total sales in GBP) from the Tesco Clubcard dataset, from May 2009 to May 2011. Data also includes an average price[7] and total food and drinks (F&D) expenditures. We could not observe some food categories of interest to the analysis, particularly British labels or sustainable fish. While no proxy for local food was available, we used general fish expenditures to represent expenditures patterns in the market for fish.

As an aggregate food index we used the Environmentally Sensitive Shopper (ESS) index (Author's ref, 2012), an indicator of sustainable food consumption designed by our research team. The ESS index measures how sustainable club card holders' purchases are on the basis of the percentage of expenditures on six items - total meat, red meat, fruit and vegetables (F&V), organic F&V, bottled water, and online shopping - over total expenditures in the reference category. If people spend more (or less, depending on the goodness or badness of the category) than the yearly median value for the population (where the population here is intended as all regular Tesco shoppers), they score one point for each category. For example, if someone spends less than the median value on meat in her total month expenditures, she scores one point. If someone spends more than the media value on organic fruit and vegetables in her total month expenditures on fruit and vegetables, she scores a point. The six individual scores are then added up to form the ESS index, which varies from 0 (unsustainable expenditures) to 6 (sustainable expenditures, see Author's ref, 2012 for further information).

[HERE TAB 3]

For each broadsheet and tabloid, expenditure data refers to readers who regularly buy them. The baseline population of a newspaper includes whoever has purchased the corresponding Sunday edition (the Observer, The Sunday Telegraph, the Mail on Sunday, and the Sunday Mirror) in the month considered. A customer is then regarded as regular buyer of the specific broadsheet/tabloid only if she spends on it more than the 2-year median of the population of readers of each specific broadsheet/tabloid (i.e. the top 50% of the population only). The focus on Sunday editions is crucial: the Tesco Clubcard data reveals that daily newspapers are not regularly bought in specific supermarkets, while Sunday editions are commonly purchased during the weekly shopping trip. The starting sample includes in the analysis only regular Tesco shoppers to avoid a sample bias. Each expenditure class is collected for four different samples: 65,870 readers of the Mail; 50,910 readers of the Mirror; 18,914 readers of the Telegraph; and 29,760 readers of the Guardian.

4. Results

Before discussing results of the quantitative analysis, it is worth exploring the distribution of articles in each thematic area in the four sources of information. From February 2009 to May 2011 (included) the four media published 7,201 articles related to at least one principle of sustainable food. Of these, 29% discuss sustainable food in general; 39% organic products; while 28% are dedicated to the sustainability of food from animal origin (table 4). All remaining categories (fair-trade, sustainable fish and health) take the remaining 4% of the media space. The Guardian (the leading source of food-related environmental articles), and the Daily Telegraph are the most prolific suppliers of articles within each topic.

[HERE TAB 4]

While the overall monthly trend of articles covering food-related environmental issues is stable in the period analysed (figure 2a), broadsheets and tabloids seem to have fluctuating trends in dealing with sustainable food topics. Fluctuations are sharper in 2010 and 2011 compared to 2009.

Dips in December suggest that the number of articles on food-related environmental topics is relatively low before Christmas and New Year, increasing noticeably in January. Individual broadsheets and tabloids behave differently (figure 2b): attention to sustainable food has declined in the Guardian and increased in the Telegraph. Similarly, articles in the Mail show a mild downward trend, while those in the Mirror increased slightly.

[HERE FIG 2A AND 2B]

Overall, the distribution of articles suggests that broadsheets engage with food related environmental concerns more than tabloids; that the Telegraph has gradually replaced the Guardian as the leading source of information; and that there are some periods during the year (like Christmas and the summer) where the attention to sustainable food declines, but this is compensated in subsequent months.

4.1. Quantitative analysis

In this section we observe how the quantity of food-related environmental information links with corresponding consumers' expenditures, considering articles as stock or flow in separate regressions. It is worth mentioning that the analysis simply shows conditional dependence and matching trends between two variables. In other words, the analysis does not necessarily identify a causal effect of the number of media articles on expenditures, but only a co-movement whereby large numbers of articles appear with high expenditure (a positive coefficient) or low expenditures (a negative coefficient). Results should be interpreted accordingly. The marginal effect of an article on the logarithm of consumer expenditures (in GBP) is presented by broadsheets and tabloids in tables 6-9. All regressions adjusted by total food expenditures and average price (both in logarithmic form), and included an intercept (these coefficients are not reported and are available from the authors). All regressions (24 time periods) correct for temporal autocorrelation using a

Prais-Winsten estimator. Results present a fairly heterogeneous picture of relation to articles in the media.

Despite being the broadsheet that has dedicated most attention to sustainable food consumption over time (table 4), the ***Guardian*** is the newspaper with the least observed influence on expenditures (table 6). In fact, expenditures increase only when two topics are discussed: organic (significant also as stock variable) and fair-trade food. Articles on both topics have an immediate effect on consumers' expenditures, for which significant increases of sales of products with these labels are observed. On the other hand, this broadsheet has a negative effect on sales of free-range eggs and wholegrain bread, with a decrease in observed sales after three and four weeks from publication, respectively. Finally, general articles on sustainability inversely correlate with the ESS index.

Readers of the ***Mail*** seem to better tune their expenditures with media messages (table 7). Specifically, articles on organic food and sustainable fishing, as well as those with possible implication on health have a positive effect on consumers' expenditures, as an increase in related articles accompanies the increase in expenditures on organic food, fish, low-salt food, and whole grain rice. The correlation seems to last for a fairly long time, particularly in the case of fish. These results hold if we consider the number of articles as a stock of information. On the other hand, total purchase of F&V and low fat foods is negatively correlated to the number of articles. Overall, readers of the Mail appear to change their expenditures for categories when more environmentally friendly or healthier options (e.g. organic products, fish, low salt, and whole grain) are available, while they do not modify expenditure patterns when articles target entire categories (e.g. meat or dairies).

Articles on the selected food-related environmental topics correlate more ambiguously with expenditures of the readers of the ***Mirror*** (table 8). In particular, media coverage has a positive

correlation with expenditures on red meat, F&V, dairy, low-salt foods, and wholegrain pasta. Information on wholegrain rice appears to present a positive stock effect, where the total number of four-month articles rather than its monthly number has an effect on expenditures. In contrast, environmental information negatively correlates with expenditures on fish and wholegrain bread, the latter having a rather persistent effect. Overall, articles in the Mirror appear to have a negative effect on observed expenditures: readers purchase more meat and dairy, but less fish. A positive note comes from an increase in F&V expenditures. Customers translate new information into expenditures in one to two months.

