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Does Sustainability Sell? The Impact of Sustainability Claims on the Success of National Brands' New Product Introductions

Submission date: October 23, 2020

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Keywords: new products, sustainability, corporate social responsibility, sales promotions, dynamic effects

Acknowledgements
We acknowledge the data-support of AIMARK. We also thank AC Nielsen for providing advertising data. We thank Remco Prins for the initial work on the data collection and analysis.
1. Introduction

Many brand manufacturers in the fast-moving consumer goods (FMCG) market are increasingly focusing on sustainability. For example, with its Sustainable Living Plan, leading FMCG manufacturer Unilever commits to increasing the sustainability of its products and to using more sustainable ingredients (Stem, 2010). Further, the number of sustainable products offered in the supermarket is increasing annually (International Supermarket News, 2015). However, although introduction of new products is one of the most important marketing activities for consumer packaged goods manufacturers, a large majority of new products fail in their first year (Gielens & Steenkamp, 2007). For the growing number of companies that are developing their new products to be sustainable, evidence that this strategy mitigates high failure rates is therefore important.

While research has given substantial attention to drivers of consumption and market share of existing sustainable products (e.g., Bezawada & Pauwels, 2013; Van Doom & Verhoef, 2015) and new product success (e.g., Steenkamp & Gielens, 2003), studies have given limited attention to the introduction of sustainable new products (see Fig. 1). However, a national brand's decision to introduce a new product with a sustainability claim is of strategic importance, as a sustainability claim implies a different sourcing of raw materials and investments in the supply chain (e.g., Porter, 2011). For example, when Unilever introduced more sustainable tea for its Lipton brand, it started to cooperate with the Rainforest Alliance and had to carefully re-configure the tea supply chain (Henderson & Nellemann, 2011). As this example suggests, top management must discuss sustainable strategies extensively with numerous stakeholders (Whelan & Fink, 2016), as stakeholders may expect higher costs owing to sourcing issues and lower sales.

By studying only the success of existing sustainable products (e.g., Van Doom & Verhoef, 2015; Bezawada & Pauwels, 2013), researchers have derived insights mainly related to the determinants of purchase behavior of sustainable products that have already survived in the market. Although recently some scholars have started to focus on innovating in a sustainable way (e.g., Iyer & Soberman, 2016;
Katsikeas, Leonidou, & Zeriti, 2016; Varadarajan, 2017), these studies do not study new product sales and focus solely on brand attitudes (e.g., Olsen, Slotegraaf, & Chandukela, 2014).

While all new products inherently carry a risk for consumers (e.g., Steenkamp & Gielens, 2003), the risk may be greater for sustainable new products, as a sustainability claim on a new product can backfire: consumers may assume that a company sacrifices quality for sustainability and may have lower purchase intentions for sustainable new products than for their conventional counterparts (Newman, Gorlin, & Dhar, 2014). As recent research confirms negative quality inferences of sustainability claims regarding new products (Van Doom, Verhoef, & Risselada, 2020) but does not reveal the effect on product sales, our study focuses on sales of new sustainable products and builds on prior relevant studies. Our first goal is to uncover whether making a new product sustainable helps or hinders its sales.

Further, although research has documented negative quality connotations surrounding sustainable products (Van Doom & Verhoef, 2011; Newman, Ghorlin, & Dhar, 2014), anecdotal examples of successful sustainable brands exist and include Ben & Jerry's ice cream and Tony Chocolonely. Conceivably, the response to sustainable new products is not uniform, but is instead affected by marketing measures surrounding the new product that support its introduction and may counter potential negative quality inferences. Moreover, prior research on new product success suggests that context factors influence the success and failure of new products (e.g., Steenkamp & Gielens, 2003). Therefore, our second goal is to investigate whether and how marketing measures that support a new product introduction temper negative quality inferences triggered by a sustainability claim and affect the success or failure of sustainable new products.

As marketing measures can act as a positive quality cue and therewith counter negative quality inferences, we expect that a high price and clear innovativeness of the sustainable new product may signal quality, therefore lessening quality concerns (Newman, Gorlin, & Dhar, 2014). Quality concerns may also be less of an issue if brands introducing the new sustainable product have a strong CSR reputation and an established track record of successful sustainable product introductions. In addition, marketing measures may induce trial, increasing familiarity with the sustainable new product and making
negative quality inferences less of an issue. As price promotions facilitate consumers’ experience of new products, providing a discount on a new sustainable product may reduce the potential negative impact of a sustainability claim on new product success (Bezawada & Pauwels, 2013).

Importantly, studies on sustainable products have given no attention to the potentially changing effects of the sustainability claim over time. These so-called dynamic effects have gained ample attention within the general marketing literature, and evidence shows that marketing effects can change throughout the product lifecycle (e.g., Leeflang et al., 2009; Osinga et al., 2010). While research suggests that consumers may initially hold unfavorable beliefs about sustainable new products (e.g., Newman, Gorlin, & Dhar, 2014), whether those beliefs alter as consumers gain experience with these new products is not clear. Quite possibly the negative quality inferences revealed in previous literature may become less pronounced over time, as consumers become more familiar with either the newly introduced product itself or sustainable new products in general as they become more mainstream. Therefore, our third goal is to investigate whether the potential negative sales effect of marketing a new product as sustainable is mitigated over time. Given our focus on new sustainable product introductions, we can investigate whether the effect of a sustainability claim is affected by the time elapsed since introduction. Moreover, as we have data for new product introductions in different years, we can also investigate whether the effect of sustainability claims changes over calendar time, as sustainable products become more mainstream.

Summing up, we have three objectives for this study. First, we assess whether making new products sustainable is a suitable strategy for national brands to overcome the high failure rates of new products, or whether sustainability actually aggravates the problem. Second, we investigate to what extent high prices, product innovativeness, price promotions, and consumers’ perceptions of brand CSR reputation are viable marketing measures to support the introduction of a new sustainable product and boost its sales by countering potential negative quality inferences. Third, we investigate whether the impact of a sustainability claim on new product sales may actually wear off over time. We explore
potential dynamic effects of the sustainability claim on sales, distinguishing between time since introduction effects and calendar time effects. Our resulting conceptual model is displayed in Fig. 1.

To achieve our objectives, we analyze 883 new product introductions of national brands and the sales development of these products over a year, using propensity score matching to account for endogeneity. We study new product introductions with and without sustainability claims to assess their impact on sales. By doing so, we contribute significantly to the literature on new product success and sustainable products (Fig. 2).

In line with earlier work, we define sustainable products as products with a positive impact on society and/or the environment, for instance by securing fair labor practices and reducing environmental impact (Luchs et al. 2010; Phipps et al. 2013). On the basis of our definition and in line with previous literature, we consider new products with an eco-friendly and/or fair trade claim to be sustainable (Luchs et al., 2010; Newman, Gorlin, & Dhar, 2014). Prior work empirically shows that consumers of sustainable products indeed purchase both eco-friendly and fair trade products (Verhoef & Van Doom, 2016), signaling that consumers categorize eco-friendly and fair trade brands in a similar way that fits the lifestyle of socially conscious consumers (Webster, 1975).

Our main findings are that sustainable new products on average achieve lower sales, and that this effect does not lessen but rather strengthens over time. Sales are higher when a brand perceived as highly conscious of its corporate social responsibility introduces the new product. Product innovativeness and lower prices mitigate the negative effect of a sustainability claim on sales, while price promotions aggravate it.

2. Hypotheses

2.1. Effect of a sustainability claim on new product sales

For consumers, purchasing a new product is inherently risky owing to lower product knowledge and uncertainty about a new product's quality (Steenkamp & Gielens, 2003). The presence of a sustainability claim could be an important differentiator for new products, because it clearly distinguishes
sustainable from conventional products. This differentiation could plausibly contribute to higher sales of sustainable new products, because by purchasing a sustainable alternative, consumers can contribute positively to society and/or the environment (Luchs et al., 2010; Phipps et al., 2013). However, only a small segment in the market strongly values sustainability (e.g., Verhoef & Van Doom, 2016), which makes a positive effect on sales less likely.

Recent experimental research finds that consumers perceive sustainable products to be of lower quality than conventional products. For sustainable new products, consumers may follow a lay theory that firm resources are zero-sum and assume that resources invested in creating a sustainable product are diverted from efforts aimed at improving its quality (Newman, Ghorlin, & Dhar, 2014; Chemev, 2007). As a consequence, uncertainty about the efficacy of the new product may be enhanced rather than reduced if the new product is sustainable. Therefore, quality concerns may be a prominent issue when a new product is sustainable (Luchs et al., 2010). Previous literature shows that consumers have quality concerns regarding both eco-friendly and fair trade products. An organic label, which also signals that a product is eco-friendly, may lead to negative taste inferences that may be particularly pronounced for certain product categories (Van Doom & Verhoef, 2011). Regarding fair trade products, consumers fear that the fair trade mechanism rewards low-quality products (De Janvry, McIntosh, & Sadoulet, 2015; Baggini, 2019).

On the basis of the above argument that consumers attribute lower quality to sustainable products, we therefore expect the sales potential of a new sustainable product to be lower than that of its conventional counterpart. While we acknowledge that this effect may differ between introduced products and brands, as a main effect we hypothesize:

**H1.** A sustainability claim on a new product has a negative effect on its sales.

### 2.2. Price as a quality cue for new sustainable products

Previous literature has convincingly shown that high prices lower sales, an effect that may be particularly pronounced in the introduction phase of a new product (Bijmolt, Van Heerde, & Pieters, 2005). Higher prices of sustainable compared to conventional products are therefore seen as an important
reason for consumers to not purchase more of them (Van Doom & Verhoef, 2011). However, previous literature also presents meta-analytic evidence that price is an important marketplace cue and that consumers interpret high prices as a signal of high product quality. This relationship is particularly strong for FMCG and for products consumers are not familiar with, implying that price is a relatively more important quality signal for new products (Volckner & Hofmann, 2007).

