School milk demand in Germany: The role of individual and contextual factors – preliminary results

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1 Introduction

Dairy products are regarded as part of a balanced diet, especially for children, because of high protein, vitamin and mineral amounts they contain in a quite optimal combination (Heine 1999). As school milk provides a way to help to cover the basic daily nutritional requirements for this age group, school milk sales have a very long tradition. In 1972, the European Union established the European School Milk Scheme as a consumption aid to encourage consumption of healthy dairy products among children. Originally, this programme had two objectives: on the one hand, it was established to improve the nutritional situation of children; on the other hand, it offered a possibility to attract new milk consumers (European Council 1977; Jacobson 1961; Griffin 1999; CEAS and IADC 1999). Today, the European School Milk Scheme also has an educational character and contributes to nutritional education with a better knowledge on products (European Commission 2008).

Within the programme, all children visiting a nursery, a primary or a secondary school are entitled to receive a maximum quantity of 250 ml of subsidized school milk equivalents per school day (European Council 1977)[1]. Subsidized prices of school milk follow a maximum price policy and, in return, distributing firms are granted a subsidy in compliance with existing regulations (BMELF 1985).

During the school year 2008/09, about 386,000 tonnes of milk equivalents were consumed within the framework of the EU school milk programme, of these 36,700 tonnes by German children. Hence in Germany, consumption of school milk has declined steadily since 1993. Various factors have been considered to influence this downward trend. Subsidies have been reduced since 1993 to their current level of 18.15 cents per kg milk, intensive discussions on adequate packaging, and waste problems in handling the milk may have contributed to declining interest. A consolidation process in the dairy industry with declining numbers of dairy firms engaged in the school milk business could have made school milk regionally less accessible and the less profitable school dairy processing was not retained. Moreover, the product range of school milk is limited and public budget pressure has decreased the technical staff at schools, reducing people likely to distribute school milk (Wietbrauk 1976; Weindlmaier and Fallscheer 1997).

Most of the mentioned factors are related to the whole production, processing and distribution chain of school milk as well as to institutional price setting. However, attitudes of consumers, parents and children alike, may also play an important role in the decision to buy school milk. In this context, attitudes towards milk and milk products, their preferences and tastes, their habits towards a healthy diet, changing eating habits and preferences should be considered as well as socio-economic factors like income or migration background. And furthermore, not only preferences and attitudes of the consumers themselves may affect school milk demand but also children's and parents' social environment, including the attitudes of teachers or school milk managers.

[1] School milk always covers a whole range of dairy products eligible for school milk subsidies, not only fluid milk.

To compile and quantify fundamental factors influencing school milk demand across all involved agents, the German Federal Ministry of Food, Agriculture and Consumer Protection set up the project "Schulmilch im Fokus"[2].
Results of the study should be used to improve future school milk policies.
The main objective of the following paper is to quantify the impact of fundamental factors in individual school milk demand by focussing on the following questions:

1) What impact does the price, respectively the school milk aid, have on the demand for school milk?
2) What special impact does a zero price have on the demand for school milk?
3) What influence do individual factors like age, gender, immigration background, structure of the household and attitudes have on the individual decision of ordering school milk in the regarded school?
4) What influence do contextual factors like characteristics of the school, attitude and behaviour of class teachers, school milk managers and school principals have on the individual decision to order school milk in the regarded class and school?

This paper is organised as follows: Chapter Two presents a very short description on the general design of the German federal research project. Chapter Three provides an overview on the available information which may enable researchers to estimate individually the school milk demand; and Chapter Four describes the applied methodology - the multilevel approach as well as empirical findings. A final section deals with the caveats of the methodology and draws some conclusions.

2 General design of the research project "Focus on school milk" ("Schulmilch im Fokus"[3])

As a core element of the project, a price experiment with school milk was conducted in a sample of primary schools in North Rhine Westphalia. The sample was drawn randomly in a multi-stage sampling procedure taking different strata into account. Here, prices of school milk were reduced stepwise during the school year 2008/09. As shown in Figure **1**, starting with 35 cents per package[4] in Price Step 1, the price is reduced stepwise to 0 cent at the end of the school year. During the school year 2009/10 price is increased stepwise to 35 cents again.
As also shown in Figure 1, primary schools, which were included in the main project, are divided into two different samples: (1) a larger 'classes' sample' providing data on demand for the classes and (2) a smaller 'pupils' sample' with data on individuals. All data collection at schools was restricted to the class years two, three and four including[5], in principle, pupils aged between 7 and 11 years old. During the experiment, data of orders of school milk were regularly reported by schools, either on an individual level (pupils' sample) or class level (classes' sample). For more details concerning the project see also Salamon et al., 2010.

