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RESEARCH ARTICLE

The cost of living in early modern cities: a study on eighteenth-century northern Italy

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Abstract
This study estimates the cost of living in three cities – Florence, Bologna and Milan – in eighteenth-century northern Italy. Although they do not allow an understanding of the differences between social groups or seasonal consumption patterns, the calculation of living costs and the implied modelling have a twofold aim. First, they allow the calculation of real wages, which are obtained by dividing nominal wages by the cost of a consumption basket; therefore, broadly, they allow the Italian case to be put into great debates of economic history, such as the one on the Little Divergence between northern and southern Europe at the end of the early modern period. In this regard, we will show that the existing calculations used for this purpose have many criticalities, and we will solve them. Second, determining the cost of consumption baskets allows us to observe the role played by urban public institutions in mediating between the market and consumers, with relevant effects on price trends and, therefore, on the purchasing power of the urban population.

Urban consumption: 'qualitative' and 'quantitative' approaches

In this article, we will estimate the cost of living in urban contexts in eighteenth-century northern Italy with Bologna, Milan and Florence as our main case-studies. To achieve this goal, besides establishing reliable prices for the products consumed, three main issues must be tackled: (i) which products (foodstuffs, but also housing, clothing and warming) and in what quantities should be included in the consumption baskets (CBs); (ii) how to make the CBs adaptable to consumers' behaviours; (iii) how to include the role played by urban public institutions in accessing foodstuffs (especially bread) in the calculation of the CBs' costs. In our reconstruction of living costs in eighteenth-century northern Italian cities, we tried to solve these challenges. The issue of what urban inhabitants consumed and the costs that they bore to sustain their livelihoods is crucial in many debates between economic and early modern historians; however, our understanding of what quantity of products were consumed (especially in terms of foodstuffs) in early modern cities, and at what price across time

Full colour versions of the figures can be viewed in the online version.

and space, remains an open question. The main problem lies with a lack of dialogue between historical research aimed at qualitatively reconstructing consumption patterns and structures and scholars fascinated by the 'new economic history', proposing long-run data series and models.[1]

Several books and articles have analysed how citizens accessed their daily foodstuffs (especially wheat bread, given its importance in the early modern diet), both in terms of market structures and the role played by public institutions in guaranteeing the supply of products.[2] For a long time, the two protagonists (the market and the public institutions) that were more or less directly in charge of the survival of the 'fragile monsters'[3] that were the urban agglomerations have been considered as separate – if not opposing – forces. Nonetheless, contemporary historians have investigated how they contributed to the shaping of the urban 'victualling systems'. As Clerici has argued, this term should be understood to include 'an organised set of public and private channels, evolved typically in urban contexts, for the procurement, storage, and distribution of goods essential for the daily life of common people ("victuals" – not necessarily only foodstuffs)'.[4] We also include in this definition the *Annone*, that is, the public offices that existed mainly in the Mediterranean area. In various ways, depending on the specific city and its context, the public offices managed the purchase, distribution and pricing of foodstuffs. The supply of meat, bread, wine and minor cereals, in the requisite amounts and at the 'right' price, has been one of the primary responsibilities of governors for centuries, from Ancient Egypt to more recent times, because of the need to guarantee social and political stability.[5] In this article, we will observe more closely how this actually happened in the three cities considered in our study, and the effects on the population's purchasing power. The role of the *Annone* in early modern societies has been analysed in a number of studies.[6] Indeed, the complex relationship between citizens and food has not been overlooked in historiography,[7] and numerous attempts have been made to characterize and quantify food consumption in urban areas. Documents preserved in hospital archives and charitable institutions – providing a detailed description of the foodstuffs supplied to their employees, patients or guests – have been used for this purpose.[8] Fewer researchers,

[1]P. Temin, 'Economic history and economic development: new economic history in retrospect and prospect', *National Bureau of Economic Research Working Paper Series*, 20107 (May 2014).

[2]An emblematic example is the well-known S.L. Kaplan, *Provisioning Paris. Merchants and the Millers in the Grain and Flour Trade during the Eighteenth Century* (London, 1984).

