Mann and Loginova
Agricultural and Food Economics (2023) 11:10
https://doi.org/10.1186/s40100-023-00252-z

Agricultural and Food Economics

RESEARCH Open Access

Distinguishing inter- and pangenerational food trends

Stefan Mann and Daria Loginova*

*Correspondence: daria.loginova@agroscope.admin.ch

Socioeconomics, Agroscope, Tänikon 1, 8356 Ettenhausen, Switzerland

Abstract

While food trends are usually described over an entire population, this paper suggests distinguishing between inter- and pangenerational food trends. To classify the food trends for the total population as inter- or pangenerational, we used disaggregated household-based consumption data on 60 food categories over the period from 1990 to 2020 in Switzerland. We followed six different cohorts with a range of 10 birth years each and estimated robust trends for each generation and each product. Our results show that especially for meat, different generations follow different trends and form 'intergenerational' trends for the total population, whereas beans and peas would be an example of products with an increasing consumption for every single generation and a 'pangenerational' trend. Our study is the first to suggest distinguishing inter- and pangenerational food trends and to cover the most disaggregated available food consumption data in Switzerland for the period from 1990 to 2020. Managers and policy-makers should consider the mentioned differences in food consumption to mitigate errors in consumption projections, target consumers more effectively, and promote healthier food consumption.

Keywords: Food, Consumption, Switzerland, Generation, Trend analysis

Introduction

The patterns of our food consumption are extremely relevant to our environmental footprint (Oita et al. 2018; Jarmul et al. 2020; von Ow et al. 2020)—and they are in constant motion. The consumption of beverages in the USA (Duffey and Popkin 2007), fat fish in Norway (Trondsen et al. 2004) and fast food in Asia (Wu et al. 2021) is on the rise, and the opposite is the case for dairy products in France (Dubuisson et al. 2010), yam and millet in Ghana (Wilhelmina et al. 2010) and traditional food among the Inuit (Hopping et al. 2010). With respect to environmentally more relevant trends, scientists welcome a growing trend of vegetarianism and veganism in the North (Tepper et al. 2022), whereas the environmental footprint in the Global South is still on the rise (Goldstein et al. 2016). However, the nature of these shifts in our diets, despite their high potential relevance (Kearney 2010), is only poorly understood. It is clear that diet changes are mostly caused by behavioural changes (Siega-Riz et al. 1998; Jahns et al. 2001; Smith et al. 2020), which distinguishes them from changes in energy demand (York 2007), for example, because

the latter are mostly caused by sociodemographic changes. However, it is unclear how these behavioural changes altering our food basket are caused.

The change in people's food choice shapes existing food systems. The trend is one of the simplest estimates of a change in behaviour, although we cannot argue that the food consumption of a 35-year-old person in 1990 is interrelated with the food consumption of a 35-year-old person in 2020. Nevertheless, studies have often measured consumption in age groups (see section 'Food consumption trends and generations') and assumed that the changes in consumption dynamics may happen in spite of possibly new behavioural patterns of new generations and generational replacement (e.g. Mori and Saegusa 2010; Arnaudova et al 2022; Baur et al 2022). The reason for the present study is the absence of any quantitative evidence for such differences between generations in the area of food choice and its dynamics. The knowledge about trends in food choice of different generations may improve the forecasts of future food trends, which constitutes the importance of developing this knowledge.

This paper compares the trends in food consumptions between generations and classifies the total population trend as inter- or pangenerational trend. A theoretical framework that highlights the role of generations is presented in the 'Food consumption trends and generations' section. The 'Materials and method' section describes the data and the method with which to check the theoretical concept. The 'Results' section presents and discusses the results, and the 'Discussion and conclusions' section provides conclusions.

Food consumption trends and generations

Theoretical framework

The studies on food trends mentioned in the Introduction do rarely consider the behavioural differences between generations. We carried out an integrative review of literature (see, e.g. Snyder 2019) to collect the studies about food consumption over many generations. As summarised in Table 1, the studies often discuss the mentioned behavioural differences in selected countries and regularly find a significance of age–period–cohort (APC) variables, although the models vary. The examples are a double-hurdle approach by Aristei et al (2008) for Italy, a cohort analysis and seemingly unrelated regressions by Drescher and Roosen (2013) for Germany, probit, logit and APC models by Gustavsen and Rickertsen (2014, 2018a, 2018b) for Norway, APC models for Finland (Kähäri 2020, 2021), APC decompositions for Japan and Korea (Mori and Saegusa 2010; Mori and Stewart 2011; Mori et al. 2012; Mori 2021, 2022), a latent class analysis by Bezerra et al. (2018) for Brazilian adults, and the bulk of literature for the USA, where one can find Tobit models and their modifications (Blisard 2001; Harris and Blisard 2000, 2001; Stewart et al 2012), cross-sectional approach (Christopher 2016), almost ideal demand system (Lee et al. 2020), as well as APC models for the widest range of foods and birth cohorts (Beatty et al. 2013). These studies assigned generations to individuals, found the significance of the APC variables and did expectations about the future behaviour of generations. None of these studies estimated, compared and classified food trends between generations, which allows us to stress the novelty of our research question compared to the existing literature.

In addition to the novelty of the research question, there is a need to select the appropriate way to define generations, at least for modelling purposes. Some previous studies

Table 1 The coverage of previous studies on food consumption between generations

Products	Period		
	1–19 years	20–29 years	30 years and more
One type of food[a]	Aristei et al (2008) and Gustavsen and Rickertsen (2014)	Gustavsen and Rickertsen (2018b), Gustavsen et al (2014), Lee et al (2020)[b], Mori and Saegusa (2010) and Stewart and Blisard (2008)	Mori (2021, 2022)[d], Mori et al (2012) and Stewart et al (2012)
Many types of food	Bezerra et al. (2018), Blisard (2001)[b], Harris and Blisard (2000, 2001)[b] and Vaterlaus et al. (2015)[d]	Gustavsen and Rickertsen (2018a), Mori and Stewart (2011)[e] and Otsuka et al (2014)	Beatty et al (2013), Kähäri (2021)[b] and Schmeling (2014)[d]
Specific intake	Yang (2020)[c]	–	Christopher (2016); Kähäri (2020)
Food away from/at home	Teisl et al (2016)	Drescher and Roosen (2013); Zan and Fan (2010)	–

The generations are defined as a 10-year age–period–cohort, if other is not mentioned.

[a] Only meat (even of many types, incl. fish), only fruit and their variety, only milk, only non-alcoholic beverages, etc.

[b] Generation is defined on 5-year intervals

[c] Generations are defined historically

[d] Only a certain cohort studied

[e] Fruits in Japan, rice in Korea

defined the generation by the age of a head of a household that may distort the generational effects in households with members from various generations. The period of one generation also varies between the studies from 5 to 10-year birth interval. There are also studies that assign generations as it is historically common (e.g. 'Baby Boomers', 'X', 'Y'), so that the length of the studied periods may differ even within one study. There are also definitions that are relevant only for selected countries, conditions and societies (e.g. Interbellum generation, MTV generation, Sandwich generation, The Boomerang Generation). These perspectives neglect, in a way, the impact of age. It competes with the perspective that food demand changes over the course of life, a well-documented perspective (Cortez and Senauer 1996; Jho 1999; Zhong et al 2012; Bilgic and Yen 2013). However, it is the merit of the approach centred on generations that the evolution of values and tastes in societies can better be taken into account. Section "Generations" shows the way to avoid the mentioned issues in defining generations, albeit using more data.

Studies with population data on consumption and age across at least a 20-year period of time could potentially predict a 10-year trend line for available products. However, to the best of our knowledge, a few studies had enough data for such quantitative exercise for many foods, and those studies did not focus on distinguishing food trends for many product types. The entire literature, however, somehow neglects to systematically take into account that some societal trends emerge because the young generation behaves differently from the old one. This simple principle, while being well documented by political scientists (Rodrigo and Torreblanca 2001; Breen 2014), has not been given sufficient attention when looking at food trends.