[2] English translation: Focus on school milk.
[3] The project is conducted in cooperation with the Department of Nutritional Behavior of the Max Rubner-Institut (MRI), Federal Research Institute of Nutrition and Food, Karlsruhe.
[4] Price of non-flavoured school milk was 30 cents per package. From the second to the seventh Price Steps, the same price is charged for pure and flavoured milk.
[5] Pupils of the first class year were not included due to their inability to read and write.

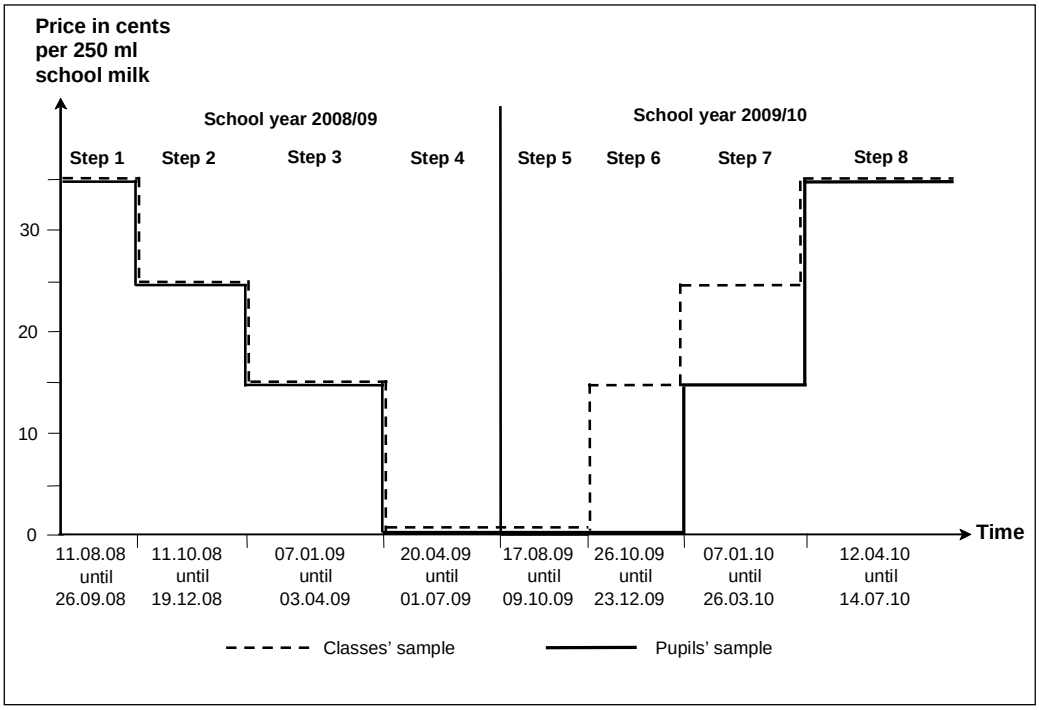

Figure 1. Prices of school milk during the price experiment
Source: own illustration.

To establish a demand model on an individual basis the following concept was applied: Demand for school milk is affected by agents taking part in the school milk chain (compare Figure 2). These agents are the child drinking or refusing school milk, his/her parents, the school with its principal, teachers and school milk manager, the dairy industry and, last but not least, the state. Involved agents have different interests in school milk; they also differ in their attitudes towards, and their knowledge of, the product. Just as with other products, they are able to influence production, distribution and consumption in various ways and with different impact, and they also interact.

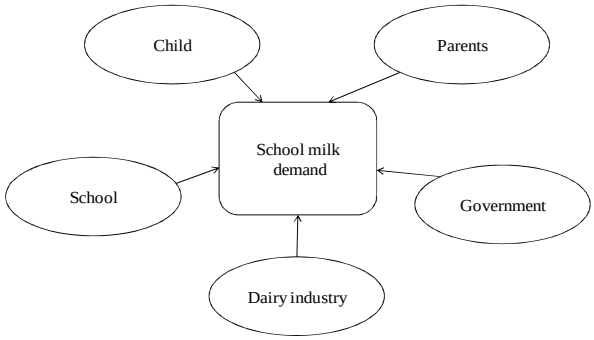

Figure 2. Agents influencing school milk demand
Source: own illustration.

