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The Use of Iodized Salt in Processed Foods: Empirical Evidence and the Role of Regulation a)

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Abstract

Salt policy is an important element of European nutrition policy. Whereas the per-capita intake of salt in the population is viewed as being too high for health reasons, the intake of iodized salt helps to counteract iodine deficiency. Given this tradeoff, the principle "If salt, then iodized salt!" is formulated in German health and nutrition policy. We address the question whether food processors follow this rule and why this is so. A market study for German grocery retailing and 30,345 processed foods in the food groups *bread, meat* and *milk* reveals that the share of products with iodized salt is low and much below the use of iodized salt in private houzseholds. Expert interviews and online surveys of food processors suggest at least three reasons for this evidence: (i) There is incomplete information among food processors with regard to the health benefits of iodized salt. (ii) A minority of salt consumers is actively opposing the iodization of salt. (iii) The reduced use of iodized salt due to (i) and (ii) is not compensated by governmental regulation and an active information and support policy for salt fortification.

Keywords: iodized salt; processed foods; regulation; market surveys

1 Introduction

Salt consumption is a major target variable of health policy with regard to its magnitude and structure. Given the high level of per-capita salt intake in European countries, a reduction of salt intake is desirable as it would contribute to lower blood pressure and, thus, to a lower number of cardiovascular diseases (Strohm et al. 2016). Whereas total salt consumption is regarded as being too high, the increased use of iodized salt within a given salt intake is evaluated positively from a health point of view. Iodine fortification of salt is seen as an effective way of reducing iodine deficiency (WHO/FAO 2006). Iodine deficiency may cause goiter and dwarfness and, if it is severe during pregnancy, the risk of mental impairment of the child is high. Large progress has been made in many countries around the world with regard to the iodine status of the population, but there is still an insufficient intake in Germany for subgroups of the population. Results from the German Health Interview and Examination Surveys for Adults (DEGS) and for Children and Adolescents (KIGGS) indicate that 30% of adults and children do not reach the recommended iodine intake (BMEL 2019).

When weighing the benefits of lower salt intake and the advantages of iodine fortification in salt, scientists in the Arbeitskreis Jodmangel and the German Federal Ministry of Food and Agriculture formulate the general principle "If salt, then iodized salt!" (Arbeitskreis Jodmangel 2015; BMEL 2019). Whereas the use of iodized salt in private households is the rule rather than the exception, it has often been argued that the use of iodized salt in processed foods is much lower and "below 30%" (Arbeitskreis Jodmangel 2015). However, hard and representative evidence was lacking. Given this background, the use of iodized salt in processed foods was analyzed empirically in a large market survey for Germany recently (Bissinger et al. 2018).

We present selected empirical evidence from this background study. We show on the basis of a large sample of manufactured food products in three major food groups that the use of iodized salt in processed foods is relatively low. On the basis of expert interviews in food-manufacturing firms and food skilled trades as well as online surveys of bakeries and butchers, we provide explanations for the observed evidence. We derive a theoretical explanation on how regulation might have affected the limited use of iodized salt in processed foods and draw conclusions on the future role of regulation at the processors' level.

2 Statistical Evidence: The Use of Iodized Salt in Processed Foods in Germany

The largest part of iodized salt in human food consumption is provided by processed foods. Therefore, a research project was conducted to investigate the use of iodized salt in processed foods within a comprehensive market survey at the level of the German grocery retailing sector. The three most important food groups with regard to salt intake were covered: (i) bread in general, bread rolls, dishes based on bread, crispbread and chips made of bread and other bread products; (ii) raw meat, meat products and sausages; (iii) milk drinks, milk products and cheese and quark. In the following, we call these three food groups *bread, meat* and *milk* to simplify reporting.

