Biased Voluntary Nutri-Score Labeling

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Abstract

Food labels are supposed to quickly inform consumers about the nutritional values of products. We provide evidence that in a system where labels are voluntary, they are systematically distorted. The probability of finding a label on a product of the category with the highest nutritional value is 51 percentage points larger than in the lowest category.

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1 Introduction

The Nutri-Score is used in several European countries in order to help consumers make more informed choices. While displaying nutritional facts is obligatory within the EU, the Nutri-Score is supposed to break down the rather complex information to a more simple choice. Indeed, the Nutri-Score has been found to affect consumers' perception and choices in experimental settings (Ducrot et al., 2016; Egnell et al., 2019; van den Akker et al., 2022; Robertson et al., 2022) and the field (Reyes et al., 2020).

The Nutri-Score, however, is not obligatory in the EU. Companies can decide on which of their brands they want to exhibit the label. If they decide for exhibiting, they are required to show labels on all products of this brand. The voluntary nature of the score has been seen as a disadvantage by consumer protection agencies.[1] Companies might deliberately omit the label for brands that have products with a low score. Indeed, many products are not labeled. Consumers may thus be misled. On the other hand, the decision whether or not to exhibit the label has to be made on the brand level. This reduces the scope for such manipulation. Labels may simply be missing because packages of respective brands have not (yet) been redesigned or for some other innocent reason. Then, the observable distribution of labels would reflect the actual distribution. Alternatively, the distribution of observable labels might be biased toward better Nutri-Scores.

The European Commission has proposed to make the Nutri-Score mandatory and this proposal is currently debated within the EU.[2] For the decision, it might be useful to know whether the lack of labels is misleading or random.

Here, we examine whether Nutri-Scores are less likely to be found on products with a low Nutri-Score. For this, we take inventory of all processed and pre-

[1] For an example, see this statement by the consumer agency for Lower Saxony, accessed on the 1st of September 2023.

[2] For an example, take this question posed at the European Parliament, accessed on the 1st of September 2023.

packaged food products offered at an arbitrary supermarket belonging to the second largest food retailer in Germany. From the online portal of this shop, we collected all relevant information about each product including whether the Nutri-Score was exhibited. We make use of the feature that the Nutri-Score can be computed from the (obligatory) nutritional facts table and that the respective official algorithm is known.

Suppose labels were missing for some other non-strategic reasons, e.g., that the redesign for packaging has been scheduled for a later point in time. Then, we would expect the share of unlabeled products to be the same, irrespective of the product's Nutri-Score. This, however, is not the case. We find that labels are not missing randomly. Rather, a product in the highest Nutri-Score category ("A") is more than three times as likely to exhibit the score than a product in the lowest Nutri-Score category ("E"). The increase of the probability of being labeled by more than 51 percentage points is highly statistically significant. Since decisions are made on the brand level, this observation is consistent with companies deliberately deciding not to label brands in which key products are unhealthy.

While many studies explore the effectiveness of food labels on consumer choices (Ducrot et al., 2016; Egnell et al., 2019; Reyes et al., 2020; van den Akker et al., 2022; Robertson et al., 2022), our aim is to document a discrepancy between the actual and observable distribution of Nutri-Scores under the current voluntary EU regulation. Dannenberg et al. (2009) find experimentally that mandatory labeling loses its value if there is a second voluntary label. We show that with a voluntary label only, the distribution of Nutri-Scores is biased toward better categories. What we identify is, of course, merely an association. We cannot claim causality. It might, for example, well be that companies first decide on displaying the label and then obtain a better score by adjusting ingredients—see Robertson et al. (2022) for an experiment disentangeling these effects. Whatever the reason, however, consumers have to guess the score of the unlabeled product, which negatively affects the quality of their choices. Policy makers can eliminate this problem and provide the missing information by making the labeling obligatory.

