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School Meals and Children Satisfaction. Evidence from Italian Primary Schools

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Abstract

This paper aims to identify which variables affect the degree of primary pupils' satisfaction concerning the quality of school meals. A representative sample of 33 public primary schools offering meals was extracted for the metropolitan city of Naples. Two questionnaires were distributed, one to the headteachers concerned and the other to the pupils enrolled in the 5th grade. Information about the catering companies is mainly sourced from the AIDA database. Pupil satisfaction is measured by two key variables: pleasantness of eating at school and food tastiness. Controlling for pupil, family, school, foodservice and catering company characteristics, the paper shows that catering company size is negatively associated with pupil satisfaction with the foodservice, whereas meal average production cost is positively associated with satisfaction. The study could assist city boroughs in devising meal quality indicators to be taken into account in designing competitive tendering.

Keywords: school meal quality, school foodservice satisfaction, catering companies, public procurement, tendering, quality-shading hypothesis.

JEL codes: I21, H44.

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1. Introduction

The question of how their children eat at schools plagues many parents worldwide. The current situation is far from particularly reassuring: extensive pupil dissatisfaction with school meals clearly emerges in media reports. For example, a blog called NeverSeconds was created and run by the Scottish schoolgirl Martha Payne, collecting pictures of uninviting school meals from all over the world. In Italy, the activities of a catering company in Ragusa were temporary suspended four times, after the parents' protests and the intervention of food-safety inspectors (Gubbini, 2015). The scarce literature on the topic also shows a fairly low level of student satisfaction with the taste of school meals (Lülfes-Baden *et al.*, 2008; Jung *et al.*, 2009).

Satisfaction with school meals is a pre-condition for improving the effects of school meals on students' nutrition status. The daily calorie supply from school meals in Italy corresponds to 40-50% of the Italian age-adjusted recommended dietary allowance (RDAs) (Rossi *et al.*, 2006; Vairano, 2011; Vania *et al.*, 1992). However, given the large quantity of leftovers (48.5% reported by D'Addesa *et al.*, 2002, and 37% found by Iappello *et al.*, 2011), actual intake during school meals is lower, providing up to almost half of the levels of the expected energy and nutrient daily intake (Martone *et al.*, 2013) with a total estimated food wastage amounting to 35-40% of the number of meals distributed in schools (Verducci *et al.*, 2007).

Some Italian municipalities (Milan, Genoa and Cesena) have adopted the slogan "Turning school canteens into restaurants for kids" (Spigarolo *et al.*, 2010) since feeding conveys a symbolic link between the food supplier and the food eater: when pupils are satisfied with the taste of school meals, they trust their school as a care provider and educational institution (Gravante *et al.*, 2000). Satisfaction with school meals becomes a pre-condition for developing school meal systems that empower young consumers by building their capacity to eat healthily (Morgan and Sonnino, 2007). With the increase in maternal labour force participation, primary schools have been asked to provide extra-familial care services, such as childcare during lunchtime at school (Filippini *et al.*, 2014). With the problem of overweight and obesity in young people becoming a major public health issue in many economies, medical organisations and international bodies have identified schools as a priority setting to promote food literacy and healthy eating and lifestyle habits among pupils (Galzerano, 2011). These aims can be achieved by

integrating home economics, food and nutrition education into the curricula (Slater, 2013), in some cases also through the intervention of professional chefs teaching cookery (Caraher *et al.*, 2013), by providing a healthy well-balanced lunch (Gleason and Sutor, 2003; Rowe *et al.*, 2010), by offering greater opportunities for physical activity (Cawley *et al.* 2007), by monitoring snack time food and beverage choice (Calabrese *et al.*, 2005) and by increasing fruit and vegetable knowledge and consumption through school-based gardening, farm visits and campaigns providing fruit and vegetables to schoolchildren (Bontrager Yoder *et al.*, 2014; Brunello *et al.*, 2014; Parmer *et al.*, 2009; Tanganelli, 2014). Snacks, drinks and meals at school have also been a successful and innovative vehicle for conveying sustainability principles and habits to pupils and their families (Morgan and Sonnino, 2010; Tanganelli, 2014), through, in some cases, involvement in their production and, generally, through everyday consumption of local, organic and/or fair trade products (Becchetti and Bustamante, 2008; Becchetti *et al.*, 2008).

Due to the high cost of running their own canteens (Giacosa *et al.*, 1989), most public schools put the contract out to tender to external catering firms. Public regulations on school food procurement influence and may enhance the quality of school meals in some “best practice” cases (Bocchi *et al.*, 2008; He *et al.*, 2014; Spigarolo *et al.*, 2010). However, current bidding procedures in public sector catering generally tend to favour large catering companies and often lead to poor service quality (Taylor, 2005), even when aspects of quality, other than food tastiness, such as those related to safety standards and nutritional requirements of school meals, receive the highest relative weighting among award criteria (Tikkanen and Kaleva, 2011).

The purpose of this paper is to analyse to what extent pupils value the characteristics of the public school foodservice and investigate the determinants of pupils’ satisfaction among catering company characteristics, such as size, meal price and estimated meal production cost, after controlling for individual, family, neighbourhood, school and foodservice characteristics.

Our data were sourced from a stratified sample of 33 public primary schools offering foodservice in the metropolitan city of Naples. Two long purpose-made questionnaires were designed and distributed to the headteachers of the sampled schools and to all pupils enrolled in the 5th grade. Information about the catering companies was sourced from Agra (2008) and the AIDA database.

Pupil satisfaction is synthesised by two key variables: the level of pleasantness of eating at school and the level of school food tastiness. A bivariate ordered probit was

applied to the two dependent variables, where the regressors are pupil, family, neighbourhood, school, foodservice and catering company characteristics.

The remainder of the paper is divided into five sections. The second section reviews the literature which addresses the issues discussed here. Sections three and four focus respectively on the procurement of school meals in Italy and on the Italian catering industry. Section five describes the survey, the catering companies operating in Naples and the empirical model that was used, and section six presents the results of the present analysis. Section seven provides concluding remarks.

2. Literature review

2.1. School meal quality and public procurement

Current bidding procedures in public sector catering often lead to a school foodservice quality that is unlikely to rise above being very basic, particularly for aspects of service not covered by targets (Taylor, 2005). A ‘quality-shading hypothesis’ has been advanced for competitively tendered contracts. In other words, a trade-off exists between lower winning price and contract performance (Domberger *et al.*, 1995).

Poor ex-post contract performance could derive from adverse selection, when bidders differ along their cost of failing to honor the contract (Spulber, 1990), or moral hazard, when the contract is incomplete (McAfee and McMillan, 1986), or winner’s curse, when large numbers of bidders (6-7) produce more aggressive bidding than with small numbers (3-4), resulting in negative profits (Kagel and Levin, 1986). Adverse selection occurs when bidding competition through public tendering give bidders incentives to submit bid-prices for low quality instead of bid-prices for high quality, though they are well qualified ex ante to provide high quality. It may occur when the product quality is not contractible and short-term gain from opportunism is greater than long-term gain from maintaining reputation. In such cases, bidders have no incentives to provide high quality. This distortion in incentives, together with excessive bidding competition, drives the bidders to bid so low that a winning bidder can provide only low quality (Kim, 1998).