In line with prior research (Volckner & Hofmann, 2007), we argue that price may be an even more important quality signal for sustainable new products than for their conventional counterparts. First, in most product categories, sustainable products are the exception rather than the rule, implying that consumer familiarity with these new products is even lower than consumer familiarity with new products in general (Bezawada & Pauwels, 2013). Second, consumers are more inclined to use price as a surrogate for product quality when the quality of a product is uncertain and the purchase is risky (Volckner, 2008). Given that quality concerns may be more pronounced for sustainable new products than for their conventional counterparts, price as a quality signal rises in importance for this category of new products (Newman, Gorlin, & Dhar, 2014). Third, given the higher production and certification costs of sustainable products, introducing a sustainable product at a low price may not be a sound strategy, especially since consumers expect price markups for sustainable products (Habel et al., 2016). We therefore expect a higher price to mitigate the negative effect of a sustainability claim on the sales of a new product.

**H2.** A higher price reduces the negative effect of the sustainability claim on the sales of the new product (positive interaction effect).

### 2.3. New product innovativeness

We conceptualize product innovativeness on the category level in terms of how innovative a new product is relative to all products currently in the category. Thereby we focus on the uniqueness and newness of the new product relative to existing products in the market, providing a new product advantage (e.g., Gielens & Steenkamp, 2007). In accordance with our definition and following previous literature (e.g., Newman, Ghorlin, & Dhar, 2014), we conceptualize innovativeness independent from whether a new product is sustainable. However, we acknowledge that a sustainability claim may
influence perceived innovativeness, which we empirically control for by including the share of sustainable new products in the category as a measure of the extent to which sustainability is a new feature in this category.

Prior research suggests that product innovativeness is positively related to product complexity and relative advantage (Goldenberg, Lehmann, & Mazursky, 2001). However, findings are inconclusive as to how product innovativeness affects new product success. Several studies report that moderate innovativeness leads to the highest success rate of new products (e.g., Goldenberg et al., 2001; Steenkamp & Gielens, 2003; Gielens & Steenkamp, 2007), given that only slightly innovative products offer too little advantage and highly innovative products are perceived as too complex. We focus on the moderating impact of product innovativeness regarding the introduction of new sustainable products.²

We argue that product innovativeness may be particularly important if a new sustainable product is introduced. Concerns that the company may have sacrificed quality for sustainability in developing the new products may be less pronounced when the sustainable new product is clearly innovative (Newman, Ghorlin, & Dhar, 2014). Conspicuous innovation may also explain why some sustainable brands are actually successful. For example, the chocolate brand Tony Chocolonely is considered successful because of its innovative product design as well as its novel tastes. By developing a new product that is not only sustainable but also innovative, a company signals that it has invested substantial resources in improving the product on dimensions in addition to developing its sustainability. Therefore, the expected negative effect of a sustainability claim on sales may be less pronounced if the sustainable product is higher in innovativeness.

**H3.** Innovativeness of the new product reduces the negative effect of a sustainability claim on new product sales (positive interaction effect).

### 2.4. Price promotions induce trial of sustainable new products

² We tried to include nonlinear effects and the corresponding interactions with the sustainability claim in the model, but this was not feasible with our data. We estimated a simplified model without any of the focal interactions but with a nonlinear effect of innovativeness. Those results suggest a nonlinear effect, but only for the products with a sustainability claim, and the effect is U-shaped instead of the expected inverted-U shape. Results are available upon request.
Extensive evidence shows that price promotions have a short-term effect on sales, whereas new product introductions potentially have a long-term effect (Nijs et al., 2001). While price promotions create new product awareness and induce trial of the new product, thereby increasing sales (Steenkamp & Gielens, 2003), researchers have theorized that price promotions are less suited to increasing sales of existing organic products because purchasing organic is an ongoing commitment that is less susceptible to temporary promotions. However, empirically they find no significant difference in the effectiveness of price promotions between organic products and conventional products (Bezawada & Pauwels, 2013).

Importantly, we argue that this effect may differ for sustainable new product introductions and that price promotions are of particular importance in that context. First, a reduced price may motivate consumers to purchase a new product because it reduces the financial risk of trial. Price promotions enable consumers to evaluate the quality of the new product through experience instead of relying on external quality cues or lay theories regarding a company's allocation of resources (Newman, Ghorlin, & Dhar, 2014). Second, the ongoing commitment to a sustainable product Bezawada and Pauwels (2013) refer to has not been established if a product is newly introduced to the market. Therefore, for sustainable new products, price promotions may be a tool suited to inducing trial and contribute to the ongoing commitment of purchasing sustainable products. We therefore hypothesize:

**H4.** Price promotions reduce the negative effect of a sustainability claim of a new product on sales (positive interaction effect).

**2.5. Brand CSR as a quality indicator**

In our study, we focus on the moderating effect of brand CSR reputation on the success of new sustainable product introductions. We define CSR as a firm's commitment to ensure societal and stakeholder well-being through discretionary business practices and contributions of corporate resources (e.g., Du, Bhattacharya, & Sen, 2007). We assert that the negative effect of a sustainability claim on the success of a new product can be mitigated when the products are introduced by brands with a strong CSR reputation. We offer two arguments to support this assertion. First, brands high in CSR have secured a position in the market and have already proven themselves as deliverers of products of sufficient quality.
Prior studies have indeed found positive effects of perceived CSR reputation on consumers' perceived quality, brand attitudes, brand equity, and self-reported consumer share-of-wallet (e.g., Ailawadi et al., 2014; Van Doom et al., 2020). Given that consumers may have already had positive quality experiences with these brands, concerns about the quality of the new sustainable product are mitigated (Van Doom et al., 2020). Second, research has shown that a low fit between a firm's image and a CSR initiative harms consumers' beliefs, attitudes, and intentions to purchase (Becker-Olsen, Cudmore, & Hill, 2006). This is not the case for sustainable new products introduced by a brand with a strong CSR record. Hence, we hypothesize:

**HS.** Brand CSR reputation reduces the negative effect of the sustainability claim on the sales of the new product (positive interaction effect).

2.6. Dynamic effects of a sustainability claim on sales

Within the marketing literature, evidence shows that marketing effects are dynamic (Leeflang et al., 2009). For new products, marketing effects change over the product life cycle because marketing functions as an information source. For new pharmaceutical products, the effect of detailing decreases over time (Narayanan et al., 2005; Osinga et al., 2010). Similarly, the effects of direct marketing decrease over time, while social influence effects also decline (Risselada et al., 2014). So far, knowledge is limited regarding the dynamic effects of a sustainability claim.

In line with previous literature, we also expect the negative effect of a sustainability claim on sales to change over time. In particular, we hypothesize that uncertainty regarding quality issues surrounding new sustainable products will become less pronounced as consumers become more familiar with the products and have received information via advertising and social influence. Importantly, two types of dynamic effects can emerge. First, familiarity can concern a particular new product (Osinga et al., 2010; Risselada et al., 2014). While consumers may hold certain beliefs regarding the unsatisfactory quality of a sustainable new product, they may alter their beliefs as they gain experience with the product. This response implies a smaller negative effect of the sustainability claim as time passes after introduction of the new product.
Second, familiarity can concern a group of new products on the level of the entire market. We study multiple new product introductions over several years and can therefore also examine the effect of calendar time. The general acceptance of sustainable products increases as more and more sustainable products are introduced and these products become more mainstream\(^3\) (e.g., Iannuzzi, 2017). As a consequence, negative quality inferences of sustainable products might lessen over time or even disappear, suggesting that the negative effect of a sustainability claim on sales diminishes. This expectation is in line with literature on the adoption of innovations that has shown that adoption can be accelerated if a new product or service is promoted by several parties, even if these parties compete with each other—the market-making effect (e.g., Prins & Verhoef, 2007). Another explanation for a decreasing negative effect of sustainability claims over time could be that increasing attention for environmental issues, such as climate change and the carbon footprint, has made sustainability a more important attribute for consumers.

We explore these two dynamic effects to shed light on the effect of sustainable claims over time. For both dynamic effects, we expect the negative effect of a sustainability claim on sales to become less pronounced.

**H6.** The negative effect of the sustainability claim on the sales of the new product reduces (a) as time since introduction passes and (b) over calendar time.

### 2.7. Control variables

We also acknowledge that in some product categories sustainable products may be more common than in others, making acceptance of a new sustainable product more likely, and we therefore empirically control for the share of sustainable products within a category at the time of introduction and account for category fixed effects in our model. We also control for other variables, such as the presence of other claims such as health and nutrition, distribution, and advertising. We discuss the included control variables in more detail in our description of the model.