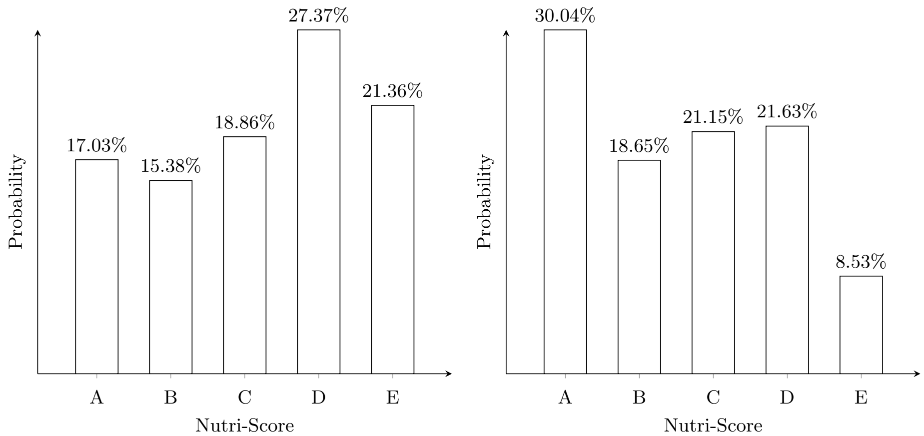
2 Data and descriptives

Data collection took place in January and February 2022 from the online portal of a large German retailer. All products were catalogued with the following exceptions: (i) fresh produce, cannot display the Nutri-Score on the packaging, (ii) seasonal products and (iii) beverages, which use a different Nutri-Score algorithm. For each product, we collected the following variables: product name, whether it exhibited the Nutri-Score, the Nutri-Score rating, and the brand. We also noted the product category (e.g. 'frozen food') and the respective subcategory (e.g. 'frozen vegetables') from the navigation bar of the web-site, the price, the price per kilo, whether the product is organically produced, and the country of origin. For products that did not exhibit the Nutri-Score, we computed it from the nutritional facts table that comes with the product details. For this, we used the implementation of the Nutri-Score algorithm offered by the German Ministry of Food and Agriculture.[3]

In total, we collected information on 4,110 products from 50 categories belonging to 459 brands and coming from 54 countries. Most of the products come from Germany, prices range from 15c to €21.90 and 8.59% are labeled organic. Only 39.93% exhibit the Nutri-Score. Those products who have a Nutri-Score label are mostly in the highest category ('A'). The categories 'B' to 'C' appear in roughly one fifth and the last category ('E') only in 8% of the cases—see Panel (b) in Figure 1.

From the observable Nutri-Scores one gets the impression that roughly a third of all products belong to the highest category. The actual share of products from this category, however, is only a fifth. On the other hand, less than a tenth of the displayed labels are in the lowest category, whereas the actual probability is above one fifth—see Panel (a) in Figure 1.

[3]A respective Excel-File can be downloaded here on the website of the German Federal Ministry of Food and Agriculture, accessed on the 1st of September 2023.



(a) all products (b) displayed on products

Figure 1: Nutri-Scores

3 Results

Figure 1 suggests that it is more likely that a product with the highest Nutri-Score displays this score than a product with the lowest score. Indeed, the distribution of Nutri-Scores that are displayed is shifted to lower categories (p-value of Kolmogorov-Smirnov test and Wilcoxon rank-sum test are below 0.001). This observation is confirmed by a linear probability regression, where we estimate the increase in the probability of displaying the label for each Nutri-score category in relation to the worst category 'E'. The coefficient for category 'A' then tells in percentage points how much more likely a product of category 'A' is to exhibit a label in relation to a product of category 'E'. In the regression, we cluster errors by brand, because the decision to show the label affects the whole brand. We find that a product classified as 'A' is about 55 percentage points more likely to be labeled than an 'E' product—see first column in Table 1. The probability drops with the category but even a product with Nutri-Score 'D' still has a probability that is about 16 percentage points larger than an 'E' product—see Figure 2.