The degree of contractual incompleteness is high for service quality when the quality characteristics of a service are both difficult to identify and specify prior to service delivery (Domberger and Jensen, 1997). This makes it difficult to establish that the private contractor is not providing the level of service stipulated in the contract specification,

particularly in the case of weak institutions for contract enforcement (Decarolis, 2013). Furthermore, information is asymmetrical as regards the possible quality and cost configurations of service and not all interested parties participate in the decision making process. There is a principal-agent problem between the contracting authority (the principal) and the catering contractor (the agent) and a principal-agent problem between the service user (the principal) and the contracting authority (the agent): the catering company is interested in cost reduction, the service user is interested in service quality but the contracting authority does not control quality directly and does not consult the users of the service when constructing the tenders (McAfee and McMillan, 1986; Taylor, 1995).

In order to prevent the contractor's opportunism, decrease the winner's rent and increase the client's utility, literature suggestions are (Doni, 2006; Klemperer, 1999; Kim, 1990): i) a minimum financial or technical requirement for bidders; ii) a client's favoritism toward a specific group of bidders such as domestic firms; iii) legal enforcement of public contracts; iv) making the winner's payment depend on ex-post, even imperfectly, observed winner' performance ; v) giving a major role to bidders' previous performance in evaluating their qualifications for future public procurement contracts. More specifically, Doni (2006) suggest a bidder classification system based, primarily, on a measurement of past performance and, secondarily, on quality certifications and technical-financial requirements. For entrants, a 'no claims clause' scheme could be adopted since they should be classified in a base category.

Compulsory competitive tendering in public sector catering may also impact the structure of the contract catering industry in that large firms adopt predatory pricing because underbidding in order to win a contract can be subsidized from surpluses earned elsewhere. Large firms also have intrinsic cost absorption advantages that cannot be overcome by small firms simply by cutting costs and are able to spread shared costs across a range of contracts (Taylor, 1995).

Small firms are at a disadvantage when public sector contracts are too large and too diversified for them to undertake. This disadvantage is present in the case of a centralised procurement organisational structure. In short, in a centralised purchasing system there is a central body in charge of handling the purchasing activity (to select contractors, negotiate prices and conditions, make purchasing decisions) for end users (in this case, schools) who just send it their requests. By way of contrast, in a decentralised system, local units procure on their own. In addition to higher coordination and set-up costs and a complex coordination process, centralisation presents the disadvantages of the possible withdrawal

of small contractors, loss of relationships with local contractors, impossibility of satisfying different needs, potential lock-in phenomena and a possibly unsatisfactory schedule for single unit needs (Baldi, 2014).

2.2. School foodservice satisfaction

The definition of school foodservice satisfaction adopted in this paper is mainly derived from the national literature relative to primary school pupils. One reason is that the international literature on foodservice satisfaction of primary school pupils, which is reviewed below, is not particularly broad. The international literature suggests, instead, several aspects defining satisfaction with the school foodservice of students enrolled in secondary and tertiary schools. These aspects relate to variety of menu, tastiness of food, eating place satisfaction, cost, service quality, hygiene and their relationship with the foodservice management type (Booth *et al.*, 1990; Jung *et al.*, 2009; Know *et al.*, 2005; Kwun *et al.*, 2014). A second reason is that the focus of this paper is not the computation of a satisfaction index, as in Lülfs-Baden *et al.* (2008), but the identification of satisfaction determinants.

Lülfs-Baden *et al.* (2008) investigate the customer satisfaction for school meals through a questionnaire distributed to a sample of 2384 pupils attending grade 5 to 13 from 20 different schools mainly located in Lower Saxony in Germany. The sample was determined with the goal of obtaining both all-day schools with a long tradition and new all-day schools. Customer satisfaction is explained by service quality through three factors: quality of food, atmosphere and service. Of these, food quality is the strongest contributor to satisfaction with an effect more than three times that of atmosphere and more than twice that of service. However, the three items of satisfaction generally received relatively low scores from pupils, especially when compared with eating at home, most pupils preferring to eat somewhere else other than at school. No relationship with the type of catering system was investigated.

Moore *et al.* (2010) study the pleasantness of eating at school by observing the eating behaviour during lunchtime of pupils in a sample of 11 primary schools in Wales, with particular emphasis on the physical, temporal and social characteristics of the service area and of the dining area. Conflicts between the available space, seats and school meals emerged since overcrowding was a common feature of the eating

experience and also affected the amount of socialising among children which was limited by requests for reduced noise levels. “Packed lunch children” usually had more opportunity to socialise when eating as they received less supervision than their cooked lunch counterparts.

Jensen *et al.* (2013) explore the role of lunch price in the participation in school lunch programmes. The survival of lunch programmes in 2010 after a pilot zero-price start-up period was analysed through the distribution of a questionnaire to school staff in 27 schools in Denmark supplemented by in-depth telephone interviews and website data collection. Significant determinants of survival for school lunch programmes are the lunch price, with a negative sign, and school size, in terms of number of pupils, with a positive sign. The willingness to pay for school lunches of occasional users’ or non-users’ parents was lower than the observed market price level (in the region of € 2.75-3.00).

In the literature on Italy, dieticians are those who most use questionnaires among primary school pupils to investigate the levels of acceptance, and then tastiness, for each kind of food item or category, focusing on nutrition and analysing the weight or the adequate supply of vitamins and nutrients. Pupils’ evaluation is generally sought with respect to the levels: not satisfied, poorly satisfied and satisfied (D’Addesa *et al.*, 2002; Martone *et al.*, 2013), whereas Carboni (2003) uses the levels not satisfied, poorly satisfied, sufficiently satisfied and fully satisfied. Questions about the pleasantness of eating at school and whether the eating place is comfortable are also included (Gravante *et al.*, 2000). Hygiene and aspects of service quality, like staff courtesy, are generally evaluated through the questionnaires to families whereas menu variety is not a matter for evaluation because menus are decided by municipal dieticians (Messina, 2009).

3. The procurement of school meals in Italy

Public regulations on school food procurement largely determine supply, since the terms of the contract affect how the firms bid in the initial competition for the contract, and the quality of that supply. Italy has a long tradition of school food procurement and is cited as the place where a “school food revolution” has started with the goal of improving the quality of school meals.

In 2012, 73% of Italian primary schools supplied foodservice, 50% supplied a healthy snack such as fruit or yoghurt, 77% had curricular programmes on nutritional education, 70% had launched initiatives for a healthy diet (like school gardens) and 35% had

involved the parents of schoolchildren in such initiatives (Ministero della Salute, 2013). School meal procurement policies are the expression of a food culture that is closely related to local identity (Morgan and Sonnino, 2008) to elude the principle of “non-discrimination” which informs EU public procurement regulations¹ from the 1990s. This principle operates to prevent biases towards domestic businesses but the legislation reform in 1999 allows for contractual requirements about localisation of suppliers that is specifying production techniques and product qualities that can only be met by local producers (for example, fresh seasonal and regionally certified products). In 2006 new rules were introduced giving the contracting authorities the powers of requiring special conditions, such as those related to environmental and social issues. The new legal framework has increased the discretionary powers of contracting authorities and pushed the public procurement strategies towards sustainable objective obtainment. In several member states (Sweden, Finland, Denmark, France and Italy) public food procurement required the presence of local, traditional, organic and healthy foodstuffs in schools’ and hospitals’ meals (Stefani *et al.*, 2015).