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\(^3\) See for example [https://www.trustinfood.com/2020/02/10/sustainability-goes-mainstream/](https://www.trustinfood.com/2020/02/10/sustainability-goes-mainstream/)
3. Data

To address our research questions, we combined four data sources: household panel data, consumer survey data, expert panel survey data, and advertising expenditure data. We aggregated the household panel data to the monthly level to match the advertising expenditure data. This action resulted in a dataset containing monthly sales data of 883 new product introductions in 14 categories in the Dutch FMCG market in the years 2008-2011. For every product, we have 12 months of data starting at the month of introduction. A period of 12 months is generally seen as critical for new product success or failure in the FMCG market (Nielsen, 1999; Steenkamp & Gielens, 2003). The products belong to 14 categories and 76 different brands. Table 1 shows the number of (sustainable) new product introductions per category. Of the 883 introduced products, 58 (6.6%) are sustainable. As noted, we label a product as sustainable when it reflects an eco-friendly or fair trade claim, given that empirical prior research shows that fair trade and eco-friendly products are from a consumer perspective considered as being sustainable (Luchs et al., 2010; Phipps et al., 2013; Verhoef & Van Doom, 2016). In our main effects model, we also distinguish between the effect of eco-friendly and fair trade claims. However, given the scarce number of sustainable new product introductions in our dataset, this more fine-grained distinction is not feasible for the models also examining moderating effects.

To account for competition and familiarity with sustainable products in the market, we include the share of sustainable products in the category at the time of introduction and the interaction between this variable and the sustainability claim. We note that in addition to the sustainability claim, products could have multiple other claims. We manually coded all claims on the basis of the product descriptions in our data. We categorized the claims as product-related claims (e.g., 100% Arabica coffee beans), taste claims (e.g., delicious), healthy additives claims (e.g., extra vitamins), nutrient content claims indicating reduced

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4 In the data collection process, we did not use product success as a criterion in any way. The inclusion criterion was based on the time of introduction only. We collected sales data during 12 months of those introduced products without selection taking place based on the sales figures in those months. Therefore, we are confident that survival bias is not an issue in our study.
levels of a certain nutrient (e.g., less salt), and functional health claims (e.g., for improved resistance). We include dummies for all these claims in our model.

The dataset also provides information on the introductory price, sales promotion, and distribution (Table 2). The price variable we include is the ratio of the introductory price and the average introductory price within the matched group—that is, the treated case and its three control cases combined (we provide details on the matching procedure below). The price ratio variable is constant over time and indicates whether a new product introduction was relatively expensive or cheap compared to a relevant set of competing products at the time of introduction. The use of price ratios to account for price differences across categories is common in these types of models (e.g., Bezawada & Pauwels, 2013). The promotion variable captures the average depth (the percentage discount relative to the base price) of the promotion per product per month. We use the average of all observed promotions per month because different retailers may use different promotion prices in the same month. We use mean-imputation per new product introduction (NPI) for missing values in this variable. The distribution variable is a weighted variable. It reflects the number of retail chains where the new product is available weighted by the average market share of the retailer in the category (measure between 0 and 1) at the time of introduction. Like the price variable, this variable is fixed at the time of introduction and is thus not affected by aggregation.

We complemented the dataset with survey data on perceived corporate social responsibility of the brand that we collected through a Dutch online panel in November 2014. The panel consisted of 1,085 consumers, 612 of whom participated (a response rate of 56.4%). From an initial list of 20, each participant answered questions for a maximum of five randomly assigned brands known by the respondent. After removing incomplete responses from the data, we had 451 usable responses for the

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5 We use price at the time of the introduction because we do not have complete price data for all NPis throughout the observation period. We used all available price data on the NPis in the matched sample and estimated a linear time trend for the prices over the first 12 months after introduction for each NPI. We omitted the missing observations and simply used consecutive available prices per NPI. We then applied a meta-analytic test to the estimated time trends to assess the direction and significance of the overall time trend across all NPis. We find that 13 of the 216 time trends are positive and significant and 22 are negative and significant. The remaining 181 time trends are not significantly different from 0. A meta-analytic test on the correlations between price and time trend shows that the average effect size is negative and significant (-0.098, p = 0.0001), but quite small, suggesting that the prices of NPis decrease slightly over the first year after product introduction. Given the small magnitude of the effect, the somewhat limited price data do not substantially affect our key findings.
CSR measure. To measure CSR, we slightly adapted the product social responsibility scale of Brown and Dacin (1997). Table 2 shows the items of the scale.

We collected data on product innovativeness through a panel of 18 FMCG experts with a diverse set of expertise areas who rated an average of 10 products (e.g., Steenkamp & Gielens, 2003). The data collection took place in May and June 2014. Panel members rated products within their area of expertise on product innovativeness on a scale of 1 = strongly disagree to 7 = strongly agree on four items (see Table 2; Cronbach's alpha = .95). The 18 experts did not rate all 883 products because some brands introduced similar new product variants simultaneously. For example, a brand may have launched a new multi-purpose cleaner in three different scents at the same time. In these cases, the experts rated the new multi-purpose cleaner only once. Our measure of innovativeness may partly measure consumer perceptions of the sustainability claim, but we remedy this by including the share of sustainable NPis in the category (sustcatintroshare variable) and as such adjust for familiarity with sustainability claims in the market. Please note that the variable sustcatintroshare depends on the category, but also on the time of introduction of the NPI, suggesting that two sustainable NPis of the same category (having the same values for the category dummy, the sustainability claim dummy, and its interaction) may have different values for the sustcatintroshare variable as a result of a different introduction moment. We obtained monthly advertising expenditure data on a brand level from AC Nielsen. Table 2 provides more detail about our data and descriptive statistics. In Table 3 we show the correlations between the included independent variables.

4. Methodology

The dependent variable in our model is the natural logarithm of unitsales—that is, the number of units of the new product purchased within our panel in a given month. We use a log transformation such

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6 We did not have measures of product innovativeness and brand CSR at the time of introduction. We use the so called confound approach (Frank 2000; Xu et al. 2019) and find that 57.86% of the estimate would have to be due to bias to invalidate the inference we made on the impact of brand CSR. That is, to invalidate the inference 57.86% (1500) of the cases would have to be replaced with cases for which there is an effect of 0. We therefore conclude that our results are robust against this potential weakness of our data. We thank an anonymous reviewer for this suggestion.

7 We observe zeros in the data, so we use ln(unitsales+1).
that we can interpret the parameter estimates as percentage changes of the unitsales, which are comparable across categories. We account for differences in sales across categories by including category-specific intercepts. We also include interaction terms of the sustainability claim and the category dummies to account for potential heterogeneity in the effect of a sustainability claim across categories. The model accounts for both calendar time (introdate variable) as well as time since introduction (time variable). Additionally, we include squared terms of both to adjust for a flexible and parsimonious time trend in sales. We mean-centered all moderating variables that did not include O (price, innovativeness, and brand CSR) to facilitate the interpretation of the moderating effects.

The equation below shows the econometric model with all interaction terms (i.e. Model IV).

\[
\ln(\text{unitsales}_{ptbc}) = /3_0 + /3_1 \text{category}\_le + \cdots + /3_{13} \text{category}\_yl \_3c
\]

\[+ /3_{14} \text{st}\_ainability}_{P+ /3_{15} \text{category}\_yl \_c\text{stainability}\_P + \cdots
\]

\[+ /3_{29} \quad \text{prodinn} \_ov\_P + /3_{30} \text{promotion} \_pt+ /3_{31} \text{brandcsr}\_P + /3_{32} \text{weighted}\_,\_dist\_ribution}\_P
\]

\[+ /3_{33} \text{st}\_cat\_int\_roshar\_ect + /3_{34} \text{claim} \_pr\_odu\_ct\_P + /3_{35} \text{claim}\_tast\_P
\]

\[+ /3_{36} \text{claim}\_healt\_h\_add\_P + /3_{37} \text{claim}\_r\_edu\_cnu\_P + /3_{38} \text{claim}\_healt\_h\_fun\_P
\]

\[+ /3_{39} \text{advertisin}\_gb\_t + /3_{39} \text{advertisin}\_gb\_t\_t + /3_{41} \text{introdate}\_P + /3_{42} \text{introdate}\_J
\]

\[+ /3_{43} \text{t\_im\_ept} + /3_{44} \text{t\_im}\_e\_J + /3_{45} \text{sustXPriceration\_matchedgroup}\_P
\]

\[+ /3_{46} \text{st}\_X\_pr\_odinn\_ov\_P + /3_{47} \text{sustXPromotion}\_pt + /3_{48} \text{st}\_X\_brandcsr\_pb
\]

\[+ /3_{49} \text{sust}\_X\text{su}\_st\_cat\_in\_t\_roshar\_e\_pct + \text{Ephtc}
\]

In this study, our main interest lies in the effect of the sustainability claim. However, the sustainability claim, our treatment, is not randomized over NPis. We apply propensity score matching to account for this potential selection bias. By creating a balanced set of treated and untreated cases that have the same propensity to be treated, we are able to estimate an unbiased effect of the treatment. We estimate a logistic regression model to obtain the propensity scores. The dependent variable is the sustainability claim dummy and we use a broad set of independent variables that are likely to be related to...
NPis having a sustainability claim (Stuart, 2010). The set of variables comprises promotion, product innovativeness, brand CSR, advertising, distribution, and a set of variables not included in our model, in particular brand quality (measured as average of the items "low quality (1) ... high quality (7)"; "inferior (1) ... superior (7)"; "worse than most brands (1) ... better than most brands (7)" in the same consumer survey where brand CSR was assessed) and a vice/virtue product category indicator (based on Van Doom & Verhoef, 2011). Using the propensity scores, we apply the Stata caliper matching procedure calimatch with a caliper width of 1 and three control observations for each treated case (i.e., sustainable NPI) in the data. For 55 of the 58 treated observations, we managed to find three matching controls.