Finally, readers of the ***Telegraph*** (table 9) present a fairly varied type of response to articles discussing the environmental impact of food. Media coverage correlates positively with eco-washing products (two months from publication). Articles on meat and free-range meat as a flow tend to have a fluctuating influence, with an increase in expenditure balancing a (previous or subsequent) decrease; as a stock the overall impact is positive in both categories. Conversely, the flow of articles correlates negatively with expenditures on red meat, eggs, fish, and wholegrain pasta, while the four-month stock negatively influences expenditures on dairy and wholegrain bread. Effects on fish and wholegrain appear long-lasting. Readers of the Telegraph do not seem prone to change expenditures on generic food categories according to information provided, which increases expenditures on meat and decreases expenditures on fish. However, consumers seem to shift towards substitute products with lower environmental impact (e.g. free-range meat, or eco-washing liquid) when available. Finally, the case of fish is worthy of note: despite their similar political stance, the correlation between number of articles and expenditures on fish is persistently negative for Telegraph readers and persistently positive for Mail readers.

4.2. Qualitative Case Study: the debate over organic food

Quantitative results indicate that media can have both positive and negative correlation with expenditures on environmentally friendly purchases, depending on the products being targeted.

However, results do not offer a systematic explanation of differences across broadsheets and tabloids. Given the different political stances of the newspapers considered, it is likely that news differ in the framing of the same argument. To explore this issue in detail, we analyze a subsample of articles included in the quantitative study through a content analysis.

To make the task manageable, we only focus on organic food (Principle 1 in table 2) as a selected case study to understand the relation between news framing and food expenditures. The debate over organic food covers a large proportion of food-related environmental news in all four sources, accounting for 34% of total articles published. Significantly, the quantitative analysis shows that customers respond differently to articles on this subject across broadsheets and tabloids: coverage positively relates to expenditures on organic food in both Guardian and Mail readers, while showing no relation for readers of the Telegraph and the Mirror. Furthermore, while the increase in expenditures is long-lasting on readers of the Mail, it is short-lived on Guardian readers. Content analysis of all case studies covered in the quantitative analysis is available in Evans and Bellotti (2012).

Because of the size of the task (2,826 articles), we limit out attention to articles published in the Sunday edition of each journal on the first Sunday of each month over the two-years period considered. The final sample covers 99 articles from the Guardian, 33 from the Mail, 47 from the Telegraph, and 7 from the Mirror. The objective of the content analysis (de Sola Pool, 1959; Neuendorf, 2002) is to determine if 'Organic': a) is the main theme of an article; b) is connected or opposed to other topics (e.g. genetically modified food, or the use of pesticides); c) relates to other products or secondary issues (e.g. fair trade, or health); d) is simply mentioned or critically debated. The distribution of articles in the first three categories, combined with the last one, is reported in table 5, while the next four subsections examine the results.

4.2.1 Topic 1: 'Organic' and competing practices

Despite a relevant coverage of the topic, the Guardian and the Mail have contrasting opinions regarding the role of 'Organic' and its competing practices (GM and pesticides). The ***Guardian*** (more precisely its Sunday edition, the Observer) tends to frame the 'Organic' debate more critically. On one hand it discusses the positive role of organic farming, especially in countries where food production is dominated by monoculture plantations. Here small-scale and organic farmers are encouraged not so much for the better quality of organic products (which is reportedly scientifically controversial), but for the hidden social and environmental costs of intensive food production which uses large quantities of pesticides and destroys rainforests. On the other hand, 'Organic' is viewed as a problem that restrains from tackling global issues such as the global food crisis, fair international trade, and malnutrition. On this last topic, organic movements are accused to be dogmatic in their refusal of GM production. Readers are often alerted on the impelling needs of changing not so much customers' choices of products, but the entire system of British food production, offering detailed accounts of the advantages of using GM-altered food on a large scale to reduce carbon dioxide emissions.

In contrast, the ***Mail*** dedicates little attention to the debate over GM food and pesticides as the antithesis of organic food. Instead, food production techniques are discussed in terms of costs of production (high for organic food), and on the malfunctioning of the current system of food provision. The debate is reduced on one hand to the individual responsibility of eating locally and seasonally, which is judged expensive and ultimately inefficient to tackle the global food crisis; on the other hand to the uneven distribution and food waste. According to the Mail, political and economic responsibilities lie in a better organization of soil allocation and distribution system, which renders the debate over GM or organic production unnecessary.

> *"We already grow enough food to nourish nine billion people (...) Much of the global harvest feeds livestock an inefficient route for delivering our nutrition, since it takes eight calories of grain to produce one calorie of meat. Plenty more is diverted to make biofuels.*

[Also] we throw about 25 per cent our food away, uneaten. (...) This is ultimately not about production or about human numbers, it is about poverty". (The Mail on Sunday, 6/2/11)

Finally, while the ***Mirror*** does not report any article specifically focused on organic, GM or pesticides, the ***Telegraph*** covers very briefly the debate over GM food, but not as an alternative to 'Organic'. In particular, the Telegraph does not seem to take any position, reporting news about scientific advances on GM research with equal attention given to both supporters and critics. Importantly, the ***Telegraph*** does not associate the concept of organic with global environmental or social issues, but with the promotion of local production, particularly British farming, and the conservation of the countryside, where health and climate change are only secondary topics:

"The Prince of Wales has long been a champion of organic farming and he was asked how he 'squared' working with those adopting more intensive farming methods. "Well, I think that you can't, and I think organic is the most genuinely sustainable form of farming" he said. "Does this matter? It does for all of us who love the British countryside, its landscapes and its villages; and for those of us who mind about food security and the impact of climate change". (The Sunday Telegraph, 4/7/10)

4.2.2 Topic 2: 'Organic' role models

The involvement of celebrities in media coverage of climate change has been deeply analyzed in Boykoff and Goodman (2009). In their work, the authors interpret the role of celebrities in ambivalent terms, as newly authorized speakers who can liaise between policy, science and public sphere, but also as promoters of individualistic "heroic" solutions. All four newspapers in this study promote role models as champions of organic, although with substantial dissimilarities which might influence the differences in the impact of each source over expenditures. 'Organic' in the ***Guardian*** is uncritically presented as a key component of a coherent environmentally-friendly lifestyle of writers and famous environmentalists. In the ***Mail*** role models are more often actors and famous

chefs who claim to use organic, seasonal and local ingredients in their daily cooking because of their freshness rather than their ethical implications. The cliché of 'Organic' belonging to celebrities' lifestyle appears also in the ***Telegraph***. However, as in the Mail role models are generic celebrities (actors, TV broadcasters, restaurateurs, the Royal Family), rather than known environmentalists. Moreover, 'Organic' is valued for its local origin rather than *per se*.