In Italy school meals are assigned the educational function of conserving local traditions. This educational purpose is recognised by Presidential Decree 275/1999 which states that each school should adopt its own educational programme, related to the culture of the local community, which plans all training activities. The latter include choices concerning school meals, when they are directly prepared by schools, and/or the school project of food education alone, should the school not run its own canteen (MIPAF, 2004).

The competences on school meal procurement are assigned to municipalities (D.P.R. 616/1977) (MIPAF, 2004). Most municipalities (67%) put the contract out to tender to catering firms, while others (18%) take direct responsibility for the management of their canteens. The remaining municipalities have adopted a system of management which is partly public and partly private². Since receiving a meal at school is considered part of both a child’s right to education and to health, municipalities usually subsidise school meals. That said, the percentage of expenditure on school meals covered by families sharply differs according to the municipality³ (Giacosa *et al.*, 1989).

¹ Council Directive 92/50/EEC, Council Directive 93/36/EEC, Council Directive 93/37/EEC, Council Directive 93/38/EEC.

² <http://www.scpclearinghouse.org>

³ For example, it was 28% in Genoa, 36% in Milan, 39% in Florence and 65% in Bologna (Giacosa *et al.*, 1989).

In the case of public open tenders for school food procurement, ‘the lowest price’ criterion, which is adopted for public contracts (Law 157/1995, Article 23, clause 1, letter a), is replaced by ‘the most economically advantageous tender’ criterion which assigns grades to the bids, submitted by catering companies, on the basis of the price of meal plus other elements relating to service quality and organisation, such as staff training, provision of products from social cooperatives, working to preserve “freshness”, seasonality, etc. (Law 157/1995, Article 23, clause 1, letter b). Furthermore, under Italian law contracting authorities retain complete control over the service since, if necessary, they can introduce the changes needed to preserve the link between school meals and the school’s educational project. The contracting authorities have also discretionary powers since they are allowed to discriminate in favour of local operators and all expertise linked to local and organic food. The State Council in 1992, during a public auction case (Cons. Stato, V, 24/11/1992, no. 1375, in *Cons. Stato*, 1992, no. 1636), states that it is legal for a municipality to restrict participation in a public competition to companies located in the province, ‘given the necessity to take into consideration the tastes of local consumers and to guarantee prompt communication and intervention in the event of problems arising’.

Italy has successfully improved the quality of school meals in recent decades. In 1977, the National Institute of Nutrition (INRAN), together with the Ministry of Agriculture and Forestry, set out the first guidelines for healthy school meals. At the end of the 1970s, the municipality of Tassullo, in Trentino Alto Adige, experienced the first organic school meals; in 1987, the municipality of Cesena launched a project for the introduction of organic food products into school meals under the funding of the Agriculture Department of the Administrative Regional Government in Emilia Romagna (Schifani, 2001). This initiative was soon followed in other regions (Liguria, Piedmont, Friuli Venezia Giulia, Veneto) and institutionalised by National Law 488/1999 which states under ‘Measures to facilitate the development of employment and of the economy’:

in order to ensure the promotion of organic farming and quality food products, it is recommended that public institutions operating school and hospital canteens introduce typical and traditional organic products, together with PDO (Protected Designation of Origin) products. The daily provision of food will be undertaken in line with the guidelines and other recommendations of the National Institute of Nutrition (Article 59, clause 4).

The number of municipalities which have introduced organic food in school meals has increased more than tenfold since the law was enacted, as evidenced in Table 1.

Table 1
Number of Italian municipalities with organic foodservice at school

Region	1996	1999	2000	2013
Piedmont	8	9	9	87
Valle d'Aosta				1
Liguria	3	3	3	32
Lombardy	3	2	2	202
Trentino Alto Adige	7	9	9	63
Veneto	13	18	18	167
Friuli VeneziaGiulia	3	13	13	83
Emilia Romagna	19	20	20	159
Tuscany	13	12	12	125
Marche	2	9	8	34
Umbria				7
Lazio	1	3	5	45
Abruzzo				15
Molise				1
Campania				16
Puglia		2	2	55
Basilicata				20
Calabria			1	6
Sicily			1	11
Sardinia		3	3	17
Italy	72	103	106	1146

Source: Biobank, 2013 & Schifani, 2001

The parents of schoolchildren are generally favourable to organic food because it is perceived as safer (Giacosa *et al.*, 1989), although in this respect the regions in southern Italy lag behind the others. On average, the cost of an organic meal is estimated to be 8-12% higher than the cost of a conventional one (Schifani, 2001).

In 2014, 1,230,000 organic meals were served in Italian schools. However, only 23% of these were prepared with at least 70% of organic food (Mingozzi and Bertino, 2015) and as few as 4.8% were completely organic (Gubbini, 2015).

The quality of school meal is monitored by municipal dieticians⁴ who carry out checks of food nutrition and hygiene to ensure that the terms of the contract are respected. Schoolchildren's families are also involved in monitoring and evaluating the quality of the school meal service through *Commissione Mensa*, or Canteen Commission. This

⁴ The definition of school food quality, given by dieticians (Vairano, 2011), includes safety, the balance of nutritional components in accordance with RDAs and food education.

includes parents who can visit the school, unannounced, any time during the term and can assess the size of the portions offered to children, the hygiene conditions of the service and the expiry dates of the ingredients used to prepare the meals (Morgan and Sonnino, 2007).

4. The Italian catering industry

Although the Italian catering sector is somewhat fragmented, a process of concentration has recently sharply reduced the number of small firms and has produced an oligopolistic market structure where competition is mainly based on price. Companies also compete through product differentiation and the supply of timesaving and service-oriented benefits. The strong competition has also forced traditional meal channels, such as restaurants, to invest in quality to preserve their market share (Pizzaferrì, 2001).

The turnover of companies which manage canteens or offer catering services with long-term contracts is €6.2 billion⁵, 34% of which stems from the health sector, 30% from schools and the remaining 36% from firm canteens. Table 2 reports the number of catering companies, operating in Italy, by size class and by type of service which is identified according to the ATECO 2007 classification adopted by the Italian Bureau of Statistics (ISTAT, Industry Census): the code 56.29.10 refers to the management of the service users' canteens (the second column of Table 2) whereas the code 56.29.20 refers to the complete contracting out of the catering service (the third column of Table 2).

According to the Industry Census, 1,278 companies managed the service users' canteens in 2001. Those offering catering services with long-term contracts or for events numbered 1,031 in 2001; no disaggregation of companies offering occasional catering services is possible.

Table 2

The number of catering companies in Italy in 2011 by service type and size class

⁵ <http://www.angem.it/it/chi-siamo/ristorazione-collettiva-in-sintesi.htm>

Size class	Canteen management	Catering services with long-term contracts	Total long- term contracts	Catering services for events
<hr/>				
0	76	31	107	160
1	180	57	237	775
2	146	24	170	243
3-5	264	56	320	308
6-9	150	54	204	168
10-15	120	33	153	107
16-19	47	10	57	34
20-49	107	24	131	54
50-99	41	14	55	10
100-199	35	10	45	4
200-249	5	4	9	1
250-499	9	7	16	1
500-999	10	7	17	
>= 1000	14	2	16	
Total	1204	333	1537	1865

ISTAT, Industry Census, 2011; size class according to number of employees

The top three regions, in terms of the number of catering companies registered with the provincial Chambers of Commerce in 2011⁶, are Lombardy (18.2%), Lazio (14.1%) and Campania (11.5%). Corporations represent 36% of total companies, partnership associations 22%, sole proprietorships 30% and cooperatives the remaining 12% (Erba and Sbraga, 2011).