As far as representativeness is concerned, the study was designed to picture the North, West, East and South of Germany in the selection of the grocery stores. Given the similar size of the cities, the survey took place in Hannover, Düsseldorf, Dresden and Stuttgart. Moreover, we tried to select the types of grocery stores in the four cities according to the market shares of the operating forms at the national level. The three dominating types of grocery retailers were included: (i) discounters; (ii) supermarkets (in German classification "Supermärkte" and "Verbrauchermärkte"); (iii) hypermarkets ("SB-Warenhäuser" in the German classification). As the large retail firms typically rely on nationally or at least regionally uniform assortment strategies, the empirical results that follow can be regarded as fairly representative for the available foods in the large German retail chains.

The data collection took place in March, April and October 2017. In each of the four cities, a random store sample was drawn until the respective market shares of the retailer types were reached. Appendix 1 gives an overview of the included grocery stores and store types; the survey comprised four hypermarkets, ten supermarkets and 13 discounters. After the selection of the individual grocery stores, a full sample of all processed foods in the three food groups was surveyed.

The information collected for each product included the type of salt that was added in processing, e.g. table salt, iodized salt or sea salt. This information was based on the product's list of ingredients. If iodized salt was included, it was possible to record the type of iodine, such as potassium iodate or sodium iodate. The amount of salt in a product, as indicated by the nutrition table, was also gathered. Apart from this major salt-related information of the particular food, the location of the store (Hannover, Düsseldorf, Dresden, Stuttgart), the survey date, the type of grocery retailer (discounter, supermarket, hypermarket), the sales line (e.g. Kaufland or Aldi Süd), the placement in the store (e.g. shelf or freezer unit) were collected as were the package size in grams and the price in €. Moreover, the name of the product, the producer, the brand and the country of origin were recorded. Additionally, the information was included whether the product was organically produced and based on wholegrain in the food group *bread*.

Overall, data collection in the 27 food stores resulted in a dataset for 30,345 products in the three selected food groups. Table 1 provides first aggregate summary statistics on the distribution of the products across the food groups and on the shares of products with salt added and of products with iodized salt added among those with salt added. Table 1 reveals that most products refer to the food groups *meat* (43.3 %) and *milk* (42.3%), whereas *bread* captures only 12.9%. The share of products with salt added is clearly higher for the food groups *bread* and *meat* compared to *milk*. A key result is then that in the group of processed foods, for

which salt was added, only **28.5%** contained iodized salt. This is a very low share and it confirms the presumption from the earlier literature that there is a rather strong potential for more iodine fortification in processed foods. The disaggregate share of products with iodized salt added in the number of products with salt added is clearly above the aggregate value for the food group *meat* (47%), lower for *bread* (10%) and much lower for *milk* (2%).

Table 1: Types of salt used in the examined food groups (in %)

Food groups	***Bread***	***Meat***	***Milk***
Salt added	98	87	44
thereof iodized types of salt	10	47	2
thereof non-iodized types of salt	90	53	98
Total number of products	3,928	13,140	12,842

Source: Bissinger et al. (2018), p. 44.

In the background study, there is ample evidence that the share of processed foods in which iodized salt is utilized varies strongly with product characteristics and – to a lesser extent - with characteristics of the type of grocery retailer (Bissinger et al. 2018, Section 4.1). Table 2 summarizes some differences in the extent to which iodized salt is utilized in those processed foods which discounters, supermarkets and hypermarkets carry. Discount stores had the highest share of products in the food groups *bread* and *meat* processed with iodized salt. Although the special case of discounters is visible in the numbers, the variation across food groups was much stronger than across types of retailers for any given food group.

Table 2: Shares of products containing iodized salt (in %) for different types of food stores

Food groups **Types of food stores**	***Bread*** ***(n = 3,850)***	***Meat*** ***(n = 11,487)***	***Milk*** ***(n = 5,386)***
Hypermarkets	11.7	43.7	3.9
Supermarkets	8.2	45.6	1.2
Discount stores	16.7	54.1	1.2

Source: Bissinger et al. (2018), p. 48.