Until now, the strength of interaction has mostly just been discussed, but rarely proven and quantifiable information on interactions is mostly rare. To capture other individual factors within the sample, almost all other information was compiled by written questionnaires given to pupils, parents, teachers, school principals, school milk managers

and also delivery firms.[6] Different questionnaires were developed by the Department of Nutritional Behaviour of the Max Rubner-Institut. Respondents were pupils, their parents, class teachers, school principals and school milk managers of the sampled schools. In general, questionnaires contained questions on nutritional behaviour, consumption preferences, attitudes towards healthy nutrition, milk and school milk, ideas about the school milk programme (promoters and barriers) and suggestions for improvement, knowledge about nutrition and milk as well as socio-economic indicators.
In contrast to the classes' sample, the pupils' sample provides an opportunity for analysis on individual demand by taking the higher-level information into account – the so-called effects of the social context.

3 Data

Within this paper the analysis is based on a consistent set of 7,336 pupils referring to 552 classes and to 101 schools. All those pupils are merged with available data of the pupils' sample. Thus, pupils with missing information, e. g., written questionnaires given to pupils themselves, parents, class teachers, school principals, school milk managers or unknown basic data, were excluded from the data set.
For the school year 2008/09, pupil's ordering or rather non-ordering is captured for each school day. At the initial Price Step, an average of 43 percent of pupils consumed school milk (see Figure 3).

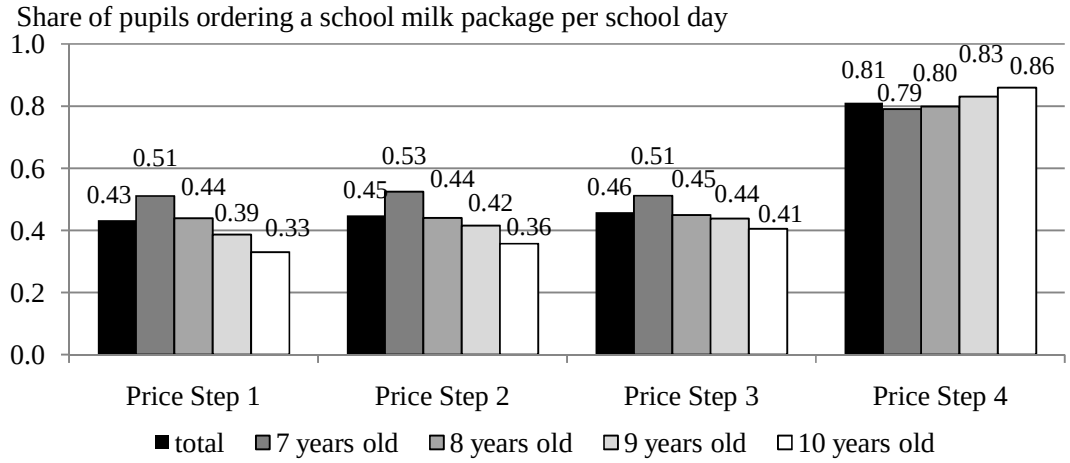

Figure 3. School milk consumption differentiated by Price Step and age
Source: own calculations.

In comparison with the classes' sample which is mentioned above, the starting value is nine percentage points higher. This difference between the two samples depends on a positive self-selection of pupils, respectively schools, which take school milk more seriously and, thus, participate more sustainably in the time-consuming questionnaires.
As the price of one package was reduced to 25 cents (Price Step 2), the consumption increased to 45 percent and up to 46 percent in Price Step 3. A relatively slight rise was

[6] Questionnaires given to pupils, parents, class teachers, school principals and school milk managers were developed by the Max Rubner-Institut (MRI), Federal Research Institute of Nutrition and Food, Karlsruhe, Germany, as the questionnaire for suppliers was developed by the vTI.

observed by reducing school milk prices 10 cents each. At zero prices (Price Step 4) consumption rapidly increased to 81 percent, as was to be expected. This 81 percent can be seen as the maximum potential demand for school milk, although only 18 percent never ever consumed school milk, as children's behaviour varies over time (forget to order and so on).
Demand at the individual level, as well as its development along Price Steps, depends on socio-economic factors such as age, gender, migration background and family income, and attitudes, consumption habits and preferences affect demand. Thereby it is supposed that certain characteristics can interact with each other. Figure 3 show that older pupils generally order less school milk than younger pupils. While initially 51 percent of the 7-years-old kids consume school milk in comparison to 33 percent with the 10-years-old kids, this large gap diminishes if price is reduced.
Because of the fact that preferences and consumption habits for younger pupils are more essential for the decision of whether to consume school milk or not, price reduction has hardly any effect. Figure 3 also shows the issue that younger pupils are less sensitive to prices because their reaction to price reduction is very reserved or even nonexistent. Against this backdrop the balance will change at zero prices.