As evidenced by the small number of companies with 250 workers or more (Table 2), the market structure is oligopolistic. Price competition is often detrimental to service quality in this industry (Zamagni, 2002).

Cantino (1994) identifies four types of catering companies operating in Italy: small businesses, cooperatives, specialized firms and large companies. Small businesses and specialized firms do not diversify their production range but cover different geographical areas: the former operate only at a local scale whereas the latter may also reach national markets. Large companies comprise foreign multinationals - generally French, those

⁶ Of the total 3402 catering companies, reported by the Census of Industry in 2011, the Chambers of Commerce only register 2799 since, generally, small firms are not registered.

which entered the Italian market through acquisition of small firms - or national corporations with a high level of production diversification and market penetration.

5. Methodology

5.1. The survey

A survey on the dietary habits and satisfaction of pupils with the school foodservice was carried out at the University Federico II of Naples in the school year 2010/11 among schoolchildren in the metropolitan city of Naples. This city provides an interesting case study of the role of state schools since the percentage of population in the age class 0-14 years is higher than in the rest of Italy, as is the percentage of overweight or obese children. In all, 45,400 school meals are served every day in 166 state schools (Vairano, 2011). Furthermore, the city presents a high variability of socio-economic and cultural conditions with illegal activities and organized crime flourishing in deprived areas inhabited by 30-40% of the city's population (Mazzarella, 2007). As a proxy of neighbourhood income, the level of flat rentals were computed: the mode of flat size distribution (in m²), sourced from the Population Census⁷, was multiplied by the mode of the rent per m², paid in the school neighbourhood, sourced from the Real Estate Market Observatory (OMI)⁸. This proxy varied from €205 to €1,192 in 2011. Similarly, for schoolchildren payers, the average price of a meal, paid at the school local unit and computed from data sourced from the Welfare and Education Department of the Municipality of Naples, varies from a minimum of 0.35 to a maximum of 2.77 €.

The survey involved a stratified sample of 33 public primary schools offering foodservice, representative of the population in the ten city boroughs and the weekly frequency of school meal supply, divided into the two categories of low supply (1-2 days per week) and high supply (3-5 days per week).

A school may include various local units but it is managed by a single headteacher. The sample contained 50 school local units, located at different addresses; the pupils of all the local units of the sampled schools were interviewed.

⁷ <http://www.comune.napoli.it/>

⁸ <http://www.agenziaentrate.gov.it/wps/content/Nsilib/Nsi/Documentazione/omi/>

Trained interviewers distributed the questionnaire to the pupils enrolled in the 5th grade, aged between 10 and 11, due to their higher cognitive ability and autonomy. In all, 2,210 children completed a purpose-made questionnaire during a face-to-face interview. A second purpose-made questionnaire was filled by the headmasters of the sampled schools.

The pupil questionnaire is divided into sections which refer to: individual and family characteristics, dietary and physical habits, knowledge of educational programmes on topics such as nutrition, organic, typical and seasonal food, satisfaction with school foodservice and body image perception. The sections of the headteacher's questionnaire refer to school educational programmes on topics such as nutrition, organic, typical and seasonal food, catering company information, foodservice characteristics and the headteacher's evaluation of school foodservice and food quality.

Schoolchildren are asked to rank the level of their own satisfaction with pleasantness of eating at school and school food tastiness in four levels: not satisfied, poorly satisfied, sufficiently satisfied and fully satisfied.

Table 3

Level of satisfaction with school foodservice

Level of satisfaction	Freq.	Percent.	Cum.	Freq.	Percent.	Cum.
<i>Pleasantness of eating at school School food tastiness</i>						
1 - Not satisfied	527	24	24	546	25	25
2 - Poorly satisfied	478	22	46	545	25	50
3 - Sufficiently satisfied	694	31	77	731	33	83
4 - Fully satisfied	494	22	99	338	15	98
I do not know	17	1	100	50	2	100
Total	2210	100		2210	100	

As shown by Table 3, 53% of schoolchildren are sufficiently or fully satisfied with the level of pleasantness of eating at school, because they mainly look for their peers' company (Giacosa *et al.*, 1989), whereas only 48% of pupils state they are sufficiently or fully satisfied with the level of school food tastiness. The latter percentage varies greatly according to the catering company: for example, 42% of schoolchildren were sufficiently

or fully satisfied by company 2, and 66% by company 5

The main reasons for dissatisfaction, as shown in Table 4, are the absence of tasty food and of an eating room: 1,852 (84%) schoolchildren eat in their classroom.

Table 4

What do you wish for?

Answer	Freq.*		Freq.*
a less noisy eating room	485	more fresh fruit and/or vegetables	597
a cleaner eating room	770	more meal variety	633
a brighter eating room	250	tastier food	1203
an eating room	852	hotter food	586
it is ok	586	a larger portion	337
		a dessert	759

* multiple answers were admitted

The foodstuffs which are most often uneaten are reported in Table 5. Plate waste is frequent for pasta, fish and vegetables.

Table 5

Which foodstuff do you leave most often?

Answers	Freq.*
pasta	804
meat	369
fish	691
vegetables	672
fruit	494
bread	617

* multiple answers were admitted

During the 2010/2011 school year, eight catering companies and one caterer self-directed by the school (Provider 9) provided meals. Table 6 reports the correlation coefficients between plate waste and the frequency, expressed in number of days per week, of home consumption for fish, vegetables and fruit by the provider.

Table 6

Pearson's correlation coefficients between plate waste and weekly frequency of home consumption for some foodstuffs by the provider

Provider	fish	vegetables	fruit
1	-0.19	-0.16	-0.14
2	-0.16	-0.22	-0.17
3	-0.26	-0.18	-0.06
4	-0.10	0.02	-0.07
5	-0.24	-0.03	-0.11
6	-0.23	-0.23	-0.23
7	-0.08	-0.09	-0.09
8	-0.03	-0.23	-0.30
9	-0.14	-0.32	-0.07
mean	-0.16	-0.16	-0.14

Frequent home consumption generally reduces plate waste, on average, equally for the three foodstuffs. However, the coefficients sharply differ among providers and, within the same provider, among foodstuffs. The possible interpretation is that the extent to which correct dietary habits prevent plate waste depends on the tastiness of that specific food item prepared by each provider.

The descriptive statistics of the variables relative to pupils, their families, their neighbourhood, their school and their foodservice characteristics are reported in Table 7. Exactly 50% of the schoolchildren are boys (gender dummy equal to 1). The overweight perception dummy is equal to 1 when the perception of body image, which is ranked in nine classes from 1 to 9, is higher than the median class, which is ranked 4.