> *[Monty Don] "Our confidence and trust have been absolutely shattered. We no longer believe in banks, we no longer believe in politicians, we hardly believe in doctors, we don't believe in the weather, we don't believe in the food we eat. People are looking for surety, they're looking for things they can make and know are good, rather than things they can buy or that other people sold to them. My commitment to farming is just as strong. I'm the president of the Soil Association, and I'm very involved in organic farming and food production". (The Sunday Telegraph, 7/2/10)*

Interestingly, the ***Guardian*** also labels 'Organic' as a pretentious and pricey symbol of social distinctiveness (i.e. rich vs poor), effectively challenging the benefits of organic products. This argument is briefly mentioned in the Sunday Mail, while absent in the other two sources. From the perspective of the ***Guardian***, the pursuit of ethical and ecological food should only be limited to consumers who can afford it.

4.2.3 Topic 3: 'Organic' products and recipes

Apart from the ***Mirror***, all other newspapers include organic products in recipes and advertising. In these occasions, 'Organic' is simply and uncritically mentioned as a culturally accepted healthy choice in daily cooking. In the ***Guardian***, for example, articles indicate organic gardening products and wine as the culturally accepted standard for these categories. The ***Mail***, advertises 'Organic' as a component of a healthy lifestyle, particularly in relation to dietary and beauty products. The ***Telegraph*** only focuses on 'Organic' to indicate local and fresh food products.

4.2.4 Topic 4: 'Organic' restaurants and tourist destinations

Finally, all media discuss 'Organic' in reviews of restaurants and tourist destinations, always as a sign of quality and luxury. For instance, for the ***Guardian*** it represents a culturally accepted measure of quality, often associated with locally produced food. The ***Telegraph*** uses a similar framing of 'Organic', with the same uncritical quality/luxury connotation given by its local production (as a note, this broadsheet mostly reviews UK locations). In the ***Mail***, destination and restaurants with organic food on their menus are seen as a trend supporting local production, rediscovery of culinary traditions, and healthy lifestyle. Finally, in the ***Mirror*** the concept of organic only appears in advertisements of luxury restaurants and tourist destinations serving locally sourced ingredients.

5. Discussion: the complexities of media debate over sustainable food

The combination of qualitative and quantitative results presented in the previous section derives a novel, detailed picture of the effects of the provision of printed media messages, which we summarise and discuss in this section. Firstly, even if often the number of articles is mostly unrelated to food expenditures, readers of different media titles seem to respond differently to the debate over sustainable food presented by the press. In particular, it seems that an increase in information on specific food categories (e.g. organic, fair-trade, sustainably sourced fish) induces a shift of expenditures towards these products from their generic alternatives. In detail, readers of the Guardian buy more fair trade and organic; those of the Mail buy more organic food and fish (some of which sustainably sourced), but also healthier options such as low-salt and wholegrain food; those of the Telegraph only shift toward eco-washing products. Readers of the Mirror appear rather inconsistent in their use of information. These results indicate that despite a general lack of effectiveness of information in modifying customers' expenditures, media are more successful in suggesting people to switch from general products to substitutes with a social, environmental or health benefit.

The quantitative analysis falls short of a complete explanation of these results because it only takes into account the number of articles published on topics related to sustainable food purchases, with no information on the content of the message. The content analysis of articles on organic food suggests that differences in response might be attributed to the way food-related environmental messages are framed. In particular, media articles seem more effective when information is consistent and presented uncritically (see also Weber and Stern, 2011), for example by incorporating the concept of organic in tourist destinations or products description as a form of advertising. This is the case of the Mail, where messages are rarely contradictory, and generally do not discuss any wider social and economic implication of organic food choices. Here, 'Organic' is uncritically associated to quality, freshness and seasonality, also promoted through role models like famous actors or celebrity chefs. As readers consistently receive information on the benefits of organic products, they might find easier to modify their expenditures by simply preferring them over non organic products, and their preference last longer than in other media sources. This point is consistent with previous research, where the amount of media coverage influences public opinion more than its content (Mazur and Lee, 1993).

In the Guardian, articles criticise the high price of organic food and the resistances in the adoption of GM food. The broadsheet engages its readers in complex discussions of problems such as resource overexploitation, waste production, the food crisis, and social responsibility for international development. Moreover, the Guardian promotes the complex idea that a 'green attitude' is an ethical and political position related to a series of principles and ideals that should embrace the whole life of consumers. Consequently, readers may relate their preference for 'Organic' to a wider set of pro-environmental attitudes. This complex message is proposed through interviews with environmental activists, where 'Organic' fits within a bigger effort to reduce the carbon footprint of personal lifestyle. The same broadsheet also promotes organic products for luxury dining and sustainable farming. We can make the hypothesis that when used for promotional

purposes the concept of organic may stimulate an immediate increase in the volume of purchases, but by linking it to broader attitudes in favour of the environment and social justice, the impact over expenditures vanishes, confirming that uncritical and coherent information is more effective (Weber and Stern, 2011) and that targeting attitudes does not necessarily imply a straightforward observable shift in consumers' choices.

The conservative Telegraph appears more concerned about the role of organic production in the provision of quality food, and associates the concept with local production to support British labels. Consequently, the quantitative analysis observes no relation between information provision and expenditures on organic products. There could possibly be an increase in expenditures on British products, but the data could not identify products with a "British" label. Finally, the considerably low number of articles dedicated by the Mirror to organic food explains the lack of association between the two variables.

In light of these results, it is worth reflecting upon the effectiveness of the existing debate in the press in inducing more sustainable food purchases. General debate around food, sustainability and climate change, represented by articles included in the first searching string, does not show any effect on the overall food basket (represented by the ESS index). This result is partially expected: the aggregate level of the index includes several typologies of products, and an increase in expenditures on a sustainable category (for example, organic F&V) can be counterbalanced by an increase in a carbon intensive one (for example, red meat). Similarly, when the target is a broader food category (e.g. meat, F&V, dairy products, eggs), we see no effect of media coverage on expenditures. Inevitably, a weakness of the data is that general categories include both sustainable and unsustainable options (for instance, meat includes white and red meat, free-range and intensive farming, organic and chemical intensive) and a drop in overall expenditures might indicate unobservable variances in all those subcategories. While we can control for some of them, because together with the whole meat category we also measure variations in specific subcategories (red

meat, organic, free range), some other variations are lost, like in the case of fish whose category does not distinguish between sustainably sourced options. Other general categories (e.g. dairy products and eggs) are included to see if, together with meat and fish categories, there is a sign of overall reduction of food of animal origin. Overall, results indicate that a substantial reduction in the expenditures of food of animal origin in diets cannot be addressed by simply informing customers about the environmental implication of food production and consumption. Although the discussion of environmental implications of food of animal origin represents 28% of the total number of articles in the four newspapers, it fails to reduce consumers' expenditures, giving strength to the hypothesis advanced in practice theoretical frameworks that see diets and eating habits as embedded in daily routines and therefore more difficult to be changed by simply informing consumers.