To assess the quality of our matching, we use the standard set of metrics to document the quality of our matches based on Rosenbaum (2002) and Stuart (2010). Table 4 shows the standardized bias per variable before and after the matching. We do not report on the price variable because it is based on the matching, so we cannot calculate it for the full sample. We find that after the matching for seven of our 11 variables (including the propensity score and excluding three of the other claim dummies owing to lack of observations), the standardized bias is below the desired 0.25. The matching procedure leads to a considerable improvement because the standardized bias before the matching is below the 0.25 threshold for only three of our 11 variables. The variance ratio of the propensity score after the matching (1.594) falls within the 0.5 - 2.0 interval. Figure A1 in the web appendix shows the boxplots of the propensity scores before (panel a) and after (panel b) the matching. The figures show that the mean propensity scores and the distribution of propensity scores of NPis with and without a sustainability claim are more similar in the matched sample than in the full sample. We exclude the three cases without matches from the matched sample.8 We use bootstrapping (B = 500) in our model estimations to account for the uncertainty because of the matching (Stuart, 2010).

8 Even after applying the matching procedure, unobserved common factors may be driving the introduction of sustainable products and consumers' response to those introductions. We use the method proposed by Frank (2000) and Xu et al. (2019) for our main effects model (Model I) to assess how large the impact of the unobserved common factors should be to invalidate our main conclusion on the impact of a sustainability claim on the sales of NPis. We find that 75.38% of the estimate would have to be due to bias to invalidate our inference on the impact of a sustainability claim. In other words, to invalidate the inference 75.38% (1954) of the cases would have to be replaced with cases for which there is an effect of 0. We thus conclude that hidden bias is not a major concern after applying the matching procedure. We thank an anonymous reviewer for this suggestion.
5. Results

5.1. Estimation procedure

We estimate six versions of the model on the matched sample (Models I-VI). We use a hierarchical approach and start with Model I containing the category fixed effects and only the main effects. Model II is an alternative to Model I where we estimate separate effects for eco-friendly and fair trade claims to shed light on the differential impact of the two claims. Model III is an extension of Model I where we add the interactions between the sustainability claim and the category dummies. Model IV contains all interactions as shown in our conceptual model. Models V and VI contain the main effects, category fixed effects, and dynamic effects of the sustainability claim in the first 12 months and over calendar time. Tables 5 and 6 show the estimation results and model fit criteria of all models. Table 7 shows the marginal effects of the sustainability claim for each of the categories in Models III and IV to facilitate the interpretation of these parameter estimates. Regarding the model fit, Table 5 shows that the BIC of Model III (8111.503) is substantially lower than the BIC of Model I (8131.604), providing support for including the interactions with the category dummies. A likelihood ratio test comparing those two models also shows that the interaction terms jointly contribute significantly to the model ($\chi^2(11) = 106.562, p < 0.001$). In turn, the BIC of Model IV (8085.861) is substantially lower than the BIC of Model III and the likelihood ratio test comparing these models confirms that the five key interactions also jointly contribute significantly to the model ($\chi^2(5) = 64.944, p < 0.001$).

5.2. Hypotheses testing

Model I reveals a negative and significant parameter estimate of the sustainability claim ($\beta = -0.477, p = 0.023$), supporting H1. Model II shows that both eco-friendly ($\beta = -0.512, p < 0.001$) and fair trade claims ($\beta = -0.393, p = 0.001$) negatively affect new product sales, providing additional support for this hypothesis. The category-specific parameter estimates of the impact of a sustainability claim on ln(unitsales) in Model IV (see Table 7) are predominantly negative; seven of the 12 estimated parameters (58%) are significantly negative, two are not significantly different from 0, and only three are significantly positive. We apply a meta-analytic fixed-effects regression model with only an intercept in
which we specify the variance-covariance matrix to quantitatively summarize these results (e.g., Schmidt & Bijmolt, 2020). The results show that the mean effect size is negative as we expected, but not significant \( \beta = -0.182, p = 0.233 \). These results suggest that a sustainability claim negatively affects new product sales in some categories, but not in all, which does not fully support HI.

The results of Model IV show that the interaction effect of a sustainability claim with the price ratio variable (Table 5, \( J = -0.235, p = 0.059 \)) is negative and marginally significant, which does not support H2. The interaction effect of a sustainability claim and product innovativeness \( (J=0.276, p=0.028) \) is positive and significant, which supports H3. The interaction effect of a sustainability claim and sales promotion is negative and significant \( (J = -0.032, p < 0.001) \), which does not support H4. Instead, this result suggests that sales promotions strengthen the negative effect of a sustainability claim. The interaction with brand CSR \( (J = 16.459, p < 0.001) \) is positive and significant, which supports H5. To facilitate interpretation of the significant interaction effects with product innovativeness, sales promotions, and brand CSR, we provide an overview in Table 8. The table shows the mean impact of a sustainability claim across categories for products with low or high values for the significant moderators (product innovativeness, sales promotion, and brand CSR). We use the meta-analytic mean of the category specific effects as a baseline. The values in the table show the impact of a claim on the DV, \( \ln(\text{unitsales}) \). The percent change in sales when comparing products with and without a sustainability claim is \( (\exp(W) - 1) \times 100\% \).

5.3. Control variables

As most of the parameter estimates of the control variables in the model are in line with previous work, we discuss them in a concise way here. We find that brand CSR for regular NPIs positively influences new product sales \( (J = 0.856, p < 0.001) \), which supports research showing that CSR reputation

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9 We have compared the mean innovativeness of sustainable NPIs and regular NPIs and found that sustainable NPIs are perceived as significantly more innovative than their conventional counterparts \( (M_{\text{sust}} = 4.081 \text{ en } M_{\text{conventional}} = 2.421; p < .01) \). It is not fully clear how that would influence our results. We would expect our results to become more significant when these differences in innovativeness are less strong. We included the share of NPIs in the category that should to some extent remedy the effects of the found difference in innovativeness. We also compared differences in innovativeness for other claims and found that other claims have a lower level of innovativeness, suggesting that these claims are considered as less novel than a sustainability claim. More results can be requested from the authors.
has a positive effect on purchase behavior (e.g., Ailawadi et al., 2014). As expected, sales promotions for regular NPIs have a strong positive effect on sales (0.034, \( p<0.001 \)). Not surprisingly, the effect of distribution on sales is positive and significant (\( \beta=3.017, p<0.001 \); e.g., Ataman, Van Heerde, & Mela, 2010).

The effect of the price ratio variable for regular NPIs is negative as expected, but not significant (\( \beta=-0.080, p=0.175 \)). Some of the introduced products in our data that generate high sales figures despite having high price ratios are from unique brands, such as Nespresso and Ben & Jerry's. These unique brand effects may have canceled out the expected negative impact of price, resulting in a nonsignificant effect over all. We find no significant effect of the variable that captures the proportion of sustainable products in the category at the time of introduction (sustcatintroshare; \( \beta=-0.008, p=0.810 \) for regular NPIs, \( \beta=-0.032, p=0.794 \) for NPIs with a sustainability claim). Products with taste claims (e.g., delicious) (\( \beta=0.804, p<0.001 \)) and reduced nutrient claims (e.g., less salt) (\( \beta=0.214, p=0.025 \)) enjoy higher sales, while products with functional health claims (e.g., for improved resistance) are sold less (\( \beta=-0.962, p<0.001 \)).

5.4. Dynamic effects of sustainability claims

We also explore potential dynamic effects. We consider the two potential dynamic effects as discussed: the effect of time since introduction of the new product and the effect of time since year of introduction. To investigate these dynamic effects, we included interaction effects between the sustainability claim and the linear and squared term of these time variables\(^\text{10}\) to the model with only main effects (Model II in Table 5) (e.g., Prins, Verhoef, & Franses, 2009). We did not include these interaction effects in our main model because with inclusion our model became overparameterized. The results of these models can be found in Table 5 under Models V (time since introduction) and VI (calendar time).

In Model V the interaction with time since introduction is shown. Although the log-likelihood decreases compared to Model II, the BIC is slightly higher with a value of 8146.901. In this model the

\(^{10}\) We also considered other specifications to account for these dynamics, including logarithmic, spline and polynomial specifications (e.g., Risselda, Verhoef & Bijmolt, 2014). The results of the discussed specifications outperformed these other specifications. Detailed results can be requested from the authors.
The sustainability claim still has a negative significant effect ($P=-0.471, p=0.013$). As we do not find any significant interaction effects between the sustainability claim and the linear and squared time since introduction, our results do not support H6a. To assess the dynamic effect time since introduction we also plotted the average marginal effects with a confidence interval of 95% of the sustainability claim for 1-12 months after introduction in Fig. 3. This plot clearly shows a consistent negative effect over these 12 months without any evidence for a dynamic effect of time since introduction.

The BIC of Model VI with the interaction with calendar time is 8128.244, which is also slightly higher than the BIC of Model II, suggesting a worse fit. However, in this model we find a positive parameter estimate for sustainability claim ($P=.0554; p=.027$), a negative interaction effect between linear calendar time and the sustainability claim ($P=-.099; p<.001$), and a positive interaction effect squared calendar time and sustainability claim ($P=.002; p=.006$). We further assess this dynamic effect of calendar time by plotting the marginal effect of sustainability claim over calendar time with a 95% confidence interval in Fig. 4. In the first months after the first observed introduction, the effect of a sustainability claim on sales is positive, although not significantly different from zero. However, over time this effect becomes negative and increasingly so over time. Between months 20 and 30, the minimum negative effect is reached and the effect tends to increase again and become less negative. Hence, our results provide some evidence for a dynamic effect of the sustainability claim over calendar time. However, the nature of this effect is not in line with the expectation that the negative sustainability effect would disappear. In fact, our results mainly suggest that the negative effect of a sustainability claim becomes stronger over time, counter to H6b.

5.5. Robustness checks and additional analyses

The hierarchical approach of estimating our Models I to VI shows the robustness of our findings with respect to the model specification. Here we provide several robustness checks.