In Switzerland, the trends in food consumption are covered by Swiss statistics (FSO 2022; FSVO 2021, 2019; FCN 2018) and researchers (e.g. de Abreu et al 2014; Dumont et al 2017), albeit not in a generational perspective. The studies report that more and more young people from urban areas are giving up eating meat and this situation is

expected to continue in the future. In a regional case study (Schneid Schuh et al. 2018), the adult population slightly improved compliance with the Swiss dietary guidelines over time, while the provision of dietary guidelines did not impact these trends. With regard to many disaggregated foods, the situation is even less clear, because most studies cover only a specific product or dietary unit and analyse less than a 10-year period.

The importance of distinguishing inter- and pangenerational food trends

If the young generation behaves differently from the old one, then the compared generational trends would have different shapes, otherwise the consumption dynamics would be similar. Having this in mind, we suggest that food trends can be distinguished into inter- and pangenerational trends. Therefore, defining intergenerational and pangenerational food trends is the first contribution of this study. Pangenerational trends are simpler in their essence, because we define that they are shaped by the same dynamics (increasing or decreasing consumption) across all generations, slightly adapting the use of the term 'pangenerational' by Maxwell and Broadbridge (2014). Therefore, the product consumption trend for the total population is pangenerational, if trends of product consumption for all studied generations have the same sign. If the negative (positive) trend for product consumption was pangenerational, it would mean that the overall negative (positive) trend is significantly negative (positive) for each age group. If some generations had a positive and others a negative trend, the overall pattern would be intergenerational (borrowing the term from Meyer 2017).

In our opinion, there are two reasons giving importance to the distinction. One, the distinction between pan- and intergenerational food trends is potentially important for marketing strategists. It is key for producers and retailers to find out to which target group they should tailor their promotional activities (Reutterer et al. 2006; Camilleri 2018). For example, if the decline in food consumption prevailed despite an increasing consumption by elder segments, it would certainly be advantageous to focus on these elder segments when promoting this food. Two, scientists who are interested in consumption forecasts will find support in the distinction between the two categories of demand trends. If a negative trend, for example, is shaped by elder consumers, while the youngest generation increases their consumption, it is unlikely that the negative trend is going to be a long-term trend because the older generation will die out over time.

One field where intergenerational food trends may be particularly important may be meat consumption. It is well known that young people are more open to vegetarian diets than older generations are (Stoll-Kleemann and Schmidt 2017; Nery do Carmo, 2019; Giacoman et al. 2021). As previous literature did not address trends between generations, we cover this research gap and hypothesise that the share of intergenerational trends is higher for meat products than for other products.

Materials and method

Data

For two reasons, Switzerland is a suitable case study to test our hypothesis and to illustrate the different categories of food trends. Owing to the country's high level of wealth and good trade relations, food availability is almost unlimited so that shifts in consumption are mostly demand rather than supply-driven. In addition, there are good databases

available for Swiss consumers that, in the past, have enabled a number of empirical and research studies on consumption patterns (Aepli and Finger 2013; Götze and Mann 2015; Götze et al. 2016; Sahakian et al. 2020).

We used disaggregated agent-based data issued by the Swiss Federal Statistical Office for the years 1990 and 2000–2017 for 6–12 thousand random participants of the survey (households of Switzerland) each year. The procedure of data collection is a random sample of households in Switzerland who report their household's characteristics and food purchasing diaries. Therefore, the data we used are the result of a reliable randomised observational survey. The processing of the conducted survey was the same each time, but there were major changes in the period of the survey, the product categories and the households' characteristics declared across the years. The data in 2006–2017 specified the yearly information about the households' respondents and average monthly consumed volumes and expenditures of 105 foods for each household. The data in 1990 and 2000–2005 specified similar information, but the households and foods were described in less detail. The nulls for the households that declared zero consumption were recorded in the data and were considered in all estimations of the present paper. The average consumption volumes may differ from reported ones in food statistics because households' food diaries contain only food purchases of the households, not food consumption in restaurants or canteens.

As we aimed at studying trends, we needed to scale the data over time and generations using only the most reliable data. Therefore, we used only the data of 1990, 2000, 2010 and 2017 to define the trends in food consumption. We used the data of 2017 to approximate the data for 2020 because the latter were not available in 2023 and the consumption might have been distorted by the Corona crisis. Because of food classifications (product categories) mismatch across the years, we aggregated several food categories into more general food categories that corresponded by meaning. Therefore, compared with official statistics, the food categories in the present study appear to be more general over the years for the least stable food categories, such as non-alcoholic drinks. We defined 49 main foods that matched precisely across all years, accurately grouped the remaining categories into more general food categories, and studied 60 food categories in total. These aggregations allowed us to avoid a major reduction in the data.

Generations

In this study, we defined a generation as all people of a certain age in all households in the corresponding year (see Table 2). Following the data availability, we started defining generations in 1990, allocating a 10-year period to each generation. Therefore, the first generation was 75 and older in 1990, the second was 65–74 years old, the third was 55–64 and so on until the seventh generation, aged 15–24 years old in 1990. In 2000, that is 10 years later, the seventh generation changed its age from 15–24 to 25–34, and first observations on consumption were available for the eighth generation, then aged 15–24. Therefore, the seventh generation was assigned to the age group 15–24 in 1990, 25–34 in 2000, 35–44 in 2010 and 45–54 in 2020. The same logic was applied to other generations.

If all participants of the household were in the same generation according to Table 2, the household was assigned to this generation, i.e. generations were assigned to singles

Table 2 The age (birth years) of generations 1–10

Age (years)	1990	2000	2010	2020
15–24	7 (1966–1975)	8 (1976–1985)	9 (1986–1995)	10 (1996–2005)
25–34	6 (1956–1965)	7 (1966–1975)	8 (1976–1985)	9 (1986–1995)
35–44	5 (1946–1955)	6 (1956–1965)	7 (1966–1975)	8 (1976–1985)
45–54	4 (1936–1945)	5 (1946–1955)	6 (1956–1965)	7 (1966–1975)
55–64	3 (1926–1935)	4 (1936–1945)	5 (1946–1955)	6 (1956–1965)
65–74	2 (1916–1925)	3 (1926–1935)	4 (1936–1945)	5 (1946–1955)
75 and older	1 (1900–1915)	2 (1916–1925)	3 (1926–1935)	4 (1936–1945)

and to households with people of similar age, which is more precise than defining the generation by a generation of a household head, but considerably reduces the number of households assigned to generations. Therefore, we introduced two more categories. First, we allocated families with children into a separate category. Second, we defined a group of 'mixed' generations if the household had no children younger than 15 years old but the age difference between the participants did not allow allocating them to one generation. We excluded households with children and the group of 'mixed' generations from the generation classification but considered their observations separately and in the total population group. As a result, we obtained 6 groups with 4 sets of observations for trend analysis (generations 4–7, 'families with children' and 'mixed'), 2 generations with 3 sets of observations (generations 3 and 8) and 2 generations with only 2 sets of observations to study (generations 2 and 9). We assumed a certain homogeneity of agents within each generation over time. We precisely analysed generations 3–8 and compared the results with the estimations performed for all available data. We chose this rationale, because if we had followed people in the same age cohort over years, then the observations for each food trend would have included people from several generations over time.

The information on the age and generation of the participants in the households and the information on the households' population and food consumption were merged for further analysis. In total, our analysis included 1.3 million observations representing consumption volumes per person for 60 comparable food categories in the households for the years 1990, 2000, 2010 and 2020.