4 Econometric Analysis

4.1 Logistic multilevel approach

Multilevel analysis is mainly used in social science which, in the broad sense, includes sociology, education, psychology, but also in other fields such as the bio-medical sciences (Snijders and Bosker 2003). According to Bickel (2007: 8), multilevel modelling can be viewed as "a better way of doing regression analysis under specific circumstances". These circumstances are those in which observations are nested or grouped in identifiable contexts, e. g., pupils in classes, employees in firms, longitudinal measures of subjects, etc. In contrast to OLS (*ordinary least squares)* regression, multilevel regression has an inherently hierarchical structure, and it is designed to deal with nested data and thus, the nesting of observations within groups is fundamental to multilevel models. In fact, nesting is the primary reason for doing multilevel analysis (Bickel 2007). Due to clustering, observations of the same group are usually more similar than the observations of different groups which violate the assumption of independence of all observations. Estimates of the standard errors of conventional statistical tests are much too small if this assumption is violated, ending in many spuriously 'siginificant' results (Hox 2002).
Thus, the multilevel approach assumes that individual decision-making is dependent on environmental clusters. However, the definition of clusters may differ and the variability between clusters must be taken into account. In the following, the explanatory variable at the individual level is named *X*, the explanatory variable at the group level is *Z* (also named contextual variable). The *X* variable, although it is a variable at the individual level, may also contain a group aspect. The mean of *X* in one group may be different from the mean in another group. In this case, *X* may have a positive between-group variance (Snijders and Bosker 2003: 39).
A main difference between regression and multilevel models is that the equation defining the hierarchical linear model contains more than one error term: one (or more) for each level (Snijders and Bosker 2003: 38). Current developments of multilevel approaches are more and more concerned with a proper treatment of the error structure for these models.

While the pioneers' multilevel methods are mostly represented by the selection of variables supposed to have fixed effects, more recent multilevel methods specify the value of variables as a mix of fixed and random effects. In a fixed effects multilevel model, the micro level coefficient is expressed as an exact function of macro level variables. In contrast, random effects multilevel models contain error terms in the macro equations. Including these error terms at the macro level implies a more complex error structure in the single equation version of the multilevel regression. Random coefficient models allow the decomposition of the variance of the dependent variable into the within-context variance and the between-context variance (DiPrete and Forristal 1994).

Within the multilevel analysis applied here, we examine pupils clustered in classes and schools. With such data, it is usually illuminating to consider the variability associated with each level of nesting (Snijders and Bosker 2003: 9). In the following a multilevel approach of the ordinary logistic model is considered: a random-intercept model that includes random effects at several hierarchical levels. Y_{ijk} is the outcome or response of the *i*th pupil of the *j*th class in the *k*th school which is either 0 or 1. Because for most of the individuals, it can be observed that there is a limited fluctuation in school milk purchase order within a Price Step. Pupils who decide to consume school milk do this almost every school day or vice versa. Thus, the distribution of orders is u-shaped; hence, there are also some pupils with an average ordering between 0 and 1. To keep both proper and simple, there is one value for each pupil per Price Step which is 1 for those who order school milk in 50 per cent or more cases, and 0 for all others. Thus, demand for each individual is represented by four measurements – one for each Price Step.

It is assumed that the given random effects U_{jk} and U_k representing unobserved class and school characteristics respectively. Further, for pupil *i* of class *j* in school *k* is assumed that

$$\pi_{ijk} = probability(Y_{ijk} = 1)$$

and the logit of this probability satisfies

$$logit(\pi_{ijk}) = \beta_0 + \beta_1 X_{ijk} + \beta_2 X_{jk} + \beta_3 X_k + U_{jk} + U_k,$$

Where X_{ijk}, X_{jk} and X_k represent observed characteristics at individual, class and school levels, with corresponding fixed effects β_1, β_2 and β_3. Further, it is assumed that the random effects are independent and normally distributed, with

$$U_{jk} \sim N(0, \sigma_2^2),$$
$$U_k \sim N(0, \sigma_3^2).$$

Residual errors are assumed to have a mean of zero, and a variance to be estimated.