5.5.1. Alternative matching procedure

We estimated our main model (Model IV) on an alternative matched sample (Model R-1) using grouped categories (see Web Appendix Table A1 for the grouping). We could only match 42 NPis to
three controls. The results show that 19 of the 34 parameters (56%) have the same sign and significance as in Model IV, seven of the 34 (21%) have the same sign but go from (marginally) significant to nonsignificant or the other way around, six of the 34 (18%) have a different sign but also go from (marginally) significant to significant or the other way around, and only one of the 34 (3%) is significant in both models but with a different sign. For the hypothesized effects specifically, we find that the interaction of price and the sustainability claim is not significant (as compared to negative and marginally significant in Model IV), the interaction of promotion and the sustainability claim is negative as in Model IV, but not significant. However, the interactions of innovativeness and brand CSR with the sustainability claim are both robust against the different matching procedure. We conclude that our key results are quite robust, despite the fact that the sample as a result of the different matching approach is substantially smaller.

5.5.2. Moderating effect of advertising

Advertising could be especially effective for new sustainable products to counter the perceived lower quality and higher uncertainty consumers are reported to have for sustainable products. Although advertising is not one of our focal variables, we explore the potential moderating effect in this additional analysis. We estimated a model where we add the interactions between advertising and a sustainability claim and lagged advertising and a sustainability claim to Model IV (Model R-2). The results show that all our key findings are robust and the additional interactions are both not significant (see Table A2 in the Web Appendix).

6. Discussion

Large brand manufacturers have embraced sustainable products as part of their strategy and are increasingly developing new products with sustainability claims. However, experimental consumer research suggests consumers respond unfavorably to sustainable new products given proven negative quality associations (Van Doom & Verhoef, 2011; Newman, Ghorlin, & Dhar, 2014; Van Doom et al.,
2020). We therefore investigate the effect of sustainability claims on the sales of new products, going beyond previous experimental research that has relied on attitudinal or intentional measures.

Interestingly, there are multiple examples of successful sustainable products, such as Ben & Jerry's ice cream, raising the question of whether the success of sustainable new products may be dependent on other factors. Adding to previous literature, we investigate whether marketing measures are suited to mitigate a potential negative effect of a sustainability claim on sales by countering negative quality cues. Furthermore, we also consider how the effect of a sustainability claim on the success or failure of a new product develops over time when consumers become more familiar with sustainable products, rendering negative quality inferences less of an issue.

We analyze the sales of 883 new product introductions by national brands of FMCG, including 58 products that were eco-friendly or that stated fair trade claims. We find that sales of newly introduced products with a sustainability claim are lower than those of their conventional counterparts. Therefore, we support evidence obtained in experimental studies that consumers might consider the addition of a sustainability claim to be a signal of lower quality that heightens their uncertainty about the functionality of a new product (e.g., Newman, Gorlin, & Dhar, 2014). Furthermore, our results confirm previous findings at the consumer level that the segment of consumers purchasing sustainable products is rather small (e.g., Verhoef & Van Doom, 2016), and that finding transfers to the sales of new products with a sustainability claim.

We find that a sustainability claim is less harmful for the sales of a newly introduced product if the brand is high in perceived CSR. We confirm that a company's reputation regarding CSR may be vital in shaping consumer responses to its new sustainable product introductions. Table 8 reveals that a high perceived CSR reputation can compensate for the negative effect of a sustainability claim on new product sales and is therefore an important way in which sales of new sustainable products can be boosted. Table 8 also reveals that perceived CSR reputation has by far the strongest effect compared to the other marketing strategies we examine. A company high in perceived CSR (> +1 SD) can realize around 1,268% higher sales on a new sustainable product compared to a conventional product. For a company
low in perceived CSR(< -1SD), sales are 94% lower for a sustainable new product than for a conventional one. This large difference in the sales of sustainable new products between low and high CSR companies may be due to the high variance in sales, with some new sustainable products being very unsuccessful and some being very successful. We note that introducing sustainable products can also be a way to invest in and build up a perceived CSR reputation. However, the limitations of our dataset do not allow us to study this possibility in more detail. We also show a positive effect of brand CSR reputation on new product sales, which not only confirms previous literature on the positive effects of CSR reputation, but also shows that CSR perceptions might affect new product performance, an outcome that has not received much attention in the current CSR literature.

More innovative new sustainable products also enjoy higher sales than less innovative new sustainable products. We generalize findings from experimental studies to actual sales data and confirm that for clearly innovative products, consumers' concern that the company is sacrificing quality for sustainability in developing the new products may be less pronounced (Newman, Ghorlin, & Dhar, 2014). However, Table 8 also reveals that high product innovativeness (operationalized as 1 SD above average) is not able to fully compensate for the negative effect of a sustainability claim.

Interestingly, we find that price promotions are a less effective tool for stimulating the sales of sustainable new products than for conventional new products. This finding does not support our reasoning that price promotions are important to induce trial of new sustainable products to familiarize consumers with these products and overcome potential quality concerns. However, our finding is in line with the reasoning of Bezawada and Pauwels (2013) that purchasing sustainable products is an ongoing commitment and that therefore promotions are less effective for increasing organic sales. While those researchers could not detect differences in the effectiveness of price promotions between existing organic and conventional products and therefore they did not find empirical support for this hypothesis, we in fact do find evidence. Again, these diverging findings illustrate the importance of distinguishing between consumer responses to new versus established sustainable products.
We find that high prices are not well suited to overcoming the negative effect of a sustainability claim on sales of a new product. Instead, lowering prices is a better strategy to boost the sales of sustainable products—an approach in line with findings of Bezawada and Pauwels (2013) that lowering prices leads to higher sales of existing organic products, but counter to the findings of Ngobo (2011), who also examines existing organic products. Given that we find only a marginally significant effect of price ratio on sales of new sustainable products, the effects of price should be interpreted with caution.

Following earlier studies in marketing (e.g., Osinga, Leeflang & Wieringa, 2010), we also explore potential dynamics in the sustainability claim effect. Our results do not suggest that the negative effect of a sustainability claim on a new product changes as time since introduction passes. The effect remains negative for the observed period of 12 months. Hence, the negative effect of a sustainability claim on a new product is not mitigated by consumers' familiarity with the product. Our results therefore deviate from previous marketing literature showing dynamic effects. One potential explanation is that the sustainability claim is a product attribute that is incorporated in the evaluation of the new product, whereas the dynamic effects of marketing frequently involve advertising that varies over time and focuses on providing new information to the market.

However, our results show that the effect of the sustainability claim varies over calendar time, with the negative effect actually becoming more pronounced. This result contrasts with our reasoning that as sustainability becomes more mainstream, the negative effect should disappear since negative quality associations should also vanish. The pattern of results suggests that in the beginning of our observation period, adding a sustainability claim to a new product at least does not harm its sales, as perhaps at that point a product with a sustainability claim still stands out from competition, countering potential negative quality inferences. As sustainability becomes more mainstream, achieving a competitive advantage with a sustainability claim becomes more difficult.

Our results also indicate that within our studied time period, after around 25 months the negative effects tend to become smaller. Given recent experimental research showing that the negative quality inferred for sustainable products persists (Van Doom, Verhoef, & Risselada, 2020), we speculate that
the negative effect may still be there in the present. We also note that the extent to which sustainable products are already present within a product category does not affect the success or failure of a new sustainable product. Hence, we conclude that the negative effect of a sustainability claim does not vanish over time, and that more research is required regarding the effect of time.

Beyond our hypothesized findings, we show that in line with previous literature, distribution and advertising are pivotal as support for newly introduced products. Interestingly, taste claims (e.g., delicious) and reduced nutrient claims (e.g., less salt) stimulate the sales of newly introduced products, while functional health claims (e.g., for improved resistance) seem to aggravate new product failure rates.

7. Management implications

First and foremost, managers must realize that making new products sustainable is not a viable strategy for preventing new products from failing. Instead, adding a sustainability claim to a new product leads to a higher likelihood of product failure—an effect that does not vanish over time. However, managers can employ various strategies to make sustainability more beneficial. Investing in a strong CSR reputation is by far the most effective strategy to boost sales of new sustainable products. If a brand's CSR reputation is low, the success of new sustainable products will be low and the product is unlikely to succeed in the market. However, as a strong brand CSR reputation has positive effects on new product sales, further investment in CSR actions is likely to benefit sales of all new products. In light of our results, we might expect that firms like Unilever that have heavily invested in corporate social responsibility actions might be more successful in introducing new sustainable products than firms like Procter & Gamble or Kraft Heinz, which have a less explicit CSR strategy.

Making a new product unmistakably innovative also helps to overcome negative sales effects due to a sustainability claim, although this strategy is less effective than investing in company-level CSR actions. While lowering prices is also effective in promoting sustainable products, price promotions can be counterproductive and do not help the sales of sustainable new products. Lastly, managers should not expect the negative effect of a sustainability claim on new product sales to wear off over time, even when...
sustainable products become more common within a product category.

**8. Research limitations**

This study has several limitations. First, despite the richness of our sales data, the number of sustainable product introductions is still limited in the studied market given the size of our conceptual model. Therefore, we could only distinguish between eco-friendly and fair trade products in our main effects model and could not engage in more fine-grained analyses with respect to moderating effects. Given the low sales of many of the new product introductions we observe, we unfortunately also could not account for changes in price and distribution of our products over time because we did not have a monthly observation for every new product. Second, our measure of product innovativeness reflects the perspective of category experts, and does not capture consumer perceptions of product innovativeness that may also rate products that are "new to the brand" as innovative. Third, data limitations unfortunately prevented us from including promotional activities for competing brands in our model.