The task of modifying expenditure patterns seems to work better when information suggest the adoption of specific sustainable products as substitutes for their less sustainable counterparts. If consumers are advised to switch from non-organic to organic, they may decide to buy the second option, possibly because switching between products does not require any readjustment of habitual diets. Although sometimes more expensive, when sustainable products are presented uncritically in the news, like necessary ingredients for successful recipes or quality signatures in restaurants, customers tend to prefer them regardless the price. This is consistent across broadsheets and tabloids, and for different labels (organic, fair-trade, wholegrain, and low salt). In this case, media can play an important role by inducing customers to prefer sustainable options.

6. Conclusion

The task of understanding consumers' purchases and how they can be influenced by the availability of information is undoubtedly complex. This article discusses the relation between media coverage of issues related to sustainable food consumption and corresponding food expenditures. Overall, results indicate that the simple provision of information does not have a

significant influence on expenditures: this result suggests that dominant policy approaches that aim at modifying individual choices by providing information and activating pro-environmental attitudes (i.e. the ABC models) may succeed in changing people opinions (Mazur and Lee, 1993; Nysbet and Myers, 2007; Sampei and Aoyagi-Usui, 2009; Scruggs and Benegal, 2012), but are ineffective in modifying purchases. In particular, the simple amount of media coverage does not strongly relates to modifications in expenditures patterns, like it does for changes in public opinion (Nysbet and Meyers, 2007): if this was the case, the Guardian and the Telegraph should show the highest influence over consumers' expenditures, while this is not the case.

However, the paper also addresses the importance of differentiating between information sources, in line with previous research (Carvalho 2005; 2007) and between several expenditures' categories. Some preliminary indications are drawn from our results, suggesting that information may be more effective in shifting purchases across products, given the uncritical frame of the message, but fails in reducing expenditures in general categories like food of animal origin. Our hypothesis is that shifting expenditures to organic, fair trade and ecological version of a product is more effective because it does not require any change in habits and routines, while reducing whole food categories has an impact on diets and eating habits and therefore requires a better understanding of how those habits are daily organized. This hypothesis is in line with recent finding of research adopting a practice theoretical framework (Warde and Southerton, 2012; Southerton *et al.*, 2011; Shove, 2010; Warde, 2005; Southerton *et al.*, 2004), but cannot be confirmed by our analysis and requires further investigation.

The lack of consistent results in the analysis of expenditures patterns for the Guardian, together with qualitative results that show the complexities and criticalities with which the broadsheet discusses environmental topics, is in line with previous results of quantitative studies, where contradictive media coverage were associated to negatively influences on public opinion (Scruggs and Bengal, 2012). Previous qualitative results also give strength to this interpretation,

showing how the skeptic coverage of climate change do not lead to dismissing the environmental problem, but to a diffused uncertainty over the topic (Gavin and Marshall, 2011; Dunlap and McCright, 2010) which may explain why Guardian's readers only briefly increase their purchases of organic products. On the same line, the effectiveness of the lack of critical discussion of 'Organic' in the Mail provides further evidence to the importance of presenting issues uncritically.

Finally, there is no clear understanding whether customers use information as a stock or flow variable. In our results, information as stock or flow variables gives similar results, but only when the effect of media spans across time periods and coefficients do not fluctuate. This might suggest that stock variables are more useful to observe consistent effect which last over a longer period of time, while flow variables might capture interesting fluctuations and contradictive effects. More ad hoc research needs to be designed to refine these measurements, and to details the micro mechanisms that can influence the expenditures on sustainable food.

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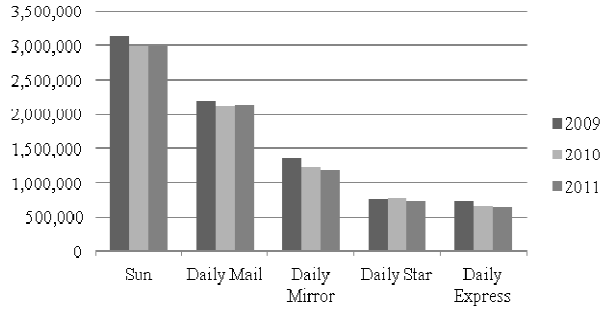
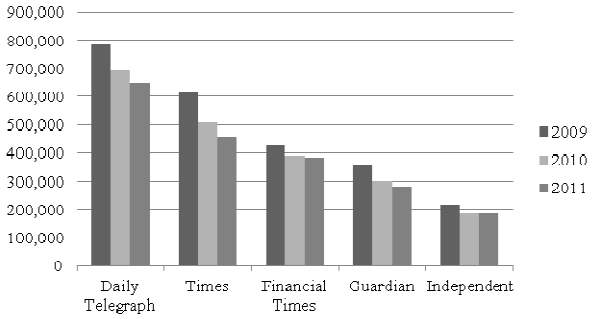
Figure 1: Circulation of main daily UK press from 2009 to 2011

a) Tabloids



b) Broadsheets

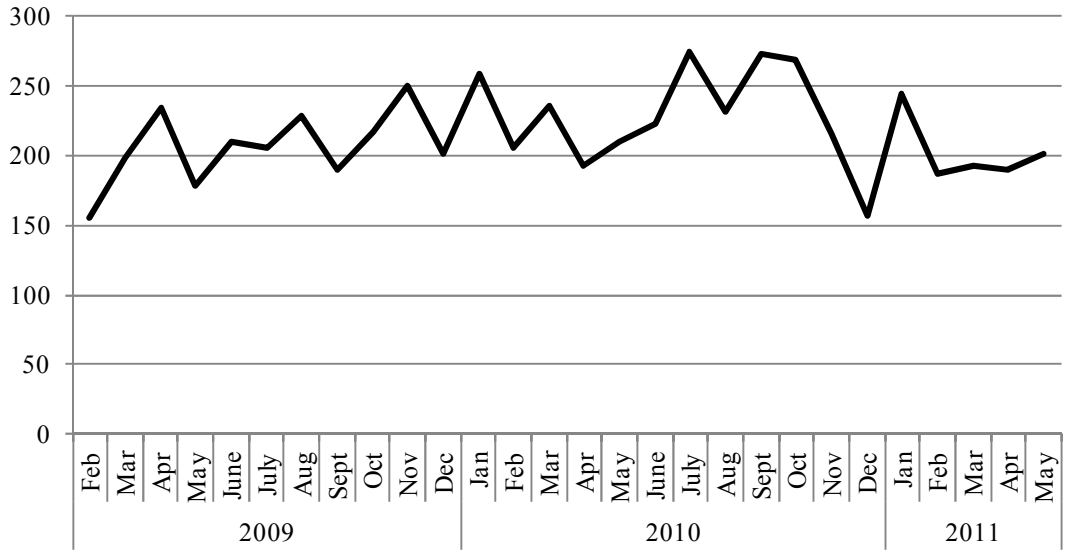


Source: Audit Bureau of Circulations.