This relationship may, of course, be driven by explanations other than a

Table 1: Linear probability regression

Dependent variable: Nutri-Score label (1=yes, 0=no)	(1)	(2)	(3)
Nutri-Score is A	0.545	0.474	0.524
	(0.065)	(0.071)	(0.068)
Nutri-Score is B	0.325	0.275	0.342
	(0.059)	(0.063)	(0.051)
Nutri-Score is C	0.288	0.231	0.268
	(0.057)	(0.058)	(0.056)
Nutri-Score is D	0.156	0.125	0.142
	(0.044)	(0.046)	(0.044)
Organic			0.138
			(0.230)
Controls for			
47 product types	no	no	yes
23 countries	no	no	yes
Constant	0.159***	0.195	0.141
	(0.060)	(0.070)	(0.086)
Observations	4110	3302	3302

Ordinary least square estimates with standard errors in parentheses, clustered by brand.
Reference category is a non-organic product with Nutri-Score E.

deliberate choice to only display good scores on a brand. Consider, for an example, the country of origin. Goods from countries that are further away may be less likely to display the score, while the longer distance may render it more attractive to transport greasy products (because they are less likely to spoil on the way). This would result in a correlation that has nothing to do with deliberate labeling. Similarly, organically produced products may be more healthy but also more likely to appeal to conscious customers who only buy if there is a label. Or, certain product groups, like frozen foods, may be less healthy but also less likely to appeal to conscious customers who ask for the label. We can eliminate these alternative explanations by controlling for the country of origin, product category and whether the product is organically produced. For this regression, we take out all combinations of country, category and organic status in which the labeling with Nutri-Scores does not vary. This leaves 3,302 observations from 23 countries and 47 product types. The reduction in the sample does not affect coefficients—see second column in Table 1. Controlling for country, category and organic status also does not alter the results. Point estimates and standard errors only change minimally—see third column in Table 1.

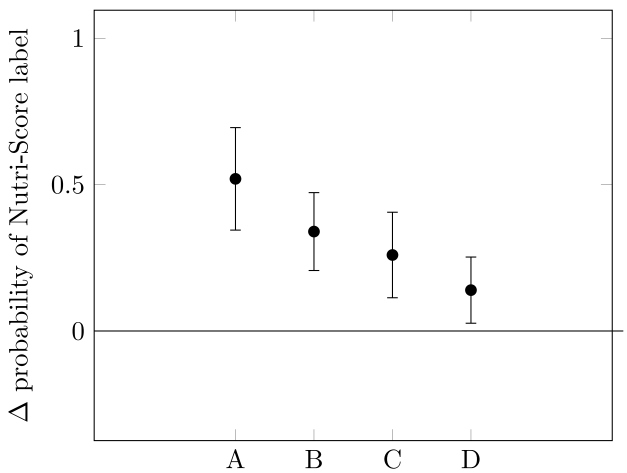


Figure 2: In relation to products from Nutri-Score category 'E', products from higher categories are more likely to exhibit the Nutri-Score. (Coefficients from Column (2) in Table 1. Bars indicate 95% Bonferroni confidence intervals.)

Looking at the coefficients in this regression shows that a product with a Nutri-Score of A is about 52 percentage points more likely to exhibit the label than a product from the lowest category—see Figure 2.

Three quarters of the products at this supermarket chain are also available in other supermarkets, one quarter, however, are own brands. In order to see whether results are driven by these own brands, we rerun the analysis without any products marketed under one of the own brands. Observation numbers drop to 2929 without and 1821 with controls. Since there are fewer country-product-category-organic combinations with variation in the label, we cannot control for as many countries and product types as before. Coefficients are smaller and standard errors higher but the tendency from our main result is confirmed: products with higher Nutri-Scores are more likely to exhibit these scores—see column (1) and (2) in Table 2.