The linearized form of the logistic multilevel model is described in the following equation:

$$Y = \pi + \epsilon \quad with \ \pi = f(X\beta + ZU).$$

Thus, outcome variable *Y* is expressed as the sum of the probability plus some individual-dependent residual. This error term has mean zero and (conditional) variance given by a diagonal matrix with entries $\pi(1 - \pi)$. This is a peculiar property for these dichotomous variables. As a consequence, the logistic multilevel model does not include a separate parameter for the level-one variance. The level-one residual variance of the dichotomous outcome variable follows directly from the success probability (it can only adopt $-\pi$ or

$1 - \pi$). Further, f is the inverse logit transformation (Snijders and Bosker 2003: 207ff; Rodriguez and Goldman 2001: 340-343; Hox 2002: 30f).

Following Rodriguez and Goldman (2001) the model written above can be illustrated as a chart (see Figure 4) whereas the nested structure (pupils of classes in schools) is shown by using stacked sheets. Boxes symbolize known quantities and oval boxes unknown quantities. Full arrows denote probabilistic dependences whereas broken arrows denote deterministic relationships (Rodriguez and Goldman 2001: 341).

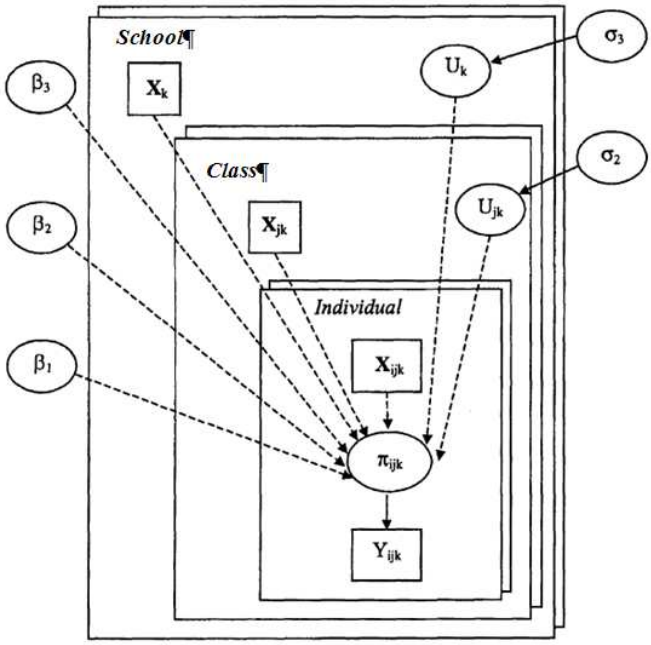

Figure 4. Three-level logit model with class and school effects on an individual level binary outcome
Source: modified after Rodriguez and Goldman 2001: 341.

However, because there are four measurements for each pupil as mentioned in Chapter Three, this longitudinal data structure of the pupils' sample leads to a four-level model (instead of a three-level model). While repeated measures on individuals are incorporated at the first level, individual variables are to be found at the second and organizational/contextual variables at the third and fourth level (Heck and Thomas 2009: 44; Snijders and Bosker 2003: 9). Thus, school milk demand of a single pupil is determined by the price as well as by individual, class and school characteristics.

4.2 Applied Model

Variables for the applied model stem from different sources (see Figure 5): Beside school milk orders by pupil per school day, further information like social index[7], municipal size and school size can be incorporated. However, the majority of the explanatory variables could be generated by the questionnaires given to pupils (pu), parents (pa), class teachers (ct), school principals (sp) and school milk managers (sm).

[7]Index describing the socioeconomic status of the district derived from the spending on welfare aid at county level, the share of people with a migration background.