Additional statistical and econometric analyses in the background study reveal for the food groups *bread* and *meat* a relatively large number of determinants of the use of iodized salt in processing. The use of iodized salt is generally more likely, as expected, the higher the salt content of a product and if two or three types of salt are added rather than just one type (Bissinger et al. 2018, Sections 4.1.2 and 4.1.3). If a food has been processed by a large firm, the use of iodized salt becomes more likely as well as with a declining ground price. It is striking, too, that the use of iodized salt varies across sales lines, and is more common for processed foods in the discounter ALDI SÜD than in the supermarkets REWE and Edeka or in the hypermarket Kaufland. For both food groups, there are structural differences between subcategories with regard to the structure of salt use. In the food group *bread*, it is noteworthy that it is less likely that iodized salt is used in the wholegrain varieties of bread and bread products compared to non-wholegrain products. In the food group *meat*, the use of iodized salt is less common in organic than in non-organic products. Interestingly, private-label brands are associated with a higher likelihood that iodized salt is used in processed foods in the group *meat*, but not in the group *bread*.

3 Evidence from Qualitative Research: Perceptions of Processors Towards the Use of Iodized Salt

The food-manufacturing firms are responsible for a part of the processed foods only. Food skilled trades, in particular bakeries and butcher shops, are producing in the food groups *bread* and *meat*, too. Therefore, the empirical study included various expert interviews and online surveys among food skilled trades (Bissinger et al. 2018, Section 4.2). According to online surveys of bakeries and butchers, 44% of the participating firms used iodized salt with a higher share in the craft butcher's sector (49%) than in the baker's trade.

As Table 3 reveals, the perception that iodized salt has a higher quality and contributes to health is a major argument of bakers and butchers for using iodized salt. Tradition is another rationale. But there is a declining share of foods that contain iodized salt. One reason stated by firms is that advantages of iodized salt in human nutrition are no longer communicated actively in the public discussion. Although the majority of consumers perceives iodized salt as the normal salt that is health-promoting (Kirchhoff, 2019), the median consumer rarely communicates this positive attitude to food processors. It is more the critical view of some consumer activists with which food processors are confronted. In the expert interviews and the online surveys, a number of food processors refer to their statements that iodine is seen as a food additive and customers should not be "medicated". As awareness-raising campaigns also took place some time ago but not recently, bakeries and butchers are rather left alone with arguments by opponents of iodized salt. This situation is a reason why some entrepreneurs in the sector state they do not use iodized salt any more or do not advertise the use of iodized salt. They see a need for food and health policy to stress the health benefits of iodine fortification but do not regard it as their task as entrepreneurs to engage in this debate.

Table 3: Some major arguments of bakers and butchers for or against the use of iodized salt in their firms

Reasons for the use of iodized salt in food processing	**Reasons for the non-use of iodized salt in food processing**
• *"iodized salt has a higher quality and is healthier";* • *"tradition";* • *"in order to contribute to the health of the customers/population".*	• *"cost differences";* • *"iodine is an additive – the use of iodized salt is a medication of the consumer";* • *"the customers should be allowed to decide for themselves, how much iodine they want to ingest";* • *"the subject isn't currently under discussion in German food industry".*

Source: Own compilation from qualitative analyses in Bissinger et al. (2018), Section 4.2.

4 A Theoretical Framework: Perceptions of Processors, Regulation and the Limited Use of Iodized Salt in Processed Foods

In Sections 2 and 3, empirical evidence was presented on the use of iodized salt in processed foods for Germany. Moreover, perceptions of processors were described that explain the use or non-use of iodized salt. There was no comparable information in the literature prior to the study on which this presentation is based. Given the explorative character of the study, we did not start with a theory. But the perceptions of the processors which were sketched briefly in Section 3 can be employed for a theoretical explanation for the limited use of iodized salt in processed foods. Figure 1 presents the theoretical framework.