Another possibility for the association between the label and the actual Nutri-Score is the following. Suppose that expensive products, e.g., original parmigiano cheese, tend to be less healthy. If such products are then also less likely to exhibit the Nutri-Score because it looks 'cheap', this would create a spurious correlation. To some extent such effects are already controlled for by the product category. As an additional robustness check, we can also control for the price of the product per kg. We did not include this variable in our main regression because price is a choice variable and hence not truly exogenous. Indeed, it seems as if high prices are associated with not exhibiting the label. This, however, does not alleviate the problem that products with a low Nutri-Score are less likely to exhibit it–see Column (3) in Table 2.

Recall that firms have to decide for the whole brand whether they want Nutri-Score labels or not. One possible explanation for the association between label and Nutri-Score is that firms violate this regulation and tend to label products within a given brand more often if they have a higher Nutri-Score. Our data, however, shows very little variation within brands. Out of the 459 brands, 402 are not labeled at all and 24 are completely labeled. This means 92% of brands fully adhere to the law. Almost all brands (99%) are consistent with at least 90% of their products. Accordingly, one would expect a high correlation between the share of products with good Nutri-Scores and a brand exhibiting labels. This is indeed the case. A brand with 1 percentage point more products with a Nutri-Score of A, for example, is about 22 percentage points more likely to exhibit labels—regardless of whether we control for the share of organic products and the average price per kilo (see column (1) and (2) in Table 3). A similar correlation can be found with respect to the share of products with a Nutri-Score of C. Interestingly, the correlation for the share of products with a Nutriscore of B is much less pronounced; possibly, because one response to the Nutri-Score may also be to elevate the score by altering the recipe (this, however, is mere speculation).

Table 2: Robustness check: regression without own brands (1-2) and controlling for price per kg (3)

Dependent variable: Nutri-Score label (1=yes, 0=no)	(1)	(2)	(3)
Nutri-Score is A	0.333	0.349	0.515
	(0.095)	(0.090)	(0.062)
Nutri-Score is B	0.218	0.298	0.338
	(0.068)	(0.070)	(0.049)
Nutri-Score is C	0.164	0.195	0.265
	(0.065)	(0.061)	(0.053)
Nutri-Score is D	0.073	0.102	0.137
	(0.035)	(0.061)	(0.041)
Organic		0.238	0.140
		(0.229)	(0.221)
Price in € per kg			-0.006
			(0.003)
# of controls for			
Product types	none	23	47
Countries	none	12	23
Constant	0.056	0.037	0.261
	(0.020)	(0.107)	(0.116)
Observations	2929	1821	3302

Ordinary least square estimates with standard errors in parentheses, clustered by brand.
Reference category is a non-organic product with Nutri-Score E.

4 Summary

Our analysis shows that there is a systematic bias in which products are labeled with the Nutri-Score. Products in a better Nutri-Score category are much more likely to exhibit the score. Consumers need to be aware that they are considerably more likely to face a product with a low Nutri-Score if they see no Nutri-Score. This bias is consistent with firms withholding 'unpleasant' Nutri-Score ratings. Since most firms tend to respect the law and label all or no products of one brand, the link between labeling and Nutri-Score originates at the brand label. So, if firms indeed strategically choose to label, this happens for the whole brand.

Table 3: Regression on the brand level

	(1)	(2)
Share of Nutri-Score A	0.217	0.220
	(0.055)	(0.057)
Share of Nutri-Score is B	0.083	0.084
	(0.049)	(0.049)
Share of Nutri-Score is C	0.179	0.178
	(0.045)	(0.045)
Share of Nutri-Score is D	0.044	0.045
	(0.037)	(0.037)
Organic		-0.048
		(0.067)
Price in € per kg		-0.000
		(0.001)
Constant	0.029	0.035
	(0.023)	(0.028)
Observations	459	459

Ordinary least square estimates with standard errors in parentheses.

However, our analysis cannot fully rule out other reasons for the observed bias. Whatever these reasons may be, rendering labels obligatory (as considered by the EU) will eliminate this bias.

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