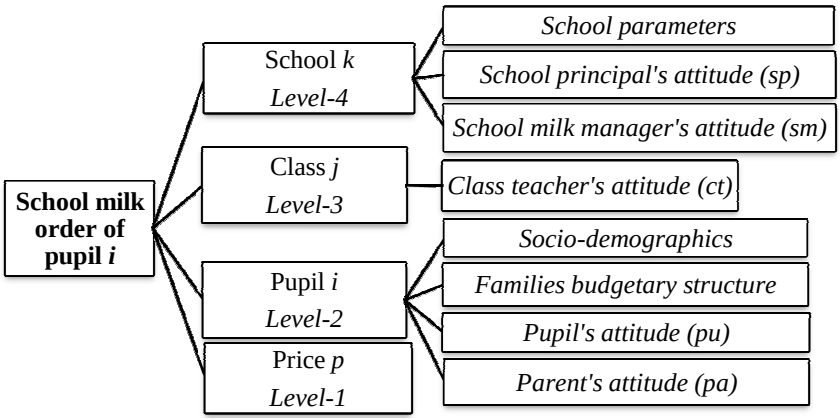

Figure 5. Groups with explanatory variables of the applied multilevel model
Source: own illustration.

Data handling and estimation were performed in the statistic program STATA Version 11 using the procedure *xtmelogit* for logistic linear random intercept model. As a pre-process a correlation matrix was generated depicting the correlation across all available explanatory variables to minimize the risk of multicollinearity. In a further step a single regression model was estimated excluding step by step insignificant explanatory variables. Beginning with the empty model, multilevel analysis is a step-by-step approach which includes available variables at different levels. When an additional variable led to insignificant results, or the regression did not converge, the respective variable was excluded.

4.3 Analysis and results

Generated results for multilevel analysis are shown in Table 1 (intercept-only model) and Table 2 (random-intercept model), in which the first level is identified by Price Step variable, second level by pupils' ID variable, the third level by classes' ID and the fourth level is defined by schools' ID variable.[8]

Indicating the random part of the first model, the intercept-only model without any predictor variables shows the decomposition of the variance across available levels. The share of variance explained by the pupils' structure is the main part of the unexplained variation (3.09); followed by the classes' structure with a value of 0.51 and the schools' structure with a value of 0.33.

[8] As in common terminology we call this model a three-level model. In contrast to common terminology, the *xtmixed* documentation of STATA calls such a three-level model a two-level because the lowest level, here repeated measurements, is not considered as a level (Rabe-Hesketh and Skrondal 2007).

Table 1. Results of logistic multilevel analyses (intercept-only model)

	Intercept-only	
Fixed part:	*Coefficient*	*Std. Err.*
constant	0.4303***	0.0719
Random part:	*Std. Dev.*	*Std. Err.*
σ_4: school	0.3300	0.0796
σ_3: class	0.5082	0.0635
σ_2: pupil	3.0940	0.0119
number of schools		101
number of classes		552
number of pupils		7,336
Log restricted Likelihood		-17,468.96

***significant at the 1 percent level

Source: own calculations with STATA.

Changing to the random-intercept model (Table 2), the random part mostly declines. Thus, the explaining variables which are included in the fixed part of the random-intercept model reduce the unexplained variance of the grouping structure at school and class level: at school level from 0.33 to 0.22 and at class level from 0.51 to 0.37. Variance at pupil's level increases from 3.09 to 5.31 which is typical for multilevel analysis with panel structure. This is because the data collection design is set up in the way that the repeated measurements are evenly spaced and the data are collected at the same time for all individuals in the sample. As a result, the variability between pupils in the time series variable is usually much higher than the hierarchical sampling model assumes. Consequently, the intercept-only model overestimates the variances at the occasional level, and underestimates the variance at the individual level (Hox 2002: 81f).
The fixed part contains the extent to which the predictor variables contribute significantly to the likelihood that pupils order school milk. Two significant variables refer to **Level 1** (price): falling school milk prices increase the probability that pupils order school milk. The free offer has a strong positive effect on consumption.
From a total of 21 significant variables (for details see Appendix 1), 13 belong to **Level 2** (pupils and parents). These are age, gender, migration background, pupil's milk drinking habit at home, pupil's image of milk, family income, parent's agreement and/or rejection of several statements. Possible interpretations of these variables are presented in the following section in the order used in Table 2. The negative coefficient of age indicates that the increase of age reduces demand of school milk. Further, the results show that boys consume more school milk than girls, and pupils with migration background consume less than pupils without migration background. Pupils who drink no milk or milk products at home show the same behaviour in school. Pupils who have a supporting attitude towards milk consume more school milk. Consequently, those who have an opposing attitude towards milk consume less school milk.