Note: The same ranking is substantially reflected in the Sunday broadsheets and tabloids. Note also that the Sun launched a Sunday edition only in February 2012.

Figure 2: Monthly trends of published articles

a) Total sample



b) By source

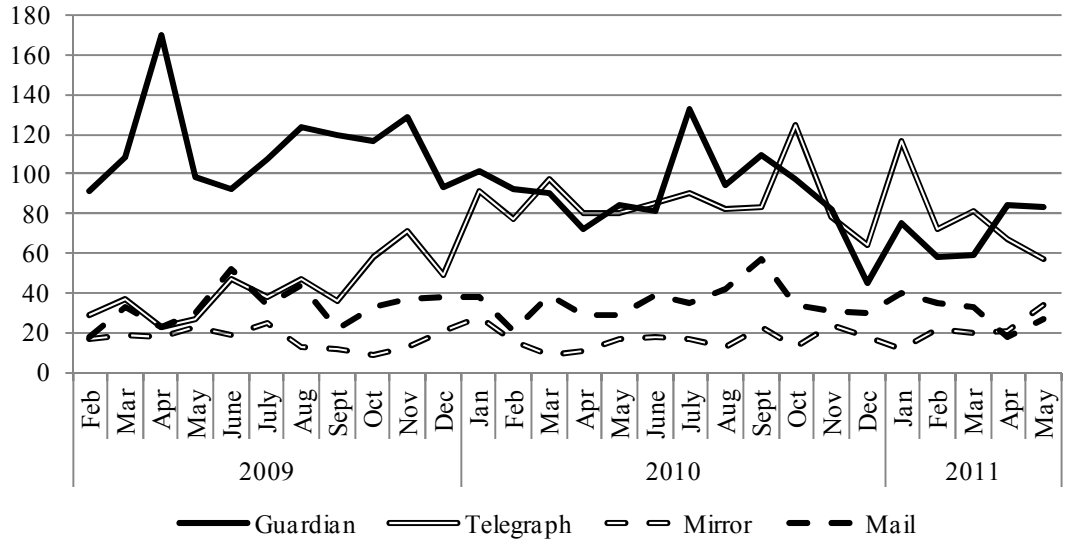


Table 1: Voting by regular readers, by tabloid or broadsheet title (2010 elections)

Journal type	*Readership*	*Conservative*	*Labour*	*Liberal Democrat*	*Others*
Total	***All GB adults***	37%	30%	24%	10%
Tabloids	***The Sun***	43%	28%	18%	11%
	Daily Mail	59%	16%	16%	9%
	Daily Mirror	16%	59%	17%	8%
	Daily Star	22%	35%	20%	23%
	Daily Express	53%	19%	18%	10%
Broadsheet	***Daily Telegraph***	70%	7%	18%	5%
	The Times	49%	22%	24%	5%
	Financial Times	n.a.	n.a.	n.a.	n.a.
	The Guardian	9%	46%	37%	8%
	The Independent	14%	32%	44%	10%

Source: Ipsos Mori, see http://www.ipsos-mori.com/researchpublications/researcharchive/2476/Voting-by-Newspaper-Readership-19922010.aspx?view=wide

Table 2: SUSTAIN's principles of sustainable food and the corresponding search strings

	SUSTAIN's '7 principles of sustainable food'	*Search strings*
0	General	– Food and sustainability or carbon or "climate change"
1	Specify food from farming systems that minimise harm to the environment, such as certified organic produce.	– Food and organic or OGM or "genetically modified" or pesticides
2	Limit foods of animal origin (meat, dairy products and eggs) served, as livestock farming is one of the most significant contributors to climate change, and promote meals rich in fruit, vegetables, pulses, wholegrains and nuts. Ensure that meat, dairy products and eggs are produced to high environmental and animal	– Food and "animal welfare" or "animal cruelty" – Food and vegetarian or vegan – Food and "animal origin" and meat or dairy or eggs

	welfare standards.	– Food and "free range" or "battery farmed"
3	Exclude fish species identified as most 'at risk' by the Marine Conservation Society, and choose fish only from sustainable sources - such as those accredited by the Marine Stewardship Council.	– Food and "Marine Conservation Society" or "Marine Stewardship Council" – Food and "farmed fish" – Food and "sustainable sources" and fish
4	Choose Fairtrade-certified products for foods and drinks imported from poorer countries, to ensure a fair deal for disadvantaged producers.	– Food and "Fair-trade"
5	Promote health and well-being by cooking with generous portions of vegetables, fruit and starchy staples like wholegrains, cutting down on salt, fats and oils, and cutting out artificial additives.	– Food and sustainability and health or "well being" or "artificial additives" or wholegrain

Note: SUSTAIN's principles also include the categories "Use local, seasonally available ingredients" and "Avoid bottled water". We did not include local food because we could not isolate products according to this criterion. We also excluded bottled water because we had very few articles on this issue, most of them unrelated to sustainability.

Table 3: Food categories selected from Tesco's Clubcard dataset

Category	***Expenditure category***
0: General	- Environmentally Sensitive Shopper (ESS) index - Expenditures on eco-friendly washing products
1: Organic	- Expenditures on foods with organic labels - Expenditures on organic Fruit and Vegetables (F&V)
2: Animal Origin	- Expenditures on meat products - Expenditures on red meat products - Expenditures on dairy products - Expenditures on eggs - Expenditures of F&V - Expenditures of free range meat - Expenditures of free range eggs
3: Fish	- Expenditures on fish
4: Fair-trade	- Expenditures on foods with fair-trade labels
5: Health & well-being	- Expenditures on low-salt products - Expenditures on low-fat products - Expenditures on wholegrain rice - Expenditures on wholegrain pasta - Expenditures on wholegrain bread

Note: the ESS index is an aggregate index of sustainable consumption that measures how sustainable club card holders' purchases are on the basis of the percentage of expenditures on six items - total meat, red meat, fruit and vegetables (F&V), organic F&V, bottled water, and online shopping - over total expenditures in the reference category (Author's ref., 2012).