As regards parental characteristics, some schoolchildren stated they did not know what their father or their mother (or both) did for a living, probably because it was illegal or highly precarious. Parent job skill levels were classified as low, medium or high, according to the educational level required by that job (whether primary, secondary or tertiary), following Etilé (2007). The dummies for parents' jobs as a cook and/or a butcher are added as controls for children who are supposed to usually eat well at home.

Among neighbourhood characteristics, the percentage of schoolchildren with free school meals, is used in the literature as a proxy for stigma related to the eligibility status for school free lunch (Mirtcheva and Povell, 2009). It was sourced from the Welfare and Education Department of the Municipality of Naples data.

Since the distance between the client and the contractor is an important aspect of public procurement contracts (Coviello *et al.*, 2015), the distance from the operative office address of the catering company to the address of the school local unit was downloaded from <http://distanzechilometriche.net>. In the case of more than one operative office, the closest to the school local unit was chosen.

The dummy for local food educational programmes is equal to 1 if the headteacher stated that the programme was present in school curricula and the pupil knew that local food was served in school meals. The dummies for organic food educational programmes and seasonal food educational programmes were similarly set.

Table 7

Descriptive statistics of pupil, family, neighbourhood, school and foodservice variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
Gender dummy	2,210	0.50	0.50	0	1
Born in Naples dummy	2,210	0.93	0.26	0	1
Special diet status dummy	2,210	0.07	0.25	0	1
Overweight perception dummy	2,203	0.34	0.47	0	1
No. brothers/sisters	2,191	1.48	1.12	0	8
No. other cohabiting relatives	2,207	0.25	0.65	0	7
Unknown parents' job dummy	2,210	0.07	0.29	0	2
Mother's job skill level	2,210	0.79	1.08	0	3
Father's job skill level	2,210	1.40	0.82	0	3
Housewife mother dummy	2,210	0.58	0.49	0	1
Unemployed father dummy	2,210	0.04	0.19	0	1
Cook parent dummy	2,210	0.02	0.13	0	1
Butcher parent dummy	2,210	0.01	0.08	0	1
No. family incomes	2,210	1.33	0.58	0	2
Mean neighbourhood income (€)	2,210	471	298	205	1192
Mean school meal price (€)	2,210	1.06	0.65	0.35	2.77
Percentage of schoolchildren with free school meals	2,210	3.55	2.62	0	9.61
No. days eating at school per week	2,210	2.59	1.27	1	5
"The eating room is ok" dummy	2,207	0.27	0.44	0	1
"I would like tastier food" dummy	2,203	0.55	0.50	0	1
Associated school unit dummy	2,210	0.28	0.45	0	2
Eating room dummy	2,127	0.13	0.34	0	1
School garden dummy	2,210	0.13	0.34	0	1
Comprehensive school dummy	2,210	0.29	0.46	0	1
Service quality level according headteacher	1,975	2.68	0.54	1	3
Food quality level according headteacher	1,975	2.48	0.58	1	3
Canteen Commission report on catering company's equipment dummy	2,210	0.14	0.35	0	1
Canteen Commission report on catering company staff's skill dummy	2,210	0.06	0.25	0	1
Canteen Commission report on catering company's service dummy	2,210	0.20	0.40	0	1
Local food educational programmes dummy	2,210	0.22	0.42	0	1
Organic food educational programmes dummy	2,210	0.35	0.48	0	1
Seasonal food educational programmes dummy	2,210	0.64	0.48	0	1
Multi-portion dummy	2,210	0.03	0.16	0	1
60-minute eating time dummy	2,210	0.15	0.36	0	1
No. lunch shifts	2,210	1.76	0.54	0	2
Multi-use dishes dummy	2,210	0.05	0.23	0	1
Jars dummy	2,210	0.08	0.26	0	1
No. pupils eating at school	2,210	565	242	93	1189
Distance from the school (km)	2,210	5.78	3.05	0	15.31
Cook-and-serve catering system dummy	2,210	0.01	0.12	0	1

5.2. The catering companies

In the metropolitan city of Naples, eight catering companies and only one caterer self-directed by the school provided meals during the 2010/2011 school year. Some characteristics, as observed in 2011, of the eight catering companies operating in Naples

are summarised in Table 8. Two of them are limited liability companies, three are local companies headquartered in Naples and two are foreign corporations.

With regard to size classes, two companies reported sales lower than €3 million (size class 1), two reported sales higher than €100 million (size class 6) whereas the remaining four fell in the following size classes, suggested by Agra (2008): €3-5 m, 5-25 m, 25-50 m and 50-100 m. The size indicator, defined according to the above sales classes, is the regressor used in Tables 9 and 10.

The supply of school meals for the 2010/2011 school year was part of a three-year contract issued by contract notices relative to the 2009-2011 years with an initial price for primary school meals, subject to rebate, equal to 3.75 or 3.77 (www.comune.napoli.it). In assessing bids, the contract notices awarded a maximum of 40 points for price and 60 for service quality and organisation, given as follows: 38 to the kitchen layout, 16 for the transport plan for meal deliveries and 6 to other elements, such as the presence of user-friendly food trays or dedicated staff for meal deliveries to schools. Only those caterers who scored at least 43 points on service quality and organisation were admitted to the subsequent lowest price evaluation. The contract notices specifically required the cook-and-hold catering system with the exception of roast meats and cooked vegetables which could be prepared by the cook-and-chill system. Certified organic tomato puree, extra virgin olive oil and fresh cut lettuce were to be used (Assessorato alla Sanità, 2012).

The meal price, reported in Table 8, is computed applying the rebate rate of the winning company, sourced from the contract award notices⁹, to the initial price proposed in the contract notice. In some cases, the same company won more than one contract with different rebate rates. Pearson's correlation coefficient between the company meal price and its sale size, as measured by the above classes, is high and negative (-0.39), confirming that large companies tend to adopt predatory pricing strategies in order to win a contract. The average production cost of meals was estimated from the company meal price and its return on sales.

⁹ [Refezione scolastica per scuole della IX Municipalità](#)
[Refezione scolastica sett. 2009 dicembre 2011-I^ Lotto](#)
[Refezione scolastica sett. 2009 dicembre 2011-II^ Lotto](#)
[Refezione scolastica sett. 2009 dicembre 2011-III^ Lotto](#)
[Refezione scolastica sett. 2009 dicembre 2011-IV^ Lotto](#)
[Refezione Scolastica Anno 2009/2011 - 1° Lotto 4° M.tA'](#)
[Refezione Scolastica Anno 2009/2011 - 2° Lotto 5° M.tA'](#)
[Refezione Scolastica Anno 2009/2011 - 3° Lotto 7° M.tA'](#)
[Refezione Scolastica Anno 2009/2011 - 4° Lotto 8° M.tA'](#)
[Refezione Scolastica Anno 2009/2011 - 5° Lotto 10° M.tA'](#)

Table 8

Descriptive statistics of the catering company variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
Sales (€ million)	8	112	173	2	421
Employees	8	2394	4111	31	11105
Age (years)	8	34	13	22	62
Share of production cost for materials (%)	8	48	13	32	71
Return on sales	8	6.5	4	1.70	10.98
Meal price (€)	8	3.4	0.216	3.12	3.67
Estimated meal production cost (€)	8	3.3	0.224	2.99	3.61
Percentage of organic on total food (%)	3	26.2	8	20.00	35.89

Source: Own calculations from AIDA, Agra (2008), Andreis (2010), Bionbank (2011) & www.comune.napoli.it

Finally, as a proxy of meal quality, the share of the production cost for materials was computed. A further proxy of meal quality is the percentage of organic food, sourced from Andreis (2010) and Biobank (2011), albeit unavailable for all companies.