Method

In this study, we grouped households in 10-year cohorts into generations and followed them comparing their reported eating behaviour for changes. Further, for each food, we compared the revealed trends between different generations to give a final characteristic for a trend for the total population. We aimed to estimate the trends in Swiss food consumption over the period from 1990 until 2020 and to check if the share of intergenerational trends was higher among animal products than among crop products. For this purpose, we applied a trend analysis. Thereby, we compared the consumption trends between the foods and generations in Switzerland, classified the products according to the trend type and discovered the correlation of the trend type with a product type. Household consumption comparisons can be difficult because the number of

participants differs between the households. However, under the assumption that the households assigned to the same generation in Switzerland were homogeneous and the people in these households would, on average, have similar consumption patterns, the consumption volumes per person served as an identifier of average consumption, which is comparable between households. In addition, we assume that the age effects are included in the generational trends. We expected these assumptions to hold for all observations within generations.

Formally, for each food i and generation j at time t, we had the observations in the households h and defined $c_{i,j,t,h}$—the consumption (in grams per person)—and the slopes of the consumption trends $\beta_{i,j}$ and β_i. We obtained the estimates of the trends in consumption per person $\widehat{\beta}_{i,j}$ and $\widehat{\beta}_i$, using the following simple regressions:

$$\text{For generation } j: \quad c_{i,j,t,h} = \alpha_{i,j} + \beta_{i,j} t + \varepsilon_{i,j,t,h}, \tag{1}$$

$$\text{For total population:} \quad c_{i,t,h} = \alpha_i + \beta_i t + \tilde{\varepsilon}_{i,t,h}, \tag{2}$$

where $\alpha_{i,j}$ and α_i are constants and $\varepsilon_{i,j,t,h}$ and $\widetilde{\varepsilon}_{i,t,h}$ are the error terms. Therefore, the trends in our study are measured by regressing the variable of interest on a time variable. This is a common procedure, albeit we have many observations at the same point of time. By definition, the time trend can be built for 3 periods and more; for 2 periods one can only define the growth or decline. That is why the trend was possible to define and built only for generations 3–8, 'mixed' generation households and households with children, because all of them were observed over 3–4 periods. For our research purposes, more points would be beneficial, but were not available. Our data did not allow various methods of dynamic investigation.

For each food i, we classify the trend β_i as.

- *intergenerational* if at least two of $\widehat{\beta}_{i,j}$ have significant opposite signs;
- *pangenerational* if all $\widehat{\beta}_{i,j}$ have the same and significant sign;
- *weakly pangenerational* if the sign is the same among significant $\widehat{\beta}_{i,j}$.

Furthermore, we defined s—the dummy variable for the type of the trend, where s_i equals 1 if β_i is intergenerational and 0 if it is pangenerational or weakly pangenerational. We explained the type of the trend with p—the dummy variable for a food type, where p_i equals 1 if the food i is meat and 0 otherwise. We used 59 observations for discovering the relation of a binary trend type with a binary food type (we dropped the mixed food category 'Oils and fats'). We denoted the relation between s and p as δ and assessed it by using correlation analysis, the Rogers–Tanimoto measure (see more in Zhang and Srihari 2003), robust linear regression (with and without the constant, using the *'felm'* function of the *'lfe'* R package by Gaure 2020) and a logit model (*'glm'* function of the '*stats*' R package). More details on the applied methods may be found in Wooldridge (2013).

The estimates for $\beta_{i,j}$, β_i and δ(i.e. $\widehat{\beta}_{i,j}$, $\widehat{\beta}_i$ and $\widehat{\delta}$) and their significance were the interest of the present study. A zero or insignificant estimate $\widehat{\beta}_{i,j}$ would mean that we have no evidence that food consumption changed over time for the defined generation j and food i. Similarly, a zero or insignificant estimate $\widehat{\delta}$ would mean that food consumption trend types did not correlate with a type of food. We expected a variety of

trend types across foods. Equation 1 is also applied to households with children and to a group of 'mixed' generation households.

Results

Descriptive evidence

Figure 1 shows the descriptive results for four selected food categories, revealing that the distinction between pangenerational and intergenerational trends is a meaningful one. The trends for eating beans and peas and for drinking milk show very similar patterns over all generations, albeit in different directions, and can therefore be considered as pangenerational.

The fact that the global demand for protein crops such as beans and peas is rising, mostly for feed purposes but partly also for meat substitution, is increasingly receiving attention (Schaack et al. 2014; McGill et al. 2019), and no generation in Switzerland is an exception to this trend. While the global demand for milk is also on the rise (Adesogan and Dahl 2020), Swiss consumers throughout all generations consume less milk than they used to, with the sharpest decline in the 1990s. This is also a well-documented trend (Statista Research Department 2020).

The demand patterns in the bottom part of the figure look more complex and are examples of intergenerational patterns. While Swiss consumers in total follow the global trend of increasing poultry consumption (Bryan and Classen 2020), Fig. 1 shows that this trend is merely driven by the middle generations. Neither the very young nor the very old generations have increased their poultry consumption. The trend for sheep and goat meat is also very heterogeneous. Here, it seems that meat is increasingly attractive to young people but not to older generations, who have reduced their consumption.

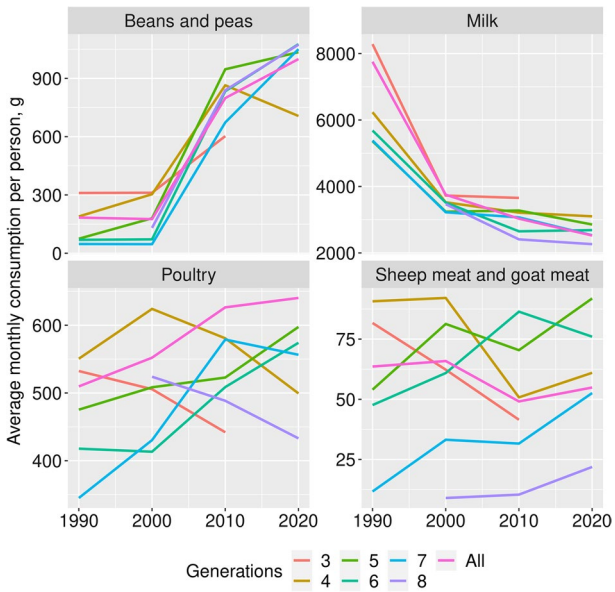

Fig. 1 Examples of two pangenerational and two intergenerational food trends

Heterogeneity of food consumption trends between generations

The econometric analysis for quantitative evidence on the heterogeneity of food consumption trends between generations is presented in Table 3. The consumptions of most fresh vegetables and fruits and of flagship foods (in Switzerland, these are chocolate, cheese and curd) have a pangenerational trend. Among non-animal-based foods, which form more than half of the studied product list, only citrus fruits and mushrooms have intergenerational trends. For citrus fruits, the slope turns from strongly negative among the oldest generation to strongly positive among the youngest. The trends for mushrooms are less significant, and such a gradient is less transparent.

The consumption trends for 7 of the 11 studied meat products are intergenerational. The exceptions are poultry, ham and bacon, horse meat and canned meat. The 6th and the 7th generations tend to consume more poultry over time, the older (3rd, 4th and 5th) generations—less horse, wild and rabbit meat. We found intergenerational trends for 15 of the 60 studied products. For dairy products, there is no product that has an intergenerational trend, i.e. most trends are pangenerational. In the case of flour, generations have positive trends, but the total trend is negative because of negative trends in mixed households and households with children.

The 8th generation stands apart from other generations with insignificant trends for banana, butter, coffee, potatoes, non-alcoholic drinks, spirits, and yoghurt consumption, supporting earlier observations on behavioural differences between the youngest and older generations. Our estimations demonstrate that these behavioural differences can also be observed concerning at least these seven food preferences.

Among households with children, the products with intergenerational trend (except jam) have negative trends over time, whereas the trends for the foods with pangenerational trends correspond to those of other generations and the total population. Households with children in Switzerland have decreased the consumption of most meat (the exceptions are poultry and canned meat), dairy (except cheese), bread, wines, potatoes, roots, tomatoes, and vegetables (leafy, fruit, and stem), but have increased the consumption of bananas, grapes, lemons, pears and quinces, pasta, cabbage, canned vegetables, dried crops, and prepared fish and seafood.