Fourth, some of our explanatory variables are related and affect each other in the long run, introducing endogeneity. For example, sales promotions may conceivably affect brand CSR reputation and product innovativeness. However, we think these effects do not affect our results substantially for two reasons. First, Table 3 shows that the correlations between the independent variables of interest are all below an absolute value of 0.198, which is only small to moderate. Second, we believe that these effects will be relatively small in our study given that we have a limited time frame of only 12 months. As these effects will become more important in the longer run, it would be interesting to account for and analyze these effects using a longer observation period, which would also allow for the use of methods like vector autoregressive (VAR) models.

Fifth, similar to the previous point, our current data do not allow us to provide insights on the buildup of CSR reputation over time and the dynamic interplay between variables like sustainability claims and CSR reputation. Both are highly relevant topics for the future and could also be explored using
VAR models. Furthermore, we do not account for different types of, or different aspects of, perceived CSR reputation.

Sixth, our sales data span the period 2008-2011 and some sources suggest that consumer preferences may have changed since then (Nielsen, 2015; Unilever, 2017). We expect that changes in preferences may mitigate the negative main effect of a sustainability claim, but would not affect the moderating effects that are the focus of our study. Furthermore, recent empirical findings suggest that sustainability claims are still viewed unfavorably (van Doorn, Verhoef, & Risselada, 2020). Seventh, the sales data for this study span one country only, which limits the generalizability of our findings. Prior research shows that cultural differences affect diffusion patterns (Van den Bulte & Stremersch, 2004). Assessing the impact of cultural differences on sustainable product success would therefore be an interesting area of future research.

Eighth, we explore dynamic effects of a sustainability claim and theorize and estimate several moderators of the impact of a sustainability claim. Unfortunately, our data did not support more complex models and therefore we could not study dynamics of the moderating effects by including three-way interactions between the sustainability claim, the variable of interest, and time since introduction.
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Table 1
Number of (sustainable) new product introductions per category.

| Category                  | #NPis | # Sustainable NPis |
|---------------------------|-------|--------------------|
| Baby food                 | 104   | 6                  |
| Buttermilk                | 3     | 2                  |
| Chocolate bar             | 53    | 19                 |
| Coffee                    | 48    | 1                  |
| Drinking yoghurt          | 66    | 2                  |
| Icecream                  | 35    | 6                  |
| Ketchup                   | 24    | 1                  |
| Liquid detergent          | 67    | 3                  |
| Liquid laundry detergent  | 163   | 2                  |
| Meal boxes                | 99    | 3                  |
| Milk                      | 18    | 4                  |
| Regular yoghurt           | 63    | 4                  |
| Soup                      | 126   | 4                  |
| Sugar                     | 14    | 1                  |
| **Total**                 | **883**| **58**             |
### Table 2

Measures and descriptive statistics.

| Variable | Variable name | Explanation | Mean | SD  | Min. | Max. | Cronbach alpl |
|----------|---------------|-------------|------|-----|------|------|---------------|
| **Dependent variables** | | | | | | | |
| Sales | | Monthly unit sales of the new product | 28.807 | 56.810 | 0 | 875 | n.a. |
| **Independent variables** | | | | | | | |
| Sustainability | Sustainability | Dummy variable taking the value of 1 if the product has a sustainability (i.e. eco-friendly or fair trade) claim | 0: 825 | 1: 58 | | | |
| Price ratio | priceratiomatchedgroup | The ratio of the introduction price & the average introduction price within the matched group | 100 | 68.357 | 10.493 | 324.392 | n.a. |
| Brand CSR | Brandcsr | Average of the items completely (disagree (1) - completely agree (7))  
"[brand] is a socially responsible brand";  
"[brand] is acting responsibly toward the environment";  
"[brand] contributes something to society" | 3.227 | 0.170 | 2.773 | 3.594 | .88 |
| Product innovativeness | Prodinnov | Average of the items  
"at the time of its introduction, product x was new in its category";  
"at the time of its introduction, product x was unique in its category";  
"at the time of its introduction, product x offered original, new benefits to the category";  
"at the time of its introduction, product x could be considered a radically new product within the category" | 3.465 | 1.440 | 1 | 6.750 | .95 |
| Sales promotion | Promotion | Average depth (the percentage discount relative to the base price) of the promotion per product per month. | 5.784 | 9.286 | 0 | 99.052 | n.a. |

*Control variables*
|                        |                          | The share of sustainable products in the category at the time of introduction. | 2.285 | 2.175 | 0.474 | 25 | n.a. |
|------------------------|--------------------------|--------------------------------------------------------------------------------|------|-------|-------|----|------|
| Weighted Distribution  | weighted_distribution    | Number of retail chains where the new product is available weighted by the average market share of the retailer in the category (measure between 0 & 1). | 0.851 | 0.175 | 0.210 | 1  | n.a. |
| Introduction date      | Introdate                | Number months between introduction & Jan 2008                                 | 20.094 | 9.689 | 4     | 35 | n.a. |
| Ad expenditures        | Advertising              | Advertising spend in millions per brand                                       | 0.176 | 0.406 | 0     | 3.522 | n.a. |
| Other claims           | claimproduct             | Product-related claim:                                                        | 121  | n.a.  |       |     | n.a. |
|                        | claimtaste               | Taste claim:                                                                   | 33   | n.a.  |       |     | n.a. |
|                        | claimhealthadd           | Healthy additives claim:                                                      | 38   | n.a.  |       |     | n.a. |
|                        | claimreducnutr           | Reduced nutrient claim:                                                        | 129  | n.a.  |       |     | n.a. |
|                        | claimhealthfunc          | Health functional claim:                                                       | 10   | n.a.  |       |     | n.a. |
Table 3

Correlations.

|               | 1     | 2          | 3          | 4          | 5          | 6          | 7          | 8          | 9    |
|---------------|-------|------------|------------|------------|------------|------------|------------|------------|------|
| 1. ln(unitsales) | 1.000 |            |            |            |            |            |            |            |      |
| 2. Brand quality | 0.098*** | 1.000     |            |            |            |            |            |            |      |
| 3. Brand CSR   | 0.089*** | 0.621***  | 1.000      |            |            |            |            |            |      |
| 4. Product innovativeness | -0.010 | 0.122***  | 0.041***  | 1.000      |            |            |            |            |      |
| 5. Sales promotion | 0.189*** | -0.062*** | -0.083*** | 0.063***  | 1.000      |            |            |            |      |
| 6. Weighted distribution | 0.367*** | 0.109***  | 0.070***  | 0.086***  | 0.160***  | 1.000      |            |            |      |
| 7. Sustcatintroshare | 0.018*  | -0.175*** | -0.090*** | -0.066*** | -0.047*** | -0.148***  | 1.000      |            |      |
| 8. Introduction date | 0.014  | -0.033*** | -0.014    | 0.020**   | 0.019*    | -0.001    | 0.004      | 1.000      |      |
| 9. Ad expend itur es | 0.057*** | 0.206***  | 0.173***  | 0.151***  | 0.030***  | 0.086***  | -0.118***  | 0.119***  | 1.000 |

*p<0.1; **p<0.05; ***p<0.01
Table 4
Matching quality.

| Variable               | Mean (no claim) | Mean (claim) | Absolute standardized bias | Mean (no claim) | Mean (claim) | Absolute standardized bias |
|------------------------|-----------------|---------------|----------------------------|-----------------|---------------|----------------------------|
| **BEFORE matching**    |                 |               |                            |                 |               |                            |
| Promotion              | 1.273           | 0.543         | 0.272                      | 1.202           | 0.573         | 0.234                      |
| Product innovativeness | -0.043          | 0.617         | 0.411                      | 0.225           | 0.567         | 0.213                      |
| Brand CSR              | -0.007          | 0.100         | 0.758                      | 0.059           | 0.096         | 0.257                      |
| Advertising            | 0.169           | 0.113         | 0.276                      | 0.141           | 0.119         | 0.107                      |
| Distribution           | 0.857           | 0.775         | 0.396                      | 0.801           | 0.785         | 0.074                      |
| Sustcatintroshare      | 2.209           | 3.367         | 0.258                      | 3.445           | 2.244         | 0.267                      |
| Introduction date      | 20.024          | 21.086        | 0.113                      | 17.925          | 20.945        | 0.322                      |
| Product-related claim  | 0.135           | 0.172         | 0.099                      | 0.236           | 0.181         | 0.142                      |
| Taste claim            | 0.032           | 0.121         | 0.271                      | 0.050           | 0.109         | 0.181                      |
| Propensity score       | -3.251          | -2.040        | 0.814                      | -2.481          | -2.130        | 0.236                      |

**AFTER matching**

Note: We do not display the price variable here because it is based on the matched sample.
Note: We cannot calculate these values for the three other claims (i.e., healthy additives claims, reduced nutrient claims, and health functional claims), because these do not occur in combination with a sustainability claim and as a result we cannot calculate the corresponding required means and standard errors.
### Table 5