Table 2. Results of logistic multilevel analyses (random-intercept model)

	Random-intercept	
Fixed part:	*Coefficient*	*Std. Err.*
Constant	0.5308	0.7904
price (Level-1)		
school milk price	-0.1989*	0.1013
dummy_free school milk	3.3126***	0.1442
pupils (Level-2)		
pu_age	-0.3355***	0.0680
pu_gender	-0.5900***	0.1159
pu_migration background	0.5644***	0.1369
pu_at home drinks except milk	-0.6302***	0.1339
pu_image milk_positive	0.6714**	0.2006
pu_image milk_negative	-1.0411***	0.2825
parents (Level-2)		
pa_net income	0.0001*	0.0000
pa_free school milk for kids from poor hh_positive	-0.2250*	0.1222
pa_good feeling if kid drinks school milk_positive	1.6020***	0.1573
pa_good feeling if kid drinks school milk_negative	-0.9236***	0.2054
pa_school milk helps kids to drink enough milk_positive	0.3255*	0.1477
pa_school milk helps kids to drink enough milk_negative	-0.3994*	0.1924
pa_friends say milk is part of healthy diet_positive	-0.4625**	0.1524
class teachers (Level-3)		
ct_teacher drink milk during morning break	0.3973*	0.2050
ct_school milk contributes to healthy diet_negative	-0.8078*	0.3998
ct_peers support school milk_negative	-0.5415*	0.2256
school principal (Level-4)		
sp_parents initiated to provide school milk at school	-0.5031*	0.2068
school milk manager (Level-4)		
sm_payment (base: no payment)		
1. fixed	-0.8241	0.7627
2. variable	-0.4274*	0.1970
number_milk types	0.4226***	0.1079
Random part:	*Std. Dev.*	*Std. Err.*
σ_4: school	0.2178	0.1074
σ_3 : class	0.3676	0.1342
σ_2 : pupil	5.3130	0.3611
number of schools		67
number of classes		299
number of pupils		2,634
Log restricted Likelihood		-5,026.63

* significant at the 10 percent level; ** significant at the 5 percent level, ***significant at the 1 percent level

Source: own calculations with STATA.

Furthermore, the probability of consumption increases when the family income is higher, as to be expected. Kids' probability to order school milk is lower if parents agree with the statement "Children from households with a low income should get school milk free of charge". Negative sign of the parameter seems to be counter-intuitive, however there is a possible interpretation: parents regarding themselves as poor would like to get school milk free of charge. Pupils of parents who agree with the statement „I feel good if my child drinks school milk during breaks" order more school milk. Thus, pupils of parents who rejected the statement order less. The probability of a pupil's consumption increases if parents agree with the statement „School milk facilitates a sufficient milk supply for children" and vice versa. The agreement with the parent's statement „My friends say that milk and milk products are components of a healthy diet for children" is combined with reduced school milk consumption. A reason for this could be the fact that there is no real reference to school milk and that in those families milk consumption could already be high.

At **Level 3** (class teacher), there are three significant variables: School milk consumption is higher in classes if the class teacher consumes school milk as well. Further, a teacher's rejection of following statement "School milk facilitates a healthy diet for children" negatively influences a pupil's decision to order school milk. School milk consumption of pupils decreases if teachers disagree with the statement „Persons that I appreciate, think that children should drink school milk".

At **Level 4 (**school principal and school milk manager), the number of available school milk types as well as the payment of the school milk manager have a significant positive impact on the school milk demand. If parents have originally initiated the supply of school milk at their school this fact has a negative impact on the average consumption. The probability of ordering school milk will be higher if there are more different flavours of school milk available. This reflects that pupils prefer a wider range of products from which they can choose, because they like to change regularly. If the school milk managers' payment for the school milk handling is variable[9], less pupils order school milk at this school. This indicates that the motivation of school milk managers to properly organize the school milk scheme in the school seems to depend on the payment system. If the support of school milk at the school was based on the decision of the parents, less pupils order school milk which leads to the conclusion that integrating school principals and teachers are a very important component for the success of the school milk program.

5 Qualification and conclusions

Descriptive statistics and figures reveal that school milk consumption is driven by various factors. When analysing individual decisions on school milk demand within the pupils' sample database the applied multilevel approach reveals important influencing factors. Those explanatory variables can either be assigned to the individual sphere consisting of the child or parent and their interrelation respectively, or they belong to the contextual sphere of the class and school. In addition, the price experiment provides variables on the governmental level. Derived results allow a separation between the impacts of the different levels appropriately.

[9] The payment is depending on the sale volume.