The type of the trend and the type of the food

We used the information on the trend type from Table 3 and the belonging of the foods to meat products to provide precise quantitative evidence for the relations between the type of the trend and the type of the food. The results of these estimations are presented in Table 4.

The correlation between the trend type and food type is 0.44; the Rogers–Tanimoto measure is 0.5. Both measures indicate an interdependency of trend type and food type, although this interdependency is not strong. However, the one-factor models show that the dummy on meat product is significant as a single factor influencing the trend type in both linear regressions (with and without constant) and the logit model.

Table 3 The yearly trends in food consumption per person between generations and foods

Food	Trends in food consumption $\widehat{\beta}_{i,j}$								$\widehat{\beta}_i$	
	$j=3$ [1926–1935]	$j=4$ [1936–1945]	$j=5$ [1946–1955]	$j=6$ [1956–1965]	$j=7$ [1966–1975]	$j=8$ [1976–1985]	Households with children	Mixed households	All	Trend type
Meat										
Beef	− 27 (2)***	− 12 (2)***	− 1 (2)	2 (1)	5 (2)**	5 (3)	− 7 (1)***	− 11 (1)***	− 7 (0)***	Inter
Ham and bacon	2 (2)	1 (1)	3 (1)**	4 (1)***	4 (1)***	0 (2)	− 1 (0)**	− 2 (1)***	− 1 (0)**	
Horse meat	− 1 (0)*	− 1 (0)***	− 1 (0)**	0 (0)	0 (0)	0 (0).	− 1 (0)***	− 1 (0)***	− 1 (0)***	
Pork	− 14 (3)***	− 6 (2)**	0 (2)	0 (1)	5 (2)*	3 (3)	− 9 (1)***	− 5 (1)***	− 6 (0)***	Inter
Poultry	− 4 (3)	− 1 (2)	4 (2).	5 (2)**	8 (2)***	− 5 (5)	7 (1)***	6 (1)***	5 (1)***	
Sausages	− 17 (3)***	− 4 (2)*	1 (2)	7 (2)***	3 (2)	0 (5)	− 8 (1)***	− 10 (1)***	− 8 (0)***	Inter
Sheep meat and goat meat	− 2 (1)**	− 1 (1)*	1 (1)*	1 (0)*	1 (0)**	1 (1)	− 1 (0)***	− 1 (0)*	0 (0)**	Inter
Veal	− 5 (1)**	− 3 (1)**	1 (1)	1 (1)*	0 (0)	− 2 (1).	− 1 (0)***	− 4 (0)***	− 2 (0)***	Inter
Wild and rabbit meat	− 5 (1)***	− 2 (0)***	− 1 (0)*	1 (0).	0 (0)	0 (0)	− 2 (0)***	− 2 (0)***	− 2 (0)***	Inter
Canned meat[a]		1 (1).	0 (1)	1 (1)	1 (1)	− 1 (1)	0 (0)**	0 (0)	0 (0)	
Other meat	− 16 (2)***	− 10 (1)***	− 7 (1)***	− 6 (1)***	− 7 (2)***	6 (3)*	− 9 (1)***	− 8 (1)***	− 8 (0)***	Inter
Fish										
Fish	− 4 (2)*	− 2 (1).	0 (1)	2 (1)*	5 (1)***	3 (2)	− 2 (0)***	− 1 (1)	− 1 (0)***	Inter
Seafood[a]		1 (1)	0 (1)	2 (1)**	1 (1)	0 (1)	− 1 (0)**	0 (0)	0 (0)	
Fish and seafood prepared	5 (1)***	3 (1)***	4 (1)***	3 (0)***	2 (0)***	3 (2).	4 (0)***	4 (0)***	4 (0)***	Pan
Dairy, margarine and egg										
Milk	− 259 (22)***	− 112 (13)***	− 81 (11)***	− 110 (8)***	− 89 (11)***	− 49 (28).	− 242 (5)***	− 188 (6)***	− 190 (3)***	Pan
Cream	− 24 (2)***	− 17 (1)***	− 13 (1)***	− 11 (1)***	− 2 (2)	− 1 (3)	− 11 (0)***	− 15 (1)***	− 13 (0)***	
Yoghurt	− 43 (4)***	− 38 (3)***	− 36 (4)***	− 43 (3)***	− 34 (5)***	− 5 (10)	− 28 (1)***	− 31 (2)***	− 30 (1)***	
Butter	− 14 (1)***	− 12 (1)***	− 8 (1)***	− 7 (0)***	− 6 (1)***	0 (2)	− 10 (0)***	− 13 (0)***	− 11 (0)***	
Cheese and curd	42 (6)***	54 (5)***	64 (4)***	58 (4)***	68 (5)***	36 (11)**	37 (2)***	47 (2)***	48 (1)***	Pan
Margarine	− 9 (1)***	− 6 (0)***	− 4 (0)***	− 5 (0)***	− 4 (0)***	− 3 (1)***	− 6 (0)***	− 6 (0)***	− 6 (0)***	Pan
Egg		9 (2)***	7 (2)***	6 (2)**	3 (1).		1 (1)	2 (1)*	2 (0)***	Pan

Table 3 (continued)

Food	Trends in food consumption $\widehat{\beta}_{i,j}$								$\widehat{\beta}_i$	
	$j = 3$ [1926–1935]	$j = 4$ [1936–1945]	$j = 5$ [1946–1955]	$j = 6$ [1956–1965]	$j = 7$ [1966–1975]	$j = 8$ [1976–1985]	Households with children	Mixed households	All	Trend type
Vegetables, mushrooms, roots										
Beans and peas	13 (3)***	23 (3)***	35 (2)***	34 (2)***	36 (3)***	41 (8)***	26 (1)***	30 (2)***	28 (1)***	Pan
Cabbage vegetables		14 (4)**	20 (4)***	29 (4)***	32 (4)***	20 (5)***	13 (1)***	20 (2)***	19 (1)***	Pan
Leafy vegetables	− 43 (3)***	− 33 (2)***	− 21 (2)***	− 19 (1)***	− 13 (2)***	− 12 (5)*	− 27 (1)***	− 32 (1)***	− 28 (0)***	Pan
Mushrooms fresh	− 1 (0)**	− 1 (0)*	− 1 (0)***	− 1 (0)**	0 (0)	2 (1).	− 1 (0)***	− 1 (0)***	− 1 (0)***	Inter
Onions and garlic	47 (5)***	42 (3)***	47 (3)***	45 (3)***	43 (3)***	34 (7)***	30 (1)***	36 (2)***	36 (1)***	Pan
Potatoes	− 127 (27)***	− 80 (13)***	− 46 (6)***	− 15 (7)*	− 10 (5)*	− 13 (8)	− 36 (3)***	− 42 (5)***	− 44 (2)***	
Root vegetables	− 36 (3)***	− 29 (2)***	− 24 (2)***	− 16 (1)***	− 11 (1)***	− 17 (4)***	− 24 (1)***	− 24 (1)***	− 23 (0)***	Pan
Stem and fruit vegetables[a]		− 25 (2)***	− 11 (2)***	− 7 (2)***	2 (2)		− 14 (1)***	− 15 (1)***	− 14 (1)***	
Tomatoes	− 31 (4)***	− 18 (3)***	− 17 (2)***	− 18 (1)***	− 12 (1)***	− 21 (5)***	− 14 (1)***	− 18 (1)***	− 17 (0)***	Pan
Canned vegetables and mushrooms[a]		80 (9)***	51 (7)***	40 (7)***	24 (6)***	6 (7)	27 (3)***	36 (4)***	35 (2)***	
Dried vegetables and mushrooms	20 (2)***	23 (2)***	21 (1)***	27 (2)***	17 (2)***	15 (4)**	18 (1)***	22 (1)***	21 (0)***	Pan
Fruits										
Apples	− 90 (10)***	− 50 (4)***	− 29 (3)***	− 29 (2)***	− 29 (3)***	− 21 (6)***	− 41 (1)***	− 46 (2)***	− 47 (1)***	Pan
Bananas	26 (7)***	29 (4)***	23 (4)***	13 (3)***	13 (3)***	9 (11)	5 (1)***	8 (2)***	11 (1)***	
Berries	12 (4)**	6 (2)**	12 (2)***	7 (1)***	9 (2)***	8 (4)*	0 (1)	1 (1)	3 (0)***	Pan
Citrus (except lemons)	− 52 (7)***	− 17 (5)**	− 10 (4)*	− 6 (3)*	1 (4)	20 (9)*	− 12 (1)***	− 17 (2)***	− 15 (1)***	Inter
Grapes	− 4 (5)	− 3 (3)	0 (2)	10 (2)***	10 (3)***	4 (7)	3 (1)**	2 (1)	2 (1)**	
Lemons	60 (8)***	55 (5)***	57 (5)***	49 (4)***	35 (5)***	25 (9)**	23 (1)***	38 (2)***	37 (1)***	Pan
Nuts[a]		− 4 (2)**	1 (2)	− 3 (2)*	− 3 (1)*	− 1 (2)	− 4 (0)***	− 1 (1)*	− 2 (0)***	
Pears and quinces	30 (7)***	43 (5)***	39 (4)***	30 (3)***	31 (3)***	13 (6)*	14 (1)***	26 (2)***	25 (1)***	Pan
Stone fruits	− 22 (6)***	− 7 (4).	− 8 (3)**	− 5 (2)*	2 (2)	− 12 (13)	− 8 (1)***	− 17 (2)***	− 12 (1)***	
Dried fruits[a]		− 2 (1)	− 1 (1)	− 1 (1)	3 (1)***	0 (1)	2 (0)***	1 (0)*	1 (0)***	
Other fruits	− 2 (4)	4 (3)	9 (3)***	7 (2)**	16 (4)***	29 (9)**	− 5 (1)***	6 (2)***	4 (1)***	