**Estimation results.**

| Model | Variables                  | Estimate | p   | Estimate | p   | Estimate | p   | Estimate | p   | Estimate | p   | Estimate | p   |
|-------|----------------------------|----------|-----|----------|-----|----------|-----|----------|-----|----------|-----|----------|-----|
|       | Intercepts                 | -0.434** | 0.023 | -0.427** | 0.025 | -0.368*  | 0.073 | -0.587*** | 0.007 | -0.435** | 0.039 | -0.556** | 0.010 |
|       | Sustainability claimtt     | -0.477*** | <0.001 | -0.512*** | <0.001 | -0.368** | 0.073 | -0.587*** | 0.007 | -0.435** | 0.039 | -0.556** | 0.010 |
|       | Eco-friendly claim         | -0.393*** | 0.001 | -0.427*** | 0.008 | -0.110** | 0.041 | -0.080   | 0.175 | -0.125** | 0.010 | -0.133*** | 0.009 |
|       | Fair trade claim           | -0.125*** | 0.009 | -0.127*** | 0.008 | -0.110** | 0.041 | -0.080   | 0.175 | -0.125** | 0.010 | -0.133*** | 0.009 |
|       | Price ratio                | -0.040*  | 0.040 | -0.043**  | 0.030 | -0.007   | 0.759 | -0.039   | 0.101 | -0.040** | 0.044 | -0.025   | 0.212 |
|       | Product innovativeness     | 0.023*** | <0.001 | 0.029**   | <0.001 | 0.027*** | <0.001 | 0.034*** | <0.001 | 0.029*** | <0.001 | 0.032*** | <0.001 |
|       | Sales Promotion            | 1.092*** | <0.001 | 1.046***  | <0.001 | 0.817*** | 0.002 | 0.856*** | 0.001 | 0.192*** | <0.001 | 1.043*** | <0.001 |
|       | Brand CSR                  | -0.113*** | 0.001 | -0.115*** | 0.001 | -0.072** | 0.024 | -0.008   | 0.810 | -0.113*** | 0.001 | -0.092*** | 0.008 |
|       | Weighted distribution      | 3.063*** | <0.001 | 3.080***  | <0.001 | 2.944*** | <0.001 | 3.017*** | <0.001 | 3.063*** | <0.001 | 2.974*** | <0.001 |
|       | Claim related              | -0.073   | 0.345 | -0.076   | 0.300 | -0.095   | 0.253 | -0.101   | 0.230 | -0.073   | 0.333 | -0.071   | 0.353 |
|       | Claim taste                | 0.777*** | <0.001 | 0.757    | <0.001 | 0.796*** | <0.001 | 0.804*** | <0.001 | 0.777*** | <0.001 | 0.722*** | <0.001 |
|       | Claim reduced nutrient     | 0.068    | 0.424 | 0.059    | 0.498 | 0.205**  | 0.032 | 0.214**  | 0.025 | 0.068    | 0.432 | 0.105    | 0.265 |
|       | Cla im hea lthy functio nal| -0.730*** | <0.001 | -0.739*** | <0.001 | -0.981*** | <0.001 | -0.962*** | <0.001 | -0.729*** | <0.001 | -0.676*** | <0.001 |
|       | Ad expenditures (in millions) | 0.147**  | 0.015 | 0.153**  | 0.012 | 0.130**  | 0.018 | 0.137**  | 0.023 | 0.146**  | 0.012 | 0.134**  | 0.022 |
|       | Lagged ad expenditures (in millions) | -0.003  | 0.960 | 0.003   | 0.962 | -0.008   | 0.881 | -0.015   | 0.797 | -0.003   | 0.954 | -0.020   | 0.731 |
|       | Introduction date           | 0.023**  | 0.040 | 0.022**  | 0.052 | 0.023*   | 0.069 | 0.024**  | 0.056 | 0.023**  | 0.040 | 0.039*** | 0.002 |
|       | Introduction date squared   | -0.001*** | 0.001 | -0.001*** | 0.002 | -0.001*** | 0.002 | -0.001*** | 0.002 | -0.001*** | 0.001 | -0.001*** | <0.001 |
|       | Time since introduction (months) | 0.091*** | 0.002 | 0.091*** | 0.002 | 0.094*** | 0.001 | 0.099*** | 0.001 | 0.095*** | 0.008 | 0.088*** | 0.003 |
|       | Time since introduction squared | -0.008*** | 0.001 | -0.008*** | 0.001 | -0.008*** | <0.001 | -0.008*** | <0.001 | -0.008*** | 0.003 | -0.007*** | 0.001 |

**Interactions**

| Variable                          | Estimate | p   |
|-----------------------------------|----------|-----|
| Sustainability X Price ratio      | -0.235*  | 0.059 |
| Sustainability X Product innovativeness | 0.276**  | 0.028 |
| Sustainability X Promotion        | -0.032*** | <0.001 |
| Sustainability X Brand CSR        | 1.645*** | <0.001 |
| Sustain abili ty X Sustcatintershare | -0.024   | 0.847 |
| Sustainability X Time since introduction | -0.016   | 0.806 |
| Sustainability X Time since introduction squared | 0.002*** | 0.707 |
| Log like liho od                  | -3940.039 |      |
| BIC                               | 8131.604  |      |
| N                                 | 2592      |      |
| NOTES                             |          |
| Model I: Model including only main effects . |
| Model II: Main effects model without interactions between the sustainability claim & the categories. with eco-friendly & fair trade claims instead of the combined sustainability claim |
| Model III: Model including main effects & category specific effects of the sustainability claim. |
Model IV: Model including main effects, category specific effects of the sustainability claim, & the interactions of interest.
Model V: Model including main effects & dynamic effects of the sustainability claim in the first 12 months after introduction
Model VI: Model including main effects & dynamic effects of the sustainability claim over calendar time.

*p<0.1; **p<0.05; ***p<0.01

To increase clarity, we do not display the category fixed effects for Models I, II, III, & IV; we provide those in Table 6. In models V & VI, we did not include category-specific intercepts for parsimony.

We display the parameter estimates of the sustainability, eco-friendly & fair trade claim only for the models without the interactions between the sustainability claim & the categories (Models I & II). Table 7 displays the marginal effect of a sustainability claim per category for models III & IV.

Introduction data: number of months between introduction of the product & January 2008
### Table 6

Category fixed effects.

| Variables              | Estimate | p   | Estimate | p   | Estimate | p   | Estimate | p   | Estimate | p   | Estimate | p   |
|------------------------|----------|-----|----------|-----|----------|-----|----------|-----|----------|-----|----------|-----|
| Coffee (ref. cat.)     | 0.786*** | 0.001 | 0.680**  | 0.013| 0.490    | 0.122| -6.992***| <0.001| 0.786*** | 0.001| 0.931*** | <0.001|
| Sugar                  | -0.064   | 0.575| -0.067   | 0.557| -0.085   | 0.515| -0.051   | 0.697| -0.064   | 0.593| 0.001    | 0.995|
| Ketchup                | 0.450**  | 0.028| 0.452**  | 0.027| 0.174    | 0.431| -0.129   | 0.565| 0.450**  | 0.038| 0.351**  | 0.099|
| Milk                   | 1.997*** | <0.001| 2.030*** | <0.001| 2.586*** | <0.001| 2.121*** | <0.001| 1.996*** | <0.001| 1.883*** | <0.001|
| Butternilk             | 3.644*** | <0.001| 3.728*** | <0.001| 2.506*** | 0.002| -0.578   | 0.849| 3.643*** | <0.001| 3.269*** | <0.001|
| Drinking yoghurt       | 0.353**  | 0.034| 0.356**  | 0.034| 0.259    | 0.176| 0.293    | 0.138| 0.353**  | 0.040| 0.366*   | 0.050|
| Regular yoghurt        | 0.553**  | 0.001| 0.562*** | 0.001| 0.156    | 0.413| -0.100   | 0.605| 0.551*** | 0.001| 0.481**  | 0.010|
| Baby food              | -1.624***| <0.001| -1.621*** | <0.001| -1.544***| <0.001| -1.542***| <0.001| -1.624***| <0.001| -1.696***| <0.001|
| Ice cream              | 0.506*** | <0.001| 0.443*** | 0.005| 0.638*** | 0.001| 0.577*** | 0.004| 0.506*** | <0.001| 0.512*** | <0.001|
| Chocolate bars         | 0.518*** | <0.001| 0.481*** | <0.001| 0.348*** | 0.002| 0.278**  | 0.010| 0.518*** | <0.001| 0.454*** | <0.001|
| Liquid detergent       | -0.131   | 0.382| -0.129   | 0.390| -0.187   | 0.275| -0.301*  | 0.074| -0.132   | 0.408| -0.141   | 0.385|
| Meal boxes             | 0.305**  | 0.019| 0.304**  | 0.020| 0.559*** | <0.001| 0.549*** | <0.001| 0.305**  | 0.014| 0.315**  | 0.018|
| Liquid laundry detergent| -0.212* | 0.082| -0.223*  | 0.071| -0.280** | 0.034| -0.367***| 0.004| -0.212   | 0.109| -0.236** | 0.047|

*p<0.1; **p<0.05; ***p<0.01

n.a. indicates that there were not sufficient observations in the matched sample to estimate the parameter.
### Table 7

**Marginal effects of the sustainability claim per category.**

| Variables                                | Estimate | p    | Estimate | p     |
|------------------------------------------|----------|------|----------|-------|
| Sustainability claim (0=no, 1=yes), Coffee| -0.205   | 0.404| -2.942** | <0.001 |
| Sustainability claim, Sugar              | n.a.     | n.a. | n.a.     | n.a.  |
| Sustainability claim, Soup                | -0.171   | 0.186| -3.640** | <0.001 |
| Sustainability claim, Ketchup             | 0.229    | 0.363| -2.726** | 0.015  |
| Sustainability claim, Milk                | -1.887***| <0.001| -6.125***| <0.001 |
| Sustainability claim, Buttermilk          | n.a.     | n.a. | n.a.     | n.a.  |
| Sustainability claim, Drinking yoghurt    | 0.596*** | 0.002| -2.531 ***| <0.001 |
| Sustainability claim, Regular yoghurt     | 0.311    | 0.158| 2.060*** | <0.001 |
| Sustainability claim, Baby food           | -0.703***| <0.001| -3.430***| <0.001 |
| Sustainability claim, Ice cream           | -0.892***| <0.001| 1.106*** | 0.002  |
| Sustainability claim, Chocolate bars     | -0.259*  | 0.067| -3.401 ***| <0.001 |
| Sustainability claim, Liquid detergent    | -0.559***| 0.002| 0.632    | 0.183  |
| Sustainability claim, Meal boxe           | -1.453***| <0.001| -0.196   | 0.548  |
| Sustainability claim, Liquid laundry detergent| 0.132   | 0.472| 4.319*** | <0.001 |