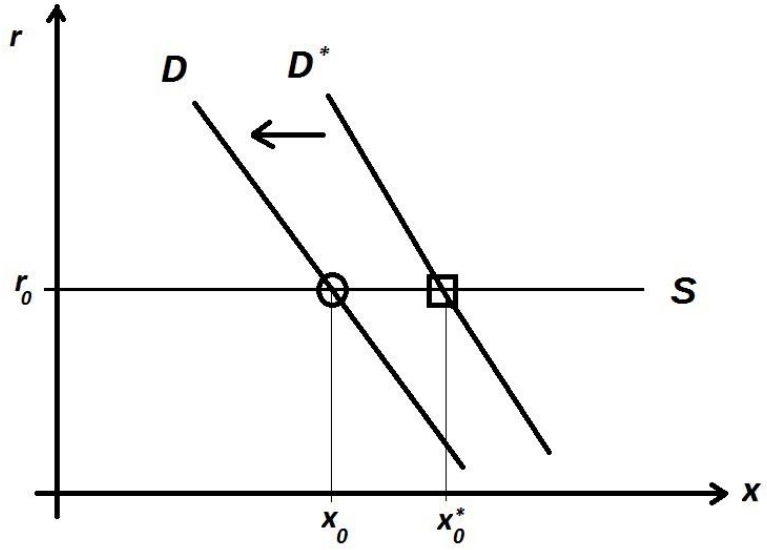

Figure 1: Use of iodized salt in processed foods with (*D**) and without (*D*) information campaigns and political support (individual firm)

The diagram illustrates the use of iodized salt by processors in market equilibrium. The processors' demand curve for iodized salt is *D*. The supply of iodized salt at the wholesale level, where food manufacturers and food skilled trades demand their input, can be regarded as totally price elastic. The market price r_0 is driven by total demand and supply of iodized salt including demand by private households and imports and exports. Thus, r_0 is assumed as exogenous for food processors and it certainly is for the individual food processor. Consequently, food processors realize a profit-maximizing input quantity x_0.

The actual quantity of iodized salt that is used in processed foods has been affected by a lack of governmental support for this input. There were no recent information campaigns and, apparently, this has contributed to heterogeneous and imperfect information of processors on the role of iodized salt for public health. Additionally, there are two types of consumers on the salt market with very different views on the use of iodized salt. There is a (silent) majority of consumers who use iodized salt in their private households as the standard salt and value the iodine fortification for health reasons. There is a (loud) minority of consumers on the other hand who are arguing very actively against it as they are opposing "additives" in food which may be detrimental to some consumers' health. If processors are faced mainly with critical consumers of the second group and a strong governmental information campaign and support is lacking, processors' demand for iodized salt will be only at x_0. Under a governmental information campaign at the consumers' and/or processors' level, processors' demand for iodized salt would be higher, at x_0^*, where their input demand curve would intersect the price-elastic input supply curve.

We can conclude that the processors' factor demand for iodized salt will remain low or even shrink given the fact that processors' information on the health benefits of iodine fortification is incomplete and that critical consumer statements on food additives dominate and tend to increase. Moreover, this situation may become more severe if only the reduction and not the structure of salt consumption is part of governmental information campaigns.

5 Some Implications for Regulation

Perceptions of processors on iodized salt vary strongly and their information on the role of iodine for nutrition and health is often incomplete. Thus, processors decide differently on the use of iodized salt. Our results for the food groups *bread* and *meat* results suggest that the image of iodized salt should be improved. In order to revise a downward trend in the use of iodized salt in processed foods, information campaigns seem necessary.

In a more detailed analysis of policy options, it may come out that information campaigns for consumers are not sufficient to reverse a possible downward trend of iodine supply in salt when overall salt consumption is reduced for health reasons. There is some evidence now from economic studies that consumer information policies on health benefits of a changing intake of nutrients are less effective than product reformulation (Griffith et al. 2017; Spiteri and Soler 2017; Réquillart and Soler 2014; Leroy et al. 2015). In particular, the study by Griffith et al. regarding salt consumption in the United Kingdom indicates that a supply-side approach towards product reformulation is superior to the demand-side approach of more consumer information.

An analysis of costs and benefits for different instruments of regulation of iodine fortification is lacking. Such analysis could help to choose an optimal mix of governmental regulation in the trade-off between a reduction of salt consumption on the one hand and a higher share of iodized salt in salt consumption on the other hand.

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