Table 3 (continued)

Food	Trends in food consumption $\widehat{\beta}_{i,j}$								$\widehat{\beta}_i$	
	$j=3$ [1926–1935]	$j=4$ [1936–1945]	$j=5$ [1946–1955]	$j=6$ [1956–1965]	$j=7$ [1966–1975]	$j=8$ [1976–1985]	Households with children	Mixed households	All	Trend type
Cereal products										
Bread	−56 (7)***	−20 (5)***	−1 (4)	−3 (3)	−5 (5)	−8 (11)	−34 (2)***	−37 (2)***	−29 (1)***	
Flours	1 (6)	6 (4)	6 (2)**	5 (2)*	3 (2).	17 (12)	−4 (1)***	−3 (1)**	−2 (1)**	
Pasta	−1 (3)	4 (3).	7 (2)**	11 (2)***	8 (3)**	−8 (8)	12 (1)***	9 (1)***	9 (1)***	
Rice	−3 (2)	−5 (2)**	−1 (1)	2 (1)	−5 (1)***	5 (5)	2 (1)	1 (1)	0 (0)	
Coffee, tea and sweets										
Cocoa and chocolate[a]		14 (4)***	25 (3)***	20 (3)***	17 (3)***		16 (2)***	24 (2)***	21 (1)***	Pan
Coffee and substitutes	−26 (3)***	−21 (2)***	−17 (2)***	−9 (1)***	−6 (1)***	0 (3)	−7 (0)***	−12 (1)***	−11 (0)***	
Honey	−8 (3)**	−1 (2)	3 (1)*	5 (1)***	7 (2)***	24 (4)***	−1 (0)**	1 (1)	1 (0)	Inter
Jam	2 (1)*	2 (1)*	−1 (0).	1 (0)**	0 (1)	−6 (2)**	1 (0)***	1 (0)**	1 (0)***	Inter
Sugar	−25 (5)***	−9 (2)***	0 (1)	−2 (1)	−1 (1)	−3 (3)	−11 (1)***	−18 (1)***	−14 (1)***	
Tea and herbs	0 (1)	−1 (0)**	−1 (0)*	−1 (0)***	−2 (0)***	−5 (1)***	0 (0)	0 (0).	−1 (0)***	
Liquids										
Beer	−41 (11)***	−49 (12)***	−47 (12)***	14 (9)	50 (14)***	42 (23).	−3 (3)	14 (6)*	5 (3).	Inter
Mineral water[a]		−267 (28)***	−176 (35)***	−59 (41)	−57 (36)	−48 (60)	−19 (13)	−132 (19)***	−90 (9)***	
Non-alcoholic drinks	−236 (49)***	−147 (32)***	−111 (28)***	−106 (26)***	−81 (47).	−35 (66)	−172 (10)***	−156 (17)***	−130 (8)***	
Olive oil	11 (2)***	6 (1)***	7 (1)***	8 (1)***	3 (1)***	11 (6).	7 (0)***	8 (1)***	7 (0)***	Pan
Spirits and liqueurs	16 (5)**	11 (3)***	11 (3)***	5 (2)***	4 (1)**	−2 (2)	2 (0)***	3 (1)***	5 (0)***	
Wines	−32 (19).	−24 (14).	9 (15)	38 (9)***	89 (16)***	−9 (17)	−14 (3)***	3 (6)	5 (3).	Inter
Oils and fats (except olive oil)	−14 (3)***	0 (2)	5 (2)**	6 (1)***	9 (2)***	8 (3)*	−5 (1)***	−3 (1)**	−2 (0)***	Inter

Significance codes: '***' = $p \leq 0.001$; '**' = $p \leq 0.01$; '*' = $p \leq 0.05$; '.' = $p \leq 0.1$. Values in round brackets are standard errors. Values in square brackets are years of birth. All estimations are done in grams, except 'Liquids' and 'Milk', which are measured in millilitres. The empty cells in trend type mean a weakly pangenerational trend.

[a] Denotes the foods that had no data in 1990

Table 4 The Relation between Trend Type and Food Type

Type of measure	$\widehat{\delta}$
Correlation	0.44
Rogers–Tanimoto	0.504
Linear regression with a constant	0.44(0.14)**
Linear regression without a constant	0.57(0.13)***
Logit model	2.16(0.70)**

Significance codes: '***' = $p \leq 0.001$; '**' = $p \leq 0.01$; '*' = $p \leq 0.05$; '.' = $p \leq 0.1$. Values in brackets are standard errors. The Rogers–Tanimoto measure was calculated with the 'rogersTanimoto' function of the 'partitionComparison' R package. Trend type dummy is defined as 1 if the trend is intergenerational and 0 otherwise. Food type dummy is defined as 1 if the food is meat and 0 otherwise

Limitations

The analysis has its limitation, in particular with regard to the quality of the data. It is based on household data, so that a lot of data, namely consumption in households that stretched over several generations, could not be utilised. This 'selection bias' may have distorted the results, and similar analyses with individual consumption datasets that are available over a long period might produce results that are more reliable. Such datasets may also be used for developing food trend forecasts taking the distinction between pan- and intergenerational trends into account.