Table 4: Number of articles for media categories for the four sources

Media Cat.	***All sources***		***The Guardian***		***The Telegraph***		***The Mirror***		***The Mail***	
	N	***%***	***N***	***%***	***N***	***%***	***N***	***%***	***N***	***%***
0: General	2,084	29%	1,060	33%	673	28%	108	19%	243	24%
1: Organic	2,826	39%	1,176	36%	1,068	45%	201	35%	381	37%
2: Animal Origin	1,998	28%	852	26%	533	23%	251	43%	362	35%
3: Fish	93	1%	40	1%	32	1%	4	1%	17	2%
4: Fair-trade	118	2%	57	2%	29	1%	14	2%	18	2%
5: Health & well-being	82	1%	46	1%	28	1%	1	0%	7	1%
Total	7,201	100%	3,231	100%	2,363	100%	579	100%	1,028	100%

Table 5: Number of articles containing "Organic" in each media source

		Main theme			*Issues Related to "Organic"*				*Association "Organic" and:*		
Media source	*Opinion*	*Organic*	*GM*	*Pesticides*	*Free Range*	*Food Crises*	*Fair Trade*	*Health*	*Role Models*	*Products/ recipes*	*Restaurants/ Tourism*
Guardian	Pro	10	12	1			4		11	1	26
	Against	4		3		9		4	1		2
	Controversial	1	2		1						
	No opinion									16	
Telegraph	Pro	5					1		10		
	Against			2							
	Controversial		2								
	No opinion									11	16
Mail	Pro	3	2	1			1	1	2	1	
	Against	3						1			
	Controversial	2	1						3		
	No opinion									7	6
Mirror	Pro								2		5
	Against										
	Controversial										
	No opinion										

Note: Because an article might cover more than one topic, the sum of articles from all topics differs from the number of sampled articles. Empty cells imply no articles on a specific topic.

Table 6: Relation between media coverage and expenditures on selected products – Guardian

Guardian	*Media (t)*	*Media (t-1)*	*Media (t-2)*	*Media (t-3)*	*Media (t-4)*	*Media Stock*
ln (ESS)	**-0.0011****	-0.0003	0.0003	0.0003*	-0.0003	-0.0000
S.E.	(0.0004)	0.0003	0.0002	0.0002	0.0002	(0.0001)
ln (Exp Eco washing products)	-0.0012	0.0003	-0.0008	0.0001	-0.0003	-0.0002
S.E.	0.0014	0.0012	0.0005	0.0004	0.0005	0.0002
ln (Exp Organic food)	**0.0026*****	0.0006	0.0006	0.0000	0.0001	**0.0008****
S.E.	0.0008	0.0008	0.0007	0.0007	0.0008	0.0003
ln (Exp Organic F&V)	0.0009	0.0000	-0.0012	-0.0012	-0.0025	-0.0006
S.E.	0.0014	0.0014	0.0012	0.0014	0.0016	0.0008
ln (Exp Meat products)	-0.0001	-0.0007	-0.0003	-0.0001	-0.0008	-0.0004
S.E.	0.0006	0.0006	0.0006	0.0006	0.0006	0.0003
ln (Exp Red Meat products)	0.0002	-0.0002	0.0002	0.0002	-0.0008	0.0000
S.E.	0.0005	0.0005	0.0005	0.0005	0.0006	0.0002
ln (Exp Free-Range meat products)	0.0002	-0.0007	0.0002	-0.0002	-0.0003	-0.0002
S.E.	0.0017	0.0019	0.0019	0.0019	0.0017	0.0009
ln (Exp Free-Range eggs)	0.0005	-0.0004	-0.0002	**-0.0017***	-0.0005	-0.0005
S.E.	0.0009	0.0009	0.0009	0.0009	0.0010	0.0004
ln (Exp F&V)	0.0007	-0.0010	-0.0014	-0.0019	-0.0008	-0.0002
S.E.	0.0009	0.0011	0.0012	0.0011	0.0009	0.0006
ln (Exp Dairy products)	0.0006	0.0006	0.0004	-0.0003	-0.0003	0.0001
S.E.	0.0003	0.0005	0.0004	0.0004	0.0003	0.0002
ln (Exp Eggs)	0.0003	0.0000	0.0002	-0.0004	0.0000	0.0000
S.E.	0.0008	0.0009	0.0008	0.0008	0.0008	0.0004
ln (Exp Fish)	-0.0056	0.0031	0.0010	-0.0034	0.0022	-0.0006
S.E.	0.0046	0.0056	0.0051	0.0051	0.0045	0.0038
ln (Exp Fair-Trade foods)	**0.0187***	-0.0062	0.0013	-0.0001	0.0139	0.0075
S.E.	0.0105	0.0106	0.0122	0.0110	0.0095	0.0057
ln (Exp Low-Salt foods)	0.0030	-0.0034	0.0072	0.0167	0.0210	0.0070
S.E.	0.0160	0.0186	0.0223	0.0201	0.0156	0.0050
ln (Exp Low-Fat foods)	-0.0019	0.0054	-0.0103	0.0023	-0.0055	-0.0012
S.E.	0.0078	0.0074	0.0094	0.0091	0.0095	0.0035
ln (Exp Wholegrain bread)	-0.0118	0.0020	0.0195	0.0106	**-0.0364***	-0.0011
S.E.	0.0188	0.0167	0.0201	0.0172	0.0185	0.0113
ln (Exp Wholegrain rice)	-0.0342	0.0288	-0.0364	-0.0047	-0.0114	-0.0091
S.E.	0.0233	0.0264	0.0304	0.0275	0.0243	0.0064
ln (Exp Wholegrain pasta)	-0.0160	0.0001	-0.0246	0.0177	-0.0165	-0.0056
S.E.	0.0217	0.0204	0.0232	0.0210	0.0221	0.0086

N = 24. Regression results are adjusted by total food expenditures and average price. Intercept included. Results are corrected for temporal autocorrelation. Significance if as follows: *** = 0.01 level of significance (2-tailed); ** = 0.10 level of significance (2-tailed); * = 0.10 level of significance (2-tailed).