The logit random-intercept model consists of four levels and shows how much variance is explained at each level. At the lowest level, there are repeated measures for each individual pupil. In this case all required information is available. Pupils, classes and schools are clusters of higher levels. Considering the Price Steps as a fourth level also allows determining the effects of price changes and the impact of a free-off charge distribution. Explanatory variables are incorporated at each level, and about 20 significant variables are identified in total. These variables significantly decrease the level of variances.

But one has to keep in mind that the data set depicts a self-selection bias in so far as more school milk buyers' than in the overall sample provide required information and thus, could be included in the dataset for estimation. A second set of restrictions deal with the problem that not all agent levels could be included in the model, e.g., regional information or information on suppliers, because they do not prove to be significant. Also seasonal patterns regarding milk consumption which may exist could not be derived with this model. The graphs indicate that different variables may interact with each other, which has not captured, yet.

Despite these limitations several conclusions are apparent. Individual as well as contextual factors matter in the pupils' decision to order school milk. The following preliminary implications could be drawn:

- Prices matters. As to be expected: demand increases with reduced prices. A free-off charge distribution has an immense impact on orders, whereas the effect is much greater than with a price reduction of equal size.
- Individual factors on the ordering decision are also important and cover a range of variables which can be grouped in factors affecting parents or pupils: Concerning parents, beside economic factors like income or social factors, e.g., a migration background, their attitudes towards school milk "I feel good if my child drinks school milk" or "school milk facilitates a sufficient milk supply for children" affect decision making. When the pupils themselves are regarded, socio-psychological variables like age or gender play an important role but also their own attitudes towards milk like "image of milk". For both groups, often supporting as well as opposing attitudes' can be established as significant. However, the attitudes of the adults are more specific as they deal with school milk than those of the children which refer to milk in general.
- At class level the role model of the teacher is important: if he or she drinks school milk, pupils are more likely to follow the example. And more, if teachers have a negative attitude towards school milk or their environment this will lower the odds for a positive decision to order school milk of their pupils.
- When school level variables are considered significant ones will cover a range of factors: if parents have originally initiated the supply of school milk at their school this will induce lower chances for an ordering decision. Other variables refer to the area of handling: an increasing number of school milk varieties will positively influence the decision in favour of school milk drinking. Further the type of payment will have an impact, here a variable payment is hindering.

While attitudes are difficult to change, some other variables enable action to increase the share of school milk drinking children, e. g., the number of school milk types supplied, the payment of the school milk manager, the inclusion of teachers in the school milk program, or the very early participation of a school principal.

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Appendix

Appendix 1. Variable names and their description

variable name	description of the variable
school milk price	price for school milk (250 ml package) in cents (35, 25, 15 and 0 cents)
dummy_free school milk	1=free school milk
pu_age	Age (between 6 and 12 years)
pu_gender	(Girl=1, Boy = 0)
pu_migration background	without background =1, with background = 0
pu_at home drinks except milk	Child drinks no milk at home
pu_image milk_positive	Image of milk is positively evaluated by the child
pu_image milk_negative	Image of milk is negatively evaluated by the child
pa_net income	Monthly household net income
pa_free school milk for kids from poor hh_positive	Positively evaluation of the statement: “Children from households with a low income should get school milk free of charge”
pa_good feeling if kid drinks school milk_positive	Agree with the statement „ I feel good if my child drinks school milk during break “
pa_good feeling if kid drinks school milk_negative	Disagree with the statement “ I feel good when my child drinks school milk during break“
pa_school milk helps kids to drink enough milk_positive	Agree with the statement „School milk facilitates a sufficient milk supply for children“
pa_school milk helps kids to drink enough milk_negative	Disagree with the statement „School milk facilitates a sufficient supply with milk for children“
pa_friends say milk is part of healthy diet_positive	Agree with the statement „ My friends say that milk and milk product are components of a healthy diet for children“
ct_teacher drink milk in break	Teacher drinks milk during morning break
ct_school milk contributes to healthy diet_negative	Disagree with the statement “School milk facilitates the healthy diet for children”
ct_peers support school milk_negative	Disagree with the statement „Persons that I appreciate, think that children should drink school milk“
number_milk types	Number of school milk varieties (1 to 5)
sp_parents decide to provide school milk at school	Parents have originally initiated the supply of school milk at their school
sm_payment (base: no payment)	0 = no payment, 1= fixed payment, 2 = variable payment