The second limitation of our study is a territorial and time coverage, as well as the fact that many factors stayed beyond the scope of our study, because we aimed at only quantifying and classifying the food trends between generations. Therefore, the literature for different time frames and territories could have been only partially integrated with our research, as our research focussed on Swiss food markets in 1990–2020. In addition to traditional factors such as income and gender, it would have been useful to consider institutional factors in future studies, for example, transitions in 2008–2009 and 2014–2015 (Loginova and Mann 2022a) and Corona-related transitions in 2020–2021, that predefined a period of new institutions starting in 2022. In this study, we attempted to avoid the years characterised by transition-related distortions and used only the data of 1990, 2000, 2010 and 2017 (to approximate the data for 2020). When more data are available over time, it would make sense to take institutional, economic and biological waves into account (Loginova and Mann 2022b), because having no data before 1990, we know very few about the eating of generations living in periods before. That means also that trends in the period 1990–2020 describe only a small part of their lives, that is relevant for only the last 30 years. In addition, the people in the oldest generation represent only a longest-living part of the society they lived in. Mirroring this, the youngest generations represent all the young people, including those whose consumption will not allow to change their age in the future 10-year periods. To the best of our knowledge, this selection bias has no solution so far, except randomising the choice of people (households) studied. We, however, did not perform this approach in our study ourselves, because our data were initially a result of a randomised survey from a reliable source.

Discussion and conclusions

The significance of the explanatories and nonzero estimations of interdependencies allow us to confirm that (1) the distinction between pangenerational and intergenerational trends is a meaningful one, (2) the share of intergenerational trends is higher among animal products in general and meat products in particular, and (3) the type of food is significant for a trend type. However, the negative trend of meat consumption in our sample has been formed rather by older generations and families with children than by younger generations. This may be explained by the fact that the data we used in the study do not cover people under 35 years old in 2020, the very generation likely to follow vegan or vegetarian diets. Since, obviously, longer panel data by the youngest generation is not available, future work that finds solutions for this problem would be desirable. Knowing how the consumption of the youngest generation is evolving within a country could provide important marketing and policy outlets, as well as theoretical ones.

Our descriptive and the econometric analyses have shown that different types of food trends exist. For the slight majority of trends, there are no major behavioural differences between generations, a pattern that we called pangenerational. However, especially for a number of food items for which the overall demand is declining over time, the generational patterns differ from each other, a situation that we described as intergenerational. The demand for citrus fruits, for example, rises for the young generations, while—in accordance with the overall negative trend—elder people decrease their consumption. This pattern matters because it implies that the negative trend of citrus fruit demand in the past is unlikely to be continued in the future and will require a change in marketing and policymaking.

Generational analysis is used in marketing (Rentz and Reynolds 1991) for which our new distinction may have significant impacts. Promotion teams may consider negative pangenerational trends as an unavoidable loss of consumers, positive pangenerational trends as an opportunity to conduct age-independent promotions and intergenerational trends as the chance to target the most sensitive or a highly potential age group. The same applies to policymakers who may want to foster pro-social nutritional behaviour like the reduction in meat consumption.

The products with intergenerational trends are usually consumed less by older generations and more by younger generations (e.g. beef, beer, citrus, fish, honey, mushrooms, pork, sausages, sheep and goat meat, wild and rabbit meat). Therefore, for the majority of the products with intergenerational negative trends, this trend is driven by older generations and may receive a positive impulse in future if younger generations continue their current diet trends.

The distinction between inter- and pangenerational trends has the potential to make forecasts on food trends more precise and to improve marketing and promotional activities. The results have shown that projections on meat consumption require the use of age-related information and contribute to the growing evidence on predicting food and meat consumption (e.g. Zeng et al. 2019; Van Dijk et al 2021; Hassoun et al 2022). As the relevance of food trends for public health and the environment can hardly be overestimated, it is worthwhile to explore the nature of these food trends in more depth, generating useful results for both managers in the food industry and policymakers.

Acknowledgements
The authors thank anonymous reviewers for their constructive comments on an earlier draft.

Author contributions
DL was responsible for software, data curation, validation and analysis. SM performed conceptualisation, supervision, reviewing, and was a major contributor in writing the manuscript. Both authors read and approved the final manuscript.

Authors' information
Stefan Mann: Dr. rer. pol. Dr. sc. agr. habil., Prof., The leader of Socioeconomics research group, Research Division Competitiveness and System Evaluation, Research Station Agroscope, Federal Office of Economics. Address: Tanikon 1, CH-8356 Ettenhausen, Switzerland.
Daria Loginova: Dr. rer. pol., Post-Doc, Department Socioeconomics, Research Division Competitiveness and System Evaluation, Research Station Agroscope, Federal Office of Economics. Address: Tanikon 1, CH-8356 Ettenhausen, Switzerland.

Funding
This work was supported by Agroscope.

Availability of data and materials
The datasets used and analysed during the current study are available from the corresponding author upon reasonable request.

Declarations

Competing interests
The authors have no conflicts of interest to declare.

Received: 4 January 2023 Revised: 7 February 2023 Accepted: 21 March 2023
Published online: 27 March 2023

References

Adesogan AT, Dahl GE (2020) MILK Symposium Introduction: dairy production in developing countries. J Dairy Sci 103(11):9677–9680. https://doi.org/10.3168/jds.2020-18313
Aepli M, Finger R (2013) Determinants of sheep and goat meat consumption in Switzerland. Agric Food Econ. https://doi.org/10.1186/2193-7532-1-11
Aristei D, Perali F, Pieroni L (2008) Cohort, age and time effects in alcohol consumption by Italian households: a double-hurdle approach. Empir Econ 35(1):29–61. https://doi.org/10.1007/s00181-007-0142-5
Arnaudova M, Brunner TA, Götze F (2022) Examination of students' willingness to change behaviour regarding meat consumption. Meat Sci 184:108695. https://doi.org/10.1016/j.meatsci.2021.108695
Baur I, Stylianou KS, Ernstoff A, Hansmann R, Jolliet O, Binder CR (2022) Drivers and barriers toward healthy and environmentally sustainable eating in Switzerland: Linking impacts to intentions and practices. Front Sustain Food Syst 6:808521. https://doi.org/10.3389/fsufs.2022.808521
Beatty TKM, Lin B-H, Smith TA (2013) The effects of age and birth cohort on dietary quality in the United States. AgEcon Search. https://doi.org/10.22004/ag.econ.151426
Bezerra IN, Bahamonde NMSG, Marchioni DML, Chor D, Cardoso LO, Aquino EM et al (2018) Generational differences in dietary pattern among Brazilian adults born between 1934 and 1975: a latent class analysis. Public Health Nutr 21(16):2929–2940. https://doi.org/10.1017/S136898001800191X
Bilgic A, Yen ST (2013) Household food demand in Turkey: a two-step demand system approach. Food Policy 43:267–277. https://doi.org/10.1016/j.foodpol.2013.09.004
Blisard N (2001) Income and food expenditures decomposed by cohort, age, and time effects. Technical Bulletins 33552, United States Department of Agriculture, Economic Research Service. https://doi.org/10.22004/ag.econ.33552.
Breen M (2014) The Koreans: who they are, what they want, where their future lies. St. Martin's Publishing Group, New York
Bryan DDSL, Classen HL (2020) In vitro methods of assessing protein quality for poultry. Animals 10(4):551. https://doi.org/10.3390/ani10040551
Camilleri MA (2018) Market segmentation, targeting and positioning. Travel marketing, tourism economics and the airline product. Tourism, hospitality and event management. Springer, Cham. https://doi.org/10.1007/978-3-319-49849-2_4
Christopher K (2016) the influence of time on food intake patterns: age, period, cohort differences. Dissertation, University of Kentucky. https://doi.org/10.13023/ETD.2016.458
Cortez R, Senauer B (1996) Taste changes in the demand for food by demographic groups in the United States: a non-parametric empirical analysis. Am J Agric Econ 78:280–289. https://doi.org/10.2307/1243702
de Abreu D, Guessous I, Gaspoz JM, Marques-Vidal P (2014) Compliance with the Swiss Society for Nutrition's Dietary Recommendations in the population of Geneva, Switzerland: a 10-year trend study (1999–2009). J Acad Nutr Diet 114(5):774–780. https://doi.org/10.1016/j.jand.2013.07.032
Drescher LS, Roosen J (2013) A cohort analysis of food-at-home and food-away-from-home expenditures in Germany. Ger J Agric Econ 62(1):39–51. https://doi.org/10.22004/ag.econ.232331
Dubuisson C, Lioret S, Touvier M, Dufour A, Talamassi-Tran G, Volatier JC, Lafay L (2010) Trends in food and nutritional intakes of French adults from 1999 to 2007. Br J Nutr 103:1035–1048. https://doi.org/10.1017/S0007114509992625