Table 7: Relation between media coverage and expenditures on selected products – Mail

Mail	*Media (t)*	*Media (t-1)*	*Media (t-2)*	*Media (t-3)*	*Media (t-4)*	*Media Stock*
ln (ESS)	0.0009	-0.0007	-0.0003	-0.0004	-0.0003	0.0001
S.E.	0.0010	0.0011	0.0011	0.0011	0.0009	0.0007
ln (Exp Eco washing products)	-0.0013	-0.0002	0.0014	0.0002	0.0015	0.0004
S.E.	0.0020	0.0020	0.0018	0.0020	0.0017	0.0008
ln (Exp Organic food)	**0.0035****	0.0020	0.0023	0.0021	**0.0025***	**0.0029****
S.E.	0.0016	0.0018	0.0019	0.0018	0.0013	0.0011
ln (Exp Organic F&V)	0.0013	0.0010	-0.0008	0.0014	0.0007	0.0010
S.E.	0.0029	0.0034	0.0034	0.0032	0.0023	0.0019
ln (Exp Meat products)	0.0000	0.0008	0.0004	0.0015	0.0011	0.0007
S.E.	0.0017	0.0015	0.0016	0.0017	0.0017	0.0006
ln (Exp Red Meat products)	0.0001	0.0006	0.0001	0.0009	-0.0003	0.0003
S.E.	0.0014	0.0014	0.0015	0.0015	0.0014	0.0003
ln (Exp Free-Range meat products)	-0.0016	-0.0037	0.0018	0.0001	-0.0012	-0.0007
S.E.	0.0042	0.0042	0.0044	0.0045	0.0041	0.0024
ln (Exp Free-Range eggs)	-0.0023	0.0026	0.0038	-0.0032	0.0017	0.0008
S.E.	0.0027	0.0024	0.0026	0.0027	0.0028	0.0012
ln (Exp F&V)	-0.0021	**-0.0069****	-0.0052	**-0.0052***	-0.0015	-0.0019
S.E.	0.0025	0.0029	0.0030	0.0029	0.0025	0.0017
ln (Exp Dairy products)	0.0007	-0.0010	-0.0008	-0.0017	-0.0011	-0.0002
S.E.	0.0011	0.0011	0.0012	0.0012	0.0010	0.0007
ln (Exp Eggs)	-0.0005	-0.0011	0.0001	-0.0015	-0.0003	-0.0006
S.E.	0.0021	0.0018	0.0019	0.0020	0.0022	0.0008
ln (Exp Fish)	**0.0183****	**0.0208****	**0.0142***	**0.0142***	**0.0150****	**0.0164*****
S.E.	0.0080	0.0083	0.0081	0.0078	0.0064	0.0051
ln (Exp Fair-Trade foods)	-0.0128	-0.0008	-0.0123	0.0379	0.0183	0.0061
S.E.	0.0243	0.0224	0.0238	0.0240	0.0267	0.0158
ln (Exp Low-Salt foods)	0.0239	**0.0690****	**0.0460***	0.0218	0.0035	**0.0309***
S.E.	0.0264	0.0262	0.0257	0.0251	0.0253	0.0156
ln (Exp Low-Fat foods)	-0.0115	**-0.0265***	0.0034	0.0074	0.0065	-0.0017
S.E.	0.0136	0.0145	0.0143	0.0136	0.0116	0.0099
ln (Exp Wholegrain bread)	0.0433	0.0570	0.0414	0.0473	0.0492	**0.0476***
S.E.	0.0440	0.0491	0.0516	0.0524	0.0356	0.0274
ln (Exp Wholegrain rice)	0.0024	-0.0110	0.0253	-0.0273	**0.0686****	0.0079
S.E.	0.0300	0.0301	0.0297	0.0288	0.0302	0.0179
ln (Exp Wholegrain pasta)	-0.0150	-0.0355	-0.0163	-0.0066	0.0473	0.0202
S.E.	0.0401	0.0439	0.0449	0.0402	0.0330	0.0264

N = 24. Regression results are adjusted by total food expenditures and average price. Intercept included. Results are corrected for temporal autocorrelation. Significance if as follows: *** = 0.01 level of significance (2-tailed); ** = 0.10 level of significance (2-tailed); * = 0.10 level of significance (2-tailed).

Table 8: Relation between media coverage and expenditures on selected products – Mirror

Mirror	*Media (t)*	*Media (t-1)*	*Media (t-2)*	*Media (t-3)*	*Media (t-4)*	*Media Stock*
ln (ESS)	0.0003	0.0009	0.0009	0.0012	-0.0003	0.0004
S.E.	0.0012	0.0013	0.0014	0.0014	0.0016	0.0007
ln (Exp Eco washing products)	-0.0014	0.0004	-0.0020	-0.0016	-0.0010	-0.0012
S.E.	0.0024	0.0023	0.0024	0.0024	0.0039	0.0009
ln (Exp Organic food)	-0.0013	0.0017	0.0004	0.0051	0.0028	0.0008
S.E.	0.0032	0.0042	0.0044	0.0043	0.0038	0.0025
ln (Exp Organic F&V)	0.0037	0.0049	0.0076	0.0008	0.0032	0.0029
S.E.	0.0050	0.0066	0.0069	0.0066	0.0060	0.0038
ln (Exp Meat products)	-0.0003	0.0034	-0.0007	-0.0026	0.0028	0.0002
S.E.	0.0019	0.0020	0.0019	0.0020	0.0021	0.0010
ln (Exp Red Meat products)	-0.0011	**0.0033***	-0.0005	-0.0020	0.0022	0.0002
S.E.	0.0016	0.0017	0.0017	0.0017	0.0017	0.0006
ln (Exp Free-Range meat products)	-0.0018	0.0001	0.0027	0.0030	-0.0005	0.0001
S.E.	0.0055	0.0061	0.0062	0.0064	0.0059	0.0032
ln (Exp Free-Range eggs)	-0.0016	0.0044	0.0038	-0.0028	0.0068	0.0023
S.E.	0.0038	0.0039	0.0039	0.0041	0.0041	0.0018
ln (Exp F&V)	0.0033	**0.0068****	-0.0005	-0.0036	0.0046	0.0031
S.E.	0.0031	0.0032	0.0031	0.0036	0.0037	0.0023
ln (Exp Dairy products)	0.0016	**0.0025***	0.0011	0.0009	**0.0026****	**0.0017****
S.E.	0.0011	0.0012	0.0011	0.0013	0.0012	0.0007
ln (Exp Eggs)	-0.0032	0.0014	-0.0007	-0.0037	0.0012	-0.0013
S.E.	0.0024	0.0025	0.0024	0.0026	0.0025	0.0011
ln (Exp Fish)	0.0339	-0.0023	-0.0035	-0.0034	**-0.0500***	-0.0071
S.E.	0.0330	0.0352	0.0302	0.0318	0.0280	0.0145
ln (Exp Fair-Trade foods)	0.0102	-0.0113	0.0201	0.0428	0.0062	0.0124
S.E.	0.0419	0.0430	0.0418	0.0322	0.0259	0.0160
ln (Exp Low-Salt foods)	0.0869	**0.2372*****	-0.0283	-0.1341	-0.0173	0.0472
S.E.	0.0707	0.0711	0.0711	0.0815	0.0743	0.0531
ln (Exp Low-Fat foods)	0.0160	-0.0454	0.0151	-0.0098	-0.0342	-0.0138
S.E.	0.0470	0.0507	0.0506	0.0514	0.0523	0.0304
ln (Exp Wholegrain bread)	-0.1643	-0.2335	**-0.2826***	**-0.3435****	**-0.3555****	**-0.2830*****
S.E.	0.1322	0.1400	0.1386	0.1423	0.1437	0.0766
ln (Exp Wholegrain rice)	0.1251	0.1045	0.0859	0.0917	0.0410	**0.0860****
S.E.	0.0902	0.0965	0.0924	0.0882	0.0898	0.0402
ln (Exp Wholegrain pasta)	0.0091	0.0335	**0.1775***	0.0472	0.0821	0.0730
S.E.	0.0947	0.0992	0.0949	0.0937	0.0973	0.0485