5.3. *The empirical model*

As explained in the Introduction, the key dependent variables are the level of school food tastiness and the level of pleasantness of eating at school. Of course, the level of satisfaction cannot be observed on a continuous scale. However, the schoolchildren were asked to rank the level of their own satisfaction, with the result that the dependent variables are effectively two ordered variables ranging from one to four. Also, it is reasonable to assume that the two variables are correlated in the sense that common factors can explain the variation of the dependent variables across respondents. Because of the characteristics of the two dependent variables, an ordered bivariate probit was adopted to estimate the model.

The structure of a bivariate ordered probit is quite simple and it is really a generalisation of the bivariate probit. The bivariate ordered probit model assumes that there are two latent variables y_{1i}^* and y_{2i}^* (the level of school food tastiness and the level of pleasantness of eating at school, in this case) which are determined by the following system of equations (Buscha and Conte, 2009; Greene and Hensher, 2009):

$$\begin{cases} y_{1i}^* = \mathbf{x}_{1i}'\boldsymbol{\beta}_1 + \epsilon_{1i} \\ y_{2i}^* = \mathbf{x}_{2i}'\boldsymbol{\beta}_2 + \epsilon_{2i} \end{cases} \quad (1)$$

where \mathbf{x}_{1i} and \mathbf{x}_{2i} are vectors of observables, $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_2$ are vectors of unknown parameters, subscript i denotes an individual observation, and ϵ_{1i} and ϵ_{2i} are two error terms, assumed to be jointly normal with unknown correlation coefficient ρ and uncorrelated with everything else in the model, in particular, $E(\mathbf{x}_{1i}, \epsilon_{1i}) = 0$ and $E(\mathbf{x}_{2i}, \epsilon_{2i}) = 0$.

The key issue is that the realization of the two latent variables y_{1i}^* and y_{2i}^* is not observed. What is observed, instead, are two ordered variables, y_{1i} and y_{2i} , which are respectively linked to y_{1i}^* and y_{2i}^* by the following observational rules:

$$y_{1i} = \begin{cases} 1 & \text{if } y_{1i}^* \leq c_{11} \\ 2 & \text{if } c_{11} < y_{1i}^* \leq c_{12} \\ \vdots & \\ 5 & \text{if } c_{14} < y_{1i}^* \end{cases} \quad y_{2i} = \begin{cases} 1 & \text{if } y_{2i}^* \leq c_{21} \\ 2 & \text{if } c_{21} < y_{2i}^* \leq c_{22} \\ \vdots & \\ 5 & \text{if } c_{24} < y_{2i}^* \end{cases} \quad (2)$$

The unknown cutoffs satisfy the condition that $c_{11} < c_{12} < \dots < c_{14}$ and $c_{21} < c_{22} < \dots < c_{24}$. The probability that $y_{1i}=j$ and $y_{2i}=k$ is:

$$Pr(y_{1i}=j, y_{2i}=k) = Pr(c_{1j-1} < y_{1i}^* \leq c_{1j}, c_{2k-1} < y_{2i}^* \leq c_{2k}) = Pr(y_{1i}^* \leq c_{1j}, y_{2i}^* \leq c_{2k}) - Pr(y_{1i}^* \leq c_{1j-1}, y_{2i}^* \leq c_{2k}) - Pr(y_{1i}^* \leq c_{1j}, y_{2i}^* \leq c_{2k-1}) + Pr(y_{1i}^* \leq c_{1j-1}, y_{2i}^* \leq c_{2k-1}) \quad (3)$$

If ϵ_{1i} and ϵ_{2i} are distributed as bivariate standard normal with correlation ρ , the individual contribution to the likelihood function could be expressed as:

$$Pr(y_{1i}=j, y_{2i}=k) = \Phi_2(c_{1j} - \mathbf{x}_{1i}'\boldsymbol{\beta}_1, c_{2k} - \mathbf{x}_{2i}'\boldsymbol{\beta}_2, \rho) - \Phi_2(c_{1j-1} - \mathbf{x}_{1i}'\boldsymbol{\beta}_1, c_{2k} - \mathbf{x}_{2i}'\boldsymbol{\beta}_2, \rho) - \Phi_2(c_{1j} - \mathbf{x}_{1i}'\boldsymbol{\beta}_1, c_{2k-1} - \mathbf{x}_{2i}'\boldsymbol{\beta}_2, \rho) + \Phi_2(c_{1j-1} - \mathbf{x}_{1i}'\boldsymbol{\beta}_1, c_{2k-1} - \mathbf{x}_{2i}'\boldsymbol{\beta}_2, \rho) \quad (4)$$

where Φ_2 is the bivariate standard normal cumulative distribution function. This is the seemingly unrelated specification.

As in standard probit models, the coefficients estimated from a bivariate ordered probit are not a measure of the marginal effects of the corresponding independent variable; the implication is that the marginal effects have to be computed separately. In the case of a bivariate model, different types of marginal effects can be computed according to the different combinations of outcomes of interest. In our study, it was interesting to compute the marginal effects of the independent variables associated to the probability of the respondents from the sample giving maximum scores to both levels of satisfaction.

In terms of actual empirical specification, the socio-economic characteristics of the respondents were used as right-hand side controls. These included the individual characteristics: gender, born in Naples, special diet status and being overweight, and the family characteristics: number of brothers/sisters, number of other cohabiting relatives, number of family income sources, mother's and father's job skill levels, unknown parents' job, housewife mother, parents employed as cooks and butchers. The characteristics of the neighbourhood, where the respondents live, were controlled for through the general economic conditions (mean neighbourhood income, mean price of school meals and percentage of schoolchildren with free school meals). This specification of the variables is referred to as Model 1.

As the empirical literature on school foodservice satisfaction suggests various motivations for satisfaction, variables related to the latter were also introduced in order to ascertain the sources of dissatisfaction. Satisfaction motivations include the dummies for the replies "The eating room is ok" and "I would like tastier food". The new specification of the variables is referred to as Model 2.

In Model 3, the satisfaction motivations were dropped and variables on the characteristics of the school unit were added relating to its general (associated school unit and comprehensive school) and structural conditions (number of pupils, presence of eating room and school garden) and to foodservice evaluation (service quality level and food quality level according to the school headteacher and the canteen commission's reports). Model 4 contains variables related to the school's educational programme topics (local food, organic food and seasonal food) and foodservice details (multi-portion, 60-minute eating time, number of shifts, multi-use dishes and jars). The number of observations in Models 3 and 4 is lower due to some school headteachers failing to respond.

In order to use all the schoolchildren's evaluations, in the end only variables related to the structural characteristics of schools were retained, when significant, and the main variables of interest, relating to the catering company, were alternatively added because

of their strong collinearity: such characteristics comprise sale size class (Model 5), meal price (Model 6), returns on sales (Model 7), estimated meal production cost (Model 8) and percentage of organic out of total food (Model 9). Other structural and behavioural company characteristics are controlled for: distance from the school, the three dummies for the cook-and-serve catering system, a Neapolitan company and a limited company, company age and the share of production cost spent on materials.