Duffey HJ, Popkin BM (2007) Shifts in patterns of consumption of beverages between 1965 and 2002. Obesity 15(11):2739–2747. https://doi.org/10.1038/oby.2007.326
Dumont S, Marques-Vidal P, Favrod-Coune T, Theler JM, Gaspoz JM, Broers B, Guessous I (2017) Alcohol policy changes and 22-year trends in individual alcohol consumption in a Swiss adult population: a 1993–2014 cross-sectional population-based study. BMJ Open 7(3):e014828. https://doi.org/10.1136/bmjopen-2016-014828
Federal Commission for Nutrition FCN (2018) Vegan diets: review of nutritional benefits and risks. Expert report of the FCN. https://www.blv.admin.ch/blv/en/home/das-blv/organisation/kommissionen/eek/vor-und-nachteile-vegane-ernaehrung.html
Federal Statistical Office FSO (2022) Agriculture and food: pocket statistics 2022. https://www.bfs.admin.ch/bfs/en/home/statistics/agriculture-forestry/food.html
Federal Food Safety and Veterinary Office FSVO (2019) Trendanalysen zum Nahrungsmittelverbrauch in der Schweiz. https://www.blv.admin.ch/blv/de/home/lebensmittel-und-ernaehrung/ernaehrung/schweizer-ernaehrungsbulletin/schweizer-ernaehrungsbulletin-2021.html
Federal Food Safety and Veterinary Office FSVO (2021) Schweizer Ernährungsbulletin 2021. https://www.blv.admin.ch/blv/de/home/lebensmittel-und-ernaehrung/ernaehrung/schweizer-ernaehrungsbulletin/schweizer-ernaehrungsbulletin-2021.html
Gaure S (2020) 'lfe' R-package. www.rdocumentation.org/packages/lfe/versions/2.8-5.1/topics/felm. Accessed 24 May 2022
Giacoman C, Alfaro J, Aguilera Bornand IM, Torres R (2021) Becoming vegan: a study of career and habitus. Soc Sci Inf (paris) 60(4):560–582. https://doi.org/10.1177/05390184211049933
Goldstein B, Birkved M, Fernández J, Hauschild M (2016) Surveying the environmental footprint of urban food consumption. J Ind Ecol 21(1):151–165. https://doi.org/10.1111/jiec.12384
Götze F, Mann S (2015) Bio: Der Mehrpreis ist das geringste Problem. LebensmittelTechnologie 10(14):8–10
Götze F, Mann S, Ferjani A, Kohler A, Heckelei T (2016) Explaining market shares of organic food: evidence from Swiss household data. Br Food J 118(4):931–945. https://doi.org/10.1108/BFJ-09-2015-0318
Gustavsen GW, Rickertsen K (2014) Consumer cohorts and purchases of nonalcoholic beverages. Empir Econ 46(2):427–449. https://doi.org/10.1007/s00181-013-0688-3
Gustavsen GW, Rickertsen K (2018a) Consumer cohorts and the demand for meat and dairy products. Proc Food Syst Dyn 2018:169–181. https://doi.org/10.18461/pfsd.2018.1812
Gustavsen GW, Rickertsen K (2018b) Wine consumption in Norway: an age-period-cohort analysis. J Wine Econ 13(1):41–56. https://doi.org/10.1017/jwe.2017.49
Gustavsen GW, Rickertsen K, Øvrum A (2014) Fish consumption across generations—a life cycle approach. https://nmbu.brage.unit.no/nmbu-xmlui/handle/11250/225359. Accessed 22 Dec 2022
Harris JM, Blisard N (2000) Decomposing red meat, poultry, and fish expenditures into age, time, and cohort effects. 2000 annual meeting of American Agricultural Economics Association. https://doi.org/10.22004/ag.econ.21805
Harris JM, Blisard N (2001) Analyzing the impact of generational effects on consumer expenditures for meats: a cohort approach. J Food Distrib Res 32(856-2016–57713):64–73. https://doi.org/10.22004/ag.econ.26512
Hassoun A, Boukid F, Pasqualone A, Bryant CJ, García GG, Parra-López C, Jagtap S, Trollman H, Cropotova J, Barba FJ (2022) Emerging trends in the agri-food sector: digitalisation and shift to plant-based diets. Curr Res Food Sci 5:2261–2269. https://doi.org/10.1016/j.crfs.2022.11.010
Hopping BN, Erber E, Mead E, Sheeley T, Roache C, Sharma S (2010) Socioeconomic indicators and frequency of traditional food, junk food, and fruit and vegetable consumption amongst Inuit adults in the Canadian Arctic. J Hum Nutr Diet 23(s1):51–58. https://doi.org/10.1111/j.1365-277X.2010.01100.x
Jahns L, Siega-Riz AM, Popkin BM (2001) The increasing prevalence of snacking among US children from 1977 to 1996. J Pediatr 138(4):493–498. https://doi.org/10.1067/mpd.2001.112162
Jarmul S, Dangour AD, Green R, Liew Z, Haines A, Scheelbeck PFD (2020) Climate change mitigation through dietary change: a systematic review of empirical and modelling studies on the environmental footprints and health effects of "sustainable diets." Environ Res Lett 15:123014. https://doi.org/10.1088/1748-9326/abc2f7
Jho KH (1999) Econometric analysis on factors of food demand in the household: comparative study between Korea and Japan. J Korean Soc Food Cult 14(4):371–383
Kähäri A (2020) Long-term change in healthy food consumption in Finland during 1985–2016: an age-period-cohort analysis. Int J Sociol Agric Food. https://doi.org/10.48416/ijsaf.v26i2.55
Kähäri A (2021) The role of sugar products and non-alcoholic beverages in the food budget: change across birth cohorts and between socio-economic groups. Br Food J 123(13):142–161. https://doi.org/10.1108/BFJ-12-2020-1109
Kearney J (2010) Food consumption trends and drivers. Philos Trans R Soc Lond B Biol Sci 365(1554):2793–2807. https://doi.org/10.1098/rstb.2010.0149
Lee JY, Qian Y, Gustavsen GW, Nayga RM, Rickertsen K (2020) Effects of consumer cohorts and age on meat expenditures in the United States. Agric Econ 51(4):505–517. https://doi.org/10.1111/agec.12568
Loginova D, Mann S (2022a) Institutional contributions to agricultural producer price stability. Agric Food Econ. https://doi.org/10.1186/s40100-022-00219-6
Loginova D, Mann S (2022b) Measuring stability and structural breaks: applications in social sciences. J Econ Surv. https://doi.org/10.1111/joes.12505
Maxwell GH, Broadbridge A (2014) Generation Y graduates and career transition: perspectives by gender. Eur Manag J 32(4):547–553. https://doi.org/10.1016/j.emj.2013.12.002
McGill J, Moss A, Swick R, Jackson D, Todd M (2019) The future protein decade: perspectives on global pressure to agriculture. Anim Prod Sci 59(11):1951–1956. https://doi.org/10.1071/AN19308
Meyer LH (2017) Intergenerational justice. Routledge, London
Mori H (2021) Changes in children's height in Japan and South korea in the past half century: the roles of fruit/vegetables on top of animal protein. Eur J Appl Sci 9(5):118–126. https://doi.org/10.14738/aivp.95.10971