N = 24. Regression results are adjusted by total food expenditures and average price. Intercept included. Results are corrected for temporal autocorrelation. Significance if as follows: *** = 0.01 level of significance (2-tailed); ** = 0.10 level of significance (2-tailed); * = 0.10 level of significance (2-tailed).

Table 9: Relation between media coverage and expenditures on selected products – Telegraph

Telegraph	*Media (t)*	*Media (t-1)*	*Media (t-2)*	*Media (t-3)*	*Media (t-4)*	*Media Stock*
ln (ESS)	0.0001	-0.0003	0.0000	-0.0003	0.0004	0.0001
S.E.	0.0004	0.0004	0.0004	0.0004	0.0004	0.0002
ln (Exp Eco washing products)	-0.0002	-0.0005	**0.0019*** **	-0.0001	0.0014*	0.0004
S.E.	0.0006	0.0006	0.0006	0.0006	0.0007	0.0003
ln (Exp Organic food)	-0.0001	-0.0008	-0.0004	-0.0003	-0.0009	-0.0005
S.E.	0.0007	0.0008	0.0008	0.0008	0.0007	0.0004
ln (Exp Organic F&V)	-0.0020	-0.0008	-0.0004	0.0019	-0.0002	-0.0008
S.E.	0.0012	0.0014	0.0013	0.0016	0.0013	0.0007
ln (Exp Meat products)	0.0010	**-0.0020****	**0.0017***	0.0012	0.0000	**0.0004*****
S.E.	0.0008	0.0008	0.0009	0.0008	0.0006	0.0001
ln (Exp Red Meat products)	0.0013	**-0.0027*****	0.0019*	0.0004	-0.0001	0.0001
S.E.	0.0009	0.0009	0.0010	0.0009	0.0007	0.0001
ln (Exp Free-Range meat products)	0.0011	-0.0008	0.0041	**0.0064****	**-0.0059****	**0.0011****
S.E.	0.0026	0.0026	0.0029	0.0024	0.0022	0.0005
ln (Exp Free-Range eggs)	-0.0009	-0.0015	0.0016	0.0005	-0.0010	-0.0002
S.E.	0.0021	0.0020	0.0023	0.0020	0.0017	0.0003
ln (Exp F&V)	-0.0023	-0.0019	0.0018	0.0012	0.0002	-0.0002
S.E.	0.0019	0.0019	0.0020	0.0019	0.0018	0.0007
ln (Exp Dairy products)	-0.0008	-0.0010	0.0006	-0.0003	-0.0006	**-0.0004***
S.E.	0.0007	0.0008	0.0008	0.0008	0.0007	0.0002
ln (Exp Eggs)	-0.0002	**-0.0022***	0.0017	-0.0004	-0.0013	**-0.0005****
S.E.	0.0013	0.0012	0.0014	0.0012	0.0011	0.0002
ln (Exp Fish)	**-0.0107***	**-0.0177****	**-0.0146****	-0.0049	-0.0054	**-0.0098*****
S.E.	0.0059	0.0063	0.0068	0.0064	0.0064	0.0033
ln (Exp Fair-Trade foods)	0.0140	0.0075	-0.0105	0.0048	-0.0122	0.0003
S.E.	0.0178	0.0154	0.0169	0.0178	0.0159	0.0070
ln (Exp Low-Salt foods)	0.0035	-0.0174	-0.0041	0.0123	0.0113	0.0063
S.E.	0.0252	0.0283	0.0276	0.0255	0.0243	0.0121
ln (Exp Low-Fat foods)	0.0101	0.0077	-0.0008	-0.0053	-0.0074	0.0021
S.E.	0.0125	0.0144	0.0150	0.0143	0.0122	0.0057
ln (Exp Wholegrain bread)	-0.0157	-0.0155	-0.0379	-0.0496	-0.0448	**-0.0269****
S.E.	0.0263	0.0392	0.0462	0.0424	0.0284	0.0129
ln (Exp Wholegrain rice)	-0.0034	-0.0059	-0.0018	0.0001	0.0230	0.0075
S.E.	0.0368	0.0374	0.0354	0.0344	0.0346	0.0155
ln (Exp Wholegrain pasta)	0.0303	0.0050	**-0.1286***	**-0.1381****	**-0.1066*****	-0.0117
S.E.	0.0353	0.0542	0.0628	0.0564	0.0360	0.0265

N = 24. Regression results are adjusted by total food expenditures and average price. Intercept included. Results are corrected for temporal autocorrelation. Significance if as follows: *** = 0.01 level of significance (2-tailed); ** = 0.10 level of significance (2-tailed); * = 0.10 level of significance (2-tailed).

[1] In this article, we use the distinction between broadsheet and tabloids when discussing our media samples. We are aware that the distinction is more about the quality of the newspaper rather than the format, and nowadays titles like the Independent and the Times publish in tabloid format. When discussing about printed media more generally, we will sometimes use the term "newspaper" to retain consistency with the previous literature, but we expressively refer to the wider category of printed news.

[2] We use the term "food-related environmental issue" and "sustainable food" (in relation to media coverage) interchangeably, to indicate media coverage of topics referring to the environmental impact of food consumption.

[3] The autocorrelation correction removes the influence of elements that span across time periods, which are unobservable because they are not available in the dataset.

[4] We are thankful to Chris Gartside (Dunnhumby) for this information.

[5] Also, due to the strategic importance of the sample, the owner of the databank (Tesco) tends to be parsimonious in the information they provide to third parties about their customer base. As a result, demographic information is not available.

[6] While it is a limitation that our data does not observe actual readership, it removes a news selectivity bias in the results, implying that the variable representing the number of published article is statistically independent from unobservable consumers' preferences for specific news.

[7] Prices refers to the average price of a unit transacted (e.g. the ratio total sales/total units sold), as unit prices (e.g. £/kilos) were not available.