6. Results and discussion

The results of the bivariate ordered probit regression are reported for several variable specifications in Tables 9–10; the marginal effects of the independent variables were computed for the maximum scores of both the levels of satisfaction, ranked as 4 in Table 3. Standard errors, not reported here, are clustered at a class level.

The likelihood ratio test, which was conducted on the hypothesis that the ρ is null, supports the bivariate framework. The interpretation of this result is that the two phenomena are highly correlated.

Both the dependent variables are positively influenced by the *unknown parents' job* dummy: for pupils whose families run illegal or highly precarious activities, school seems to be perceived as a substitute caregiving institution.

The level of pleasantness of eating at school is positively influenced by the dummy *being overweight*: pupils who perceive themselves as overweight are probably more controlled when they eat at home.

Looking for their peers' company could explain why the number of family incomes is a positive determinant of the satisfaction with the level of pleasantness of eating at school, the number of children in two-income families being generally lower.

The level of mother's job skills is a negative determinant of both the dependent variables because, in southern Italy, the mother is still the main person responsible for feeding the family and a pupil's food requirements and knowledge increase with the educational level of her/his mother.

Table 9

Bivariate ordered probit regression. Dependent variable Level of pleasantness of eating at school

Variables	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Gender dummy	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01
Born in Naples dummy	-0.02	-0.02	-0.01	-0.02	-0.01	-0.01	-0.01	-0.02	0.04
Special diet status dummy	0.00	0.00	0.01	-0.02	-0.02	-0.01	-0.01	-0.01	0.01
Overweight perception dummy	0.03**	0.03**	0.04**	0.03*	0.03**	0.03**	0.03*	0.03*	0.03
No. brothers/sisters	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
No. other cohabiting relatives	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Unknown parents' job dummy	0.08***	0.08***	0.07**	0.09***	0.09**	0.09***	0.05*	0.09***	0.09**
Mother's job skill level	-0.04***	-0.05***	-0.04***	-0.04***	-0.05***	-0.05***	-0.05***	-0.05***	-0.04**
Father's job skill level	-0.01	-0.01	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.01
Housewife mother dummy	-0.03	-0.04	0.00	0.03	0.01	0.01	-0.04	-0.03	-0.01
Unemployed father dummy	0.08	0.09*	0.10*	0.11**	0.10*	0.09*	0.07	0.08	0.20***
Cook parent dummy	-0.09**	-0.09**	-0.09*	-0.09*	-0.08**	-0.09**	-0.08**	-0.08**	-0.10***
Butcher parent dummy	-0.01	0.02	0.05	0.03	-0.03	-0.03	-0.03	-0.03	0.06
No. family incomes	0.09**	0.09**	0.08***	0.11***	0.10***	0.10***	0.09***	0.10***	0.07
Mean neighbourhood income (th. €)	0.00	0.00	0.00	-0.11*	0.00	0.00	0.00	0.00	0.00
Mean school meal price	-0.04	-0.03	0.00	-0.02	-0.05*	-0.06*	-0.04	-0.06*	-0.06
Percentage of schoolchildren with free school meals	0.00	0.00	0.00	0.00	-0.01*	-0.01**	-0.01**	-0.01*	-0.02**
No. days eating at school per week	-0.02**	-0.02**	-0.02*	-0.03**	-0.03***	-0.03***	-0.03***	-0.03***	-0.05***
"The eating room is ok" dummy		0.03***							
Associated school unit dummy			0.04	0.03					
Eating room dummy			0.05	0.00					
School garden dummy			0.09**	0.07*	0.06	0.07	0.06	0.07*	-0.02
Comprehensive school dummy			0.07	-0.04					
Service quality level according headteacher			-0.01	-0.02					
Canteen Commission report on catering company's equipment dummy			-0.04						
Canteen Commission report on catering company staff's skill dummy			-0.06						
Canteen Commission report on catering company's service dummy			-0.02						
No. pupils eating at school (hundreds)				-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.03***
Local food educational programmes dummy				-0.02					
Organic food educational programmes dummy				0.04					
Seasonal food educational programmes dummy				0.14***					
Multi-portion dummy				0.04					
60-minute eating time dummy				-0.10***					
No. lunch shifts				0.07**					
Multi-use dishes dummy				-0.01					
Jars dummy				-0.05					
Sale size class					-0.03***				
Distance from the school					0.00	-0.01**	0.00	-0.01	-0.01**
Cook-and-serve catering system dummy					-0.24***	-0.23***			
Company age					0.01***	0.005**			
Neapolitan company dummy					0.02	0.04			
Co. Ltd (Limited liability company) dummy					0.10**	0.09*			
Company meal price						0.17**			
Company share of production cost for materials							0.27		
Company returns on sales							-0.02***		
Company estimated meal production cost								0.18***	
Company percentage of organic on total food									0.01***
Rho	0.83**	0.82**	0.82**	0.81**	0.82**	0.82**	0.82**	0.82**	0.79**
No. observations	2134	2133	1832	2064	2134	2134	2103	2103	979
Log pseudolikelihood	-4900	-4886	-4209	-4650	-4834	-4843	-4776	-4778	-2207
Wald test of indep. eqns.	875	855	744	852	873	892	866	885	308

*** significant at 1% level ** significant at 5% level * significant at 10% level

Male gender is a positive determinant of the satisfaction with the level of school food tastiness, as already evidenced in the literature (Jung *et al.*, 2009).

Table 10

Bivariate ordered probit regression. Dependent variable Level of school food tastiness