Mori H (2022) The Dutch, the world tallest are shrinking in the latest decade or so: the lessons from the case of South Korea and Japan in North-East Asia. Eur J Appl Sci 13(1):85–96. https://doi.org/10.14738/aivp.96.11357
Mori H, Saegusa Y (2010) Cohort effects in food consumption: What they are and how they are formed. Evol Inst Econ Rev 7(1):43–63. https://doi.org/10.14441/eier.7.43
Mori H, Saegusa Y, Dyck J (2012) Estimating demand elasticities in a rapidly aging society—the cases of selected fresh fruits in Japan. Annu Bull Soc Sci 46:123–144
Mori H, Stewart H (2011) Cohort analysis: ability to predict future consumption—the cases of fresh fruit in Japan and rice in Korea. Annu Bull Soc Sci 45:153–173
Nery do Carmo I (2019) Feminista e vegana: gastropolíticas e convenções de gênero, sexualidade e espécie entre feministas jovens. Rev Estud Fem 27(1):1–15. https://doi.org/10.1590/1806-9584-2019v27n144021
Oita A, Nagano I, Matsuda H (2018) Food nitrogen footprint reductions related to a balanced Japanese diet. Ambio 47:318–326. https://doi.org/10.1007/s13280-017-0944-4
Otsuka R, Yatsuya H, Tamakoshi K (2014) Descriptive epidemiological study of food intake among Japanese adults: analyses by age, time and birth cohort model. BMC Public Health 14(1):328. https://doi.org/10.1186/1471-2458-14-328
Reutterer T, Mild A, Natter M, Taudes A (2006) A dynamic segmentation approach for targeting and customizing direct marketing campaigns. J Interact Mark 20(3–4):43–57. https://doi.org/10.1002/dir.20066
Rentz JO, Reynolds FD (1991) Forecasting the effects of an aging population on product consumption: an age-period-cohort framework. J Mark Res 28(3):355–360. https://doi.org/10.1177/002224379102800310
Rodrigo F, Torreblanca JI (2001) Germany on my mind? The transformation of Germany and Spain's European policies. In: Schneider H, Jopp M, Schmalz U (eds) Germany's (new) European policy—external perceptions. Institut für Europäische Politik, Berlin
Sahakian M, Godin L, Courtin I (2020) Promoting 'pro', 'low', and 'no' meat consumption in Switzerland: the role of emotions in practices. Appetite. https://doi.org/10.1016/j.appet.2020.104637
Schaack D, Rampold C, Pusch E, Willer H (2014) Weiterentwicklung der Erhebungs- und Analysemethoden zur Entwicklung des ausländischen Angebots bei Bioprodukten am Beispiel 2011/12. Agrarmarkt Informations-GmbH, D-Bonn, Forschungsinstitut für biologischen Landbau, FiBL. CH-Frick
Schmeling K (2014) The Food Trends of the future with the focus on women's Generation Y in Germany. Haaga-Helia University of Applied Sciences, Helsinki
Schneid Schuh D, Guessous I, Gaspoz JM, Theler JM, Marques-Vidal P (2018) Twenty-four-year trends and determinants of change in compliance with Swiss dietary guidelines. Eur J Clin Nutr 73:859–868. https://doi.org/10.1038/s41430-018-0273-0
Siega-Riz AM, Popkin BM, Carson T (1998) Trends in breakfast consumption for children in the United States from 1965–1991. Am J Clin Nutr 67(4):748S-756S. https://doi.org/10.1093/ajcn/67.4.748S
Smith ML, Lee S, Towne SD, Han G, Quinn C, Pena-Purcell NC, Ory MG (2020) Impact of a behavioral intervention on diet, eating patterns, self-efficacy, and social support. J Nutr Educ Behav 52(2):180–186. https://doi.org/10.1016/j.jneb.2019.06.008
Snyder H (2019) Literature review as a research methodology: An overview and guidelines. J Bus Res 104:333–339. https://doi.org/10.1016/j.jbusres.2019.07.039
Statista Research Department (2020) Pro-Kopf-Konsum von Milch in der Schweiz in den Jahren 2000/02 bis 2020. https://de.statista.com/statistik/daten/studie/289189/umfrage/pro-kopf-konsum-von-milch-in-der-schweiz/. Accessed 22 Dec 2022
Stewart H, Blisard N (2008) Are younger cohorts demanding less fresh vegetables? Rev Agric Econ 30(1):43–60
Stewart H, Dong D, Carlson A (2012) Is generational change contributing to the decline in fluid milk consumption? J Agric Resour Econ 37(3):435–454. https://doi.org/10.22004/ag.econ.142354
Stoll-Kleemann S, Schmidt UJ (2017) Reducing meat consumption in developed and transition countries to counter climate change and biodiversity loss: a review of influence factors. Reg Environ Change 17:1261–1277. https://doi.org/10.1007/s10113-016-1057-5
Teisl MF, Lando AM, Levy AS, Noblet CL (2016) Importance of cohorts in analyzing trends in safe at-home food-handling practices. Food Control 62:381–389. https://doi.org/10.1016/j.foodcont.2015.10.040
Tepper S, Kissinger M, Avital K, Shahar DR (2022) The environmental footprint associated With the Mediterranean diet, EAT-Lancet diet, and the sustainable healthy diet index: a population-based study. Front Nutr 9:870883. https://doi.org/10.3389/fnut.2022.870883
Trondsen T, Braaten T, Lund E, Eggen AE (2004) Health and seafood consumption patterns among women aged 45–69 years. Food Qual Prefer 15(2):117–128. https://doi.org/10.1016/S0950-3293(03)00038-7
Van Dijk M, Morley T, Rau ML, Saghai Y (2021) A meta-analysis of projected global food demand and population at risk of hunger for the period 2010–2050. Nat Food 2(7):494–501. https://doi.org/10.1038/s43016-021-00322-9
Vaterlaus MJ, Patten EV, Cesia R, Young JA (2015) The perceived influence of social media on young adult health behaviors. Comput Hum Behav 45:151–157. https://doi.org/10.1016/j.chb.2014.12.013
Von Ow A, Waldvogel T, Nemecek T (2020) Environmental optimization of the Swiss population's diet using domestic production resources. J Clean Prod 248:119241. https://doi.org/10.1016/j.jclepro.2019.119241
Wilhelmina Q, Joost J, George E, Ruivenkamp G (2010) Globalization vs. localization: global food challenges and local solutions. Int J Consum 34(3):357–366. https://doi.org/10.1111/j.1470-6431.2010.00868.x
Wooldridge J (2013) Introductory econometrics: A modern approach, 5th edn. Cengage Learning, South-Western
Wu Y, Wang L, Zhu J, Gao L, Wang Y (2021) Growing fast food consumption and obesity in Asia: challenges and implications. Soc Sci Med 269:113601. https://doi.org/10.1016/j.socscimed.2020.113601
Yang SB (2020) A cohort analysis on sodium and sodium-calorie intake with the Korean National Health and Nutrition Examination Survey. Korean J Food Sci Technol 33(1):98–104. https://doi.org/10.9799/ksfan.2020.33.1.098
York R (2007) Demographic trends and energy consumption in European Union Nations, 1960–2025. Soc Sci Res 36(3):855–872. https://doi.org/10.1016/j.ssresearch.2006.06.007

Zan HUA, Fan JX (2010) Cohort effects of household expenditures on food away from home. J Consum Aff 44(1):213–233
Zhang B, Srihari SN (2003) Properties of binary vector dissimilarity measures. CEDAR, State University of New York at Buffalo. https://cedar.buffalo.edu/~binzhang/Papers/bin_CVPRIP03_propbina.pdf. Accessed 22 Dec 2022
Zeng L, Ruan M, Liu J, Wilde P, Naumova EN, Mozaffarian D, Zhang FF (2019) Trends in processed meat, unprocessed red meat, poultry, and fish consumption in the United States, 1999–2016. J Acad Nutr Diet. https://doi.org/10.1016/j.jand.2019.04.004
Zhong F, Xiang J, Zhu J (2012) Impact of demographic dynamics on food consumption—a case study of energy intake in China. China Econ Rev 23(4):1011–1019. https://doi.org/10.1016/j.chieco.2012.05.005

Publisher's Note