*p<0.1; **p<0.05; ***p<0.01

n.a. indicates that there were not sufficient observations in the matched sample to estimate the parameter.
Table 8

Simulated impact of a sustainability claim for low/high values of the significant moderators.

| Sustainability claim impact on ln(unitsales) | Impact on sales ((exp(P)-1)*100%) |
|--------------------------------------------|-----------------------------------|
| Innovativeness *low* (-1SD)                | -0.222                            | -20% |
| Innovativeness *high* (+1SD)               | -0.142                            | -13% |
| Promotion *low* (0)                        | -0.182                            | -17% |
| Promotion *high* (+1SD)                    | -0.664                            | -49% |
| Brand CSR *low* (-1SD)                     | -2.980                            | -94% |
| Brand CSR *high* (+1SD)                    | 2.616                             | 1,268% |

NOTE: For the promotion variable (M=0.784, SD=9.286) we use the lowest possible value, 0.
Fig. 1. Conceptual model.
### Scope of study in terms of conventional vs. sustainable products

|                     | Conventional Brands/Products                          | Sustainable Products                                                                 |
|---------------------|------------------------------------------------------|--------------------------------------------------------------------------------------|
| **Existing Products** | Nijs et al. (2001); Van Heerde et al. (2013); Mela et al. (1997) | Bezawada & Pauwels (2013), Ngobo (2011), Van Doom & Verhoef (2015); Verhoef & Van Doom (2016), Juhl et al. |
| **New Products**     | Gielens & Steenkamp (2007); Steenkamp & Gielens (2003), Ataman et al. (2008) | This Study+ Exploration of Dynamic Effects of Sustainability Claim                     |

**Note:** This Study+ refers to the new study presented in this document.
Fig. 3. Dynamic effect of a sustainability claim in the first 12 months.
Fig. 4. Dynamic effect of a sustainability claim on sales over calendar time.
WEB APPENDIX

TABLE A1

Category Groups

| Category          | Components                                                                 |
|-------------------|-----------------------------------------------------------------------------|
| Baby food         | Baby food                                                                  |
| Coffee            | Coffee                                                                      |
| Liquid detergents | Milk, buttermilk, drinking yoghurt, yoghurt                                |
| Meal boxes        | Liquid detergents, liquid laundry detergents                                |
| Snacks            | Meal boxes                                                                  |
| -and sauces       | Ice cream, chocolate                                                        |
|                   | , ketchups                                                                  |
### TABLE A2

Additional Analyses - Estimation Results

| Variables                                      | Estimate 1   | p         | Estimate 2   | p         |
|------------------------------------------------|-------------|-----------|-------------|-----------|
| Intercept                                      | -1.265***   | 0.001     | -0.580***   | 0.007     |
| Sustainability claim                           | -0.384***   | <0.001    | -0.079      | 0.178     |
| Eco-friendy claim                              | -0.215***   | <0.001    | -0.038      | 0.104     |
| Fairtrade claim                                | 0.038***    | <0.001    | 0.034***    | <0.001    |
| Price ratio                                    |             |           |             |           |
| Product innovativeness                         |             |           |             |           |
| Sales Promotion                                | -0.032      | 0.922     | 0.867***    | 0.001     |

#### Control variables

| Variables                                      | Estimate 1   | p         | Estimate 2   | p         |
|------------------------------------------------|-------------|-----------|-------------|-----------|
| Sustcatintroshare                              | 0.169***    | <0.001    | -0.008      | 0.808     |
| Weighted distribution                          | 3.727***    | <0.001    | 3.017***    | <0.001    |
| Claim product-related                          | 0.454***    | <0.001    | -0.100      | 0.236     |
| Claim taste                                    | 0.085       | 0.598     | 0.804***    | <0.001    |
| Claim healthy additives                        | -0.338**    | 0.010     | -0.022      | 0.857     |
| Claim reduced nutrients                        | 0.340***    | 0.001     | 0.214**     | 0.025     |
| Claim health functional                        | -0.093      | 0.581     | -0.958***   | <0.001    |
| Ad expenditures (in millions)                  | 0.183**     | 0.015     | 0.109       | 0.100     |
| Lagged expenditures (in millions)              | 0.050       | 0.494     | -0.005      | 0.937     |
| Introduction date                              | 0.030*      | 0.065     | 0.024*      | 0.062     |
| Introduction date squared                      | -0.001***   | <0.001    | -0.001***   | <0.001    |
| Time since introduction (in millions)          | 0.097***    | 0.001     | 0.098***    | 0.001     |
| Time since introduction squared                | -0.007***   | 0.001     | -0.008***   | <0.001    |

#### Interactions

| Variables                                      | Estimate 1   | p         | Estimate 2   | p         |
|------------------------------------------------|-------------|-----------|-------------|-----------|
| Sustainability X Price ratio                   | 0.088       | 0.551     | -0.235*     | 0.060     |
| Sustainability X Product innovativeness        | 1.158***    | <0.001    | 0.272**     | 0.031     |
| Sustainability X Promotion                     | -0.009      | 0.247     | -0.032***   | <0.001    |
| Sustainability X Brand CSR                     | 22.402***   | <0.001    | 16.519***   | <0.001    |
| Sustainability X Sustcat introshare            | 0.875***    | <0.001    | -0.026      | 0.834     |

Log likelihood                               
-2845.301                                    
BIC                                           
6055.827                                      
N                                             
2016                                          

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### TABLE A3

**Additional Analyses - Category Fixed Effects**

| Variables          | \( R-1 \)    | \( p \)    | \( R-2 \)    | \( p \)    |
|--------------------|---------------|------------|---------------|------------|
| Coffee (ref. cat.) | 1.653***      | <0.001     | 7.113***      | <0.001     |
| Sugar              | -0.257        | 0.430      | -0.045        | 0.734      |
| Soup               | -4.020***     | <0.001     | -0.129        | 0.563      |
| Ketchup            | -1.237***     | 0.001      | 2.115***      | <0.001     |
| Milk               | -26.738***    | <0.001     | -0.416        | 0.891      |
| Drinking yoghurt   | 0.176         | 0.577      | 0.293         | 0.137      |
| Regular yoghurt    | -0.231        | 0.483      | -0.100        | 0.605      |
| Baby food          | -1.383***     | <0.001     | -1.544***     | <0.001     |
| Icecream           | -1.1185***    | 0.001      | 0.590***      | 0.003      |
| Chocolate bars     | -0.001        | 0.997      | 0.275**       | 0.010      |
| Liquid detergent   | -1.171***     | 0.001      | -0.301 *      | 0.074      |
| Mealboxes          | -0.020        | 0.950      | 0.547***      | <0.001     |
| Liquid undry detergent | -1.529***  | <0.001     | -0.366***     | 0.004      |

*p<0.1; **p<0.05; ***p<0.01

n.a. indicates that there were not sufficient observations in the matched sample to estimate the parameter.
## TABLE A4

Additional Analyses: Marginal Effects of the Sustainability Claim per Category

| Variables                        | Estimate R-1 | Estimate p  | Estimate R-2 | Estimate p  | p     |
|----------------------------------|--------------|-------------|--------------|-------------|-------|
| Sustainability claim (0=no, 1=yes), Coffee | -6.530***    | <0.001      | -3.061***    | <0.001      |       |
| Sustainability claim, Sugar      | 1.674***     | 0.010       | n.a.         | n.a.        |       |
| Sustainability claim, Soup       | -7.489***    | <0.001      | -3.792***    | <0.001      |       |
| Sustainability claim, Ketchup    | n.a.         | n.a.        | -2.778**     | 0.014       |       |
| Sustainability claim, Milk       | -16.280***   | <0.001      | -6.121***    | <0.001      |       |
| Sustainability claim, Butter milk | n.a.        | n.a.        | n.a.         | n.a.        |       |
| Sustainability claim, Drinking yoghurt | -3.413***    | <0.001      | -2.570 ***   | <0.001      |       |
| Sustainability claim, Regular yoghurt | -1.538***    | 0.001       | 2.024***     | <0.001      |       |
| Sustainability claim, Baby food  | -4.054***    | <0.001      | -3.500***    | <0.001      |       |
| Sustainability claim, Ice cream  | 1.064***     | 0.004       | 1.094***     | 0.003       |       |
| Sustainability claim, Chocolate bars | -6.817***    | <0.001      | -3.413**     | <0.001      |       |
| Sustainability claim, Liquid detergent | -2.741***    | <0.001      | 0.639        | 0.178       |       |
| Sustainability claim, Meal boxes | -1.561***    | <0.001      | -0.186       | 0.566       |       |
| Sustainability claim, Liquid laundry detergent | 4.764***    | <0.001      | 4.293***     | <0.001      |       |

*p<0.1; **p<0.05; ***p<0.01

n.a. indicates that there were insufficient observations in the matched sample to estimate the parameter
Figure A1

Boxplots of the propensity scores used for the matching procedure in the full sample (a) and the matched sample (b)

(a)

(b)