Variables	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx
	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>	<i>Model 5</i>	<i>Model 6</i>	<i>Model 7</i>	<i>Model 8</i>	<i>Model 9</i>
Gender dummy	0.03***	0.04***	0.04***	0.04***	0.03**	0.03***	0.03***	0.03***	0.03*
Born in Naples dummy	-0.02	-0.02	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	0.02
Special diet status dummy	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	0.01
Overweight perception dummy	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01
No. brothers/sisters	0.01	0.01	0.01*	0.01	0.01*	0.01*	0.01	0.01	0.01
No. other cohabiting relatives	0.01*	0.01*	0.01*	0.01*	0.01	0.01	0.01	0.01	0.00
Unknown parents' job dummy	0.05*	0.05*	0.05*	0.05**	0.05*	0.05*	0.05*	0.05**	0.00
Mother's job skill level	-0.04***	-0.04***	-0.04***	-0.04***	-0.04***	-0.04***	-0.04***	-0.04***	-0.05***
Father's job skill level	-0.01	-0.01	-0.04	-0.01	-0.01	-0.01	-0.01	-0.01	0.00
Housewife mother dummy	-0.05	-0.05	-0.06	-0.03	-0.05	-0.05	-0.05	-0.05	-0.10
Unemployed father dummy	0.02	0.02	0.04	0.04	0.03	0.02	0.01	0.01	0.09
Cook parent dummy	-0.03	-0.03	-0.03	-0.02	-0.02	-0.03	-0.02	-0.02	-0.03
Butcher parent dummy	-0.09***	-0.08**	-0.09***	-0.07*	-0.10***	-0.10***	-0.10***	-0.10***	-0.03
No. family incomes	0.02	0.02	0.02	0.04*	0.03	0.02	0.03	0.03	-0.02
Mean neighbourhood income (th. €)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mean school meal price	-0.02	-0.01	0.00	-0.01	-0.03	-0.03	-0.02	-0.03	-0.04
Schoolchildren with free school meals	-0.01	0.00	0.00	-0.01	-0.01***	-0.01***	-0.01***	-0.01***	-0.01***
No. days eating at school per week	-0.01	-0.01	-0.01	-0.01*	-0.02**	-0.02**	-0.02**	-0.02*	-0.03***
"I would like tastier food" dummy		-0.03***							
Associated school unit dummy			0.02	0.00					
Eating room dummy			0.07*	0.00					
School garden dummy			0.09***	0.08***	0.06*	0.06*	0.06**	0.06**	-0.01
Comprehensive school dummy			0.05	-0.04					
Food quality level according headteacher			0.00						
Canteen Commission report on catering company's equipment dummy			0.00						
Canteen Commission report on catering company staff's skill dummy			-0.04						
Canteen Commission report on catering company's service dummy			-0.07**						
No. pupils eating at school (hundreds)				-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***
Local food educational programmes dummy				-0.01					
Organic food educational programmes dummy				0.01					
Seasonal food educational programmes dummy				0.13***					
Multi-portion dummy				0.05					
60-minute eating time dummy				-0.08***					
No. lunch shifts				0.03*					
Multi-use dishes dummy				0.15**					
Jars dummy				-0.10***					
Sale size class					-0.02***				
Distance from the school					0.00	-0.01**	0.00	-0.01	-0.01**
Cook-and-serve catering system dummy					-0.16***	-0.15***			
Company age					0.01***	0.004**			
Neapolitan company					0.04	0.04			
Co. Ltd (limited liability company) dummy					0.09**	0.09**			
Company meal price						0.09			
Company share of production cost for materials							0.15		
Company returns on sales							-0.01***		
Company estimated meal production cost								0.11**	
Company percentage of organic on total food									0.01**

*** significant at 1% level ** significant at 5% level * significant at 10% level

As regards satisfaction motivations, “The eating room is ok” and “I would like tastier food” are significant. All the other motivations, reported in Table 4, are not statistically significant whereas “I would like an eating room” is significant alone but not when it is together with “The eating room is ok”.

Among the neighbourhood characteristics, the marginal effect, relative to the variable percentage of schoolchildren with free school meals, is negative and becomes significant

when catering companies' variables are added, particularly for the level of school meal tastiness. A possible explanation is the stigma derived from the eligibility status for free school lunches (Mirtcheva and Lovell, 2009).

The headteachers' evaluations are never significant, probably because they have never tasted school meals while the Canteen Commission report on the catering company's service seems to improve the school meal tastiness.

The presence of seasonal food programmes, associated to the knowledge of seasonal food presence in school meals, impacts both the dependent variables, positively and with high significance, sustaining families which are often ignorant about nutrition (Giacosa *et al.*, 1989). The presence of a school garden also exerts a positive but not robust impact.

Both the dependent variables are influenced negatively by a one-hour meal, which reduces the opportunity to socialize, but positively by the number of lunch shifts (Moore *et al.*, 2010). The use of jugs for water negatively influences the satisfaction with the level of school food tastiness whereas the use of multi-use dishes positively influences it.

The number of pupils eating at school is a negative and highly significant determinant for both the dependant variables. A possible explanation is the adoption of the cook-and-chill catering system in case of a large number of meals instead of the cook-and-hold one.

The impact of the distance between schools and catering companies is negative and significant for both the dependant variables but it appears not robust because it is strongly collinear with company size.

Among the catering system characteristics, the cook-and-serve dummy display a negative and highly significant marginal effect that is stronger for the level of pleasantness of eating at school. Even if similar results have already been found in literature when comparing the self-managed foodservice and the contract-conventional one (Kwon *et al.*, 2005), in the present case, the evidence is not robust since only one school in the sample provided the cook-and-serve foodservice.

Among the catering company characteristics, sales size and return on sales are negative determinants of both the dependent variables whereas company age, the limited liability proprietary structure, the average production cost of a meal and the percentage of organic in total food are positive determinants.

Meal price is a positive and significant determinant of the level of pleasantness of eating at school, supporting the already evidenced trade-off between lower winning price and contract performance in public procurement (Decarolis, 2013).

The results of the present analysis provides empirical evidence on the tendency of large catering firms to adopt predatory pricing strategies in order to win a contract and then offer services of poor quality. The ‘quality-shading hypothesis’ holds particularly if the contractor is a large company because the long-term gain from maintaining reputation is lower and/or the cost of contract resolution is absorbed across a range of other contracts. For small firms, the cost of opportunistic behaviour in terms of reputation loss is higher being their market more locally delimited. Furthermore, the lowering price strategy of large companies can be profitable in case of contracts for delivery of a large number of school meals and when cost is reduced though low-quality material purchase.

7. Concluding remarks

The purpose of this paper was to analyse how much pupils value the characteristics of public school foodservice and investigate the determinants of pupil satisfaction among catering company characteristics, such as turnover and (estimated) meal production cost, after controlling for individual, family, neighbourhood, school and foodservice characteristics.

A sample of 33 primary schools offering foodservice, representing the population with respect to city boroughs and weekly frequency of school meal supply, was extracted for the metropolitan city of Naples. Two questionnaires were distributed: one to school headteachers and the other to 2,210 5th grade pupils.

Pupil satisfaction was summarised by two key variables: the level of school food tastiness and the level of pleasantness of eating at school. The results of the analysis confirm that school plays an important role in more socially deprived contexts since the level of both the dependent variables are higher for pupils with unknown parents’ jobs.

Among the educational activities, programmes on seasonal food and the presence of a school garden are significant in explaining both the level of school food tastiness and the level of pleasantness of eating at school. As regards caterer characteristics, smaller and older companies offer a better quality service. Further, a higher (estimated) average production cost is associated to higher levels of foodservice satisfaction.

The recipe for improving foodservice quality and designing competitive tendering is, as generally suggested by Taylor (2005), that the bidding process be undertaken in two rounds. The first round would reveal possible quality/cost configurations since bidders would be free to make multiple bids. However, after the bids had been submitted, the

contracting authority would publish the details of the prices and specifications without the names of the bidders. In the second round, the top three to five bidders would be invited to submit a new bid or revised bids which could differ in price and nature from their original bid. No new bidders would be allowed to bid in the second round.

Furthermore, the contracting authority should enforce contract terms and exercise the right to monitor the service through annual evaluation of school foodservice. This evaluation has to be performed not by the catering company itself but by external trustworthy third parties including expertise other than that of dietitians whose definition of school food quality does not include tastiness. A target (let us say, more than half) of pupils at least sufficiently satisfied with school foodservice should be required in order to reconsider the catering company for contract continuation and/or for competitive tenders in subsequent years.

Company characteristics, such as a small turnover, could be included among the other elements, such as provision of products from social cooperatives, to which points may be awarded when assessing the bids. Finally, headteachers should taste school meals and food distributed at school, such as fruit and vegetables of the EU School Fruit campaign, since unripe fruit and stale vegetables are unlikely to attract children.

An extension of the present work would require the investigation of other situations to generalize the relationship between the catering company size and the level of pupil foodservice satisfaction.

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