[3]B. Marin and C. Virlouvet, 'Introduction', in B. Marin and C. Virlouvet (eds.), *Nourrir les cités de Méditerranée. Antiquité – temps modernes* (Paris, 2003), 13–29, at 13.

[4]L. Clerici, 'Italian victualling systems in the early modern age: an overview and a critical assessment', in L. Clerici (ed.), *Italian Victualling Systems in the Early Modern Age, 16th to 18th Century* (London, 2021), 3–38, at 4.

[5]Marin and Virlouvet, 'Introduction', 19.

[6]See for example R.P. Corritore (ed.), 'Un problema negletto. Per un riesame della questione annonaria nelle città di antico regime', Special Issue of *Storia Urbana*, 134 (2012).

[7]On the contrary, it has been for example at the centre of the biennial conference of the Italian Association of Urban History, held in Padua in 2015, and resulted in the book G.L. Fontana (ed.), *Food and the City. Il cibo e la città* (Venice, 2017).

[8]See for example the Special Issue of *Food & History*, 4 (2016), on 'Food and hospitals: from 9th-century Baghdad to 20th-century Sochi', or for the Italian case many of the essays included in the three volumes of the *Gli archivi per la storia dell'alimentazione. Atti del convegno Potenza-Matera, 5–8 Settembre 1988* (Rome,

however, have focused on the components of urban CBs other than food, such as house rents,[9] textiles and wood consumption.[10] These costs have rarely been investigated, and those studies that do so focus on the upper classes. In addition, a common trait of this diverse list of sources is the lack of quantitative analysis: it is well known *which* kind of products were consumed and *how* they reached the urban dining table, but the literature discussed above provides only a few sporadic figures relating to the amounts consumed (particularly at the individual/household level), the related aggregated prices and especially how these changed across time and space.

More information can be gleaned by browsing through the 'quantitative' research, notably within the last two decades. Several economic historians have investigated CBs in medieval and early modern cities, estimating the number of calories inhabitants would have needed to survive while performing labour-intensive tasks in the context of low mechanization. Scholars have typically addressed this intricate puzzle by proposing a certain caloric intake per person per day (roughly 2,000–2,500 calories) and listing the fixed quantities of bread, wine, beer (for southern and northern Europe, respectively), legumes, meat, cheese and eggs needed to provide the proposed daily caloric intake. A fixed quantity of textiles and wood completes the basket, ensuring the survival of medieval–early modern urban families. This functional method allows for the calculation of the cost of living for extended periods, helping to estimate real wages. Robert C. Allen[11] used this methodology to identify divergence in European wages and prices, arguing that the English high-wage economy laid the foundation for the industrial revolution and north European economic growth.[12] In the same article, Allen proposed the so-called bread equation, which has been used by several historians to calculate the price of urban bread based on the price of wheat added to production costs.

The debate on how best to calculate CBs has recently been revived, critiquing some aspects of Allen's approach. David González Agudo, for example, emphasized the incompleteness and static character of Allen's CB; in González Agudo's CB, house rent increased from 5 per cent to approximately 10–15 per cent of Allen's CB cost.[13] Moreover, diversified baskets were proposed for the periods 1521–50, 1551–1600 and 1601–50 to assess the changes in consumption patterns, that is, the increasing consumption of wheat and wine. In 2021, Ernesto López Losa and Santiago Piquero Zarauz proposed a new dataset of prices and wages for Spain, substituting wheat bread with brown bread, with consequences in terms of the

1995), and G. Ongaro, 'I consumi alimentari negli ospedali di antico regime: il caso di Bologna nel XVIII secolo', in M. Morandotti and M. Savorra (eds.), *La città e la cura. Spazi, istituzioni, strategie, memoria / The City and Healthcare. Spaces, Institutions, Strategies, Memory* (Turin, 2021), 104–18.

[9]See for example M. Barbot, *Le architetture della vita quotidiana. Pratiche abitative e scambi immobiliari nella Milano d'età moderna* (Venice, 2008).

[10]The topic is at the centre of a forthcoming book edited by Bruno Blondé, Wouter Ryckbosch and Wout Saelens, *Energy in the Early Modern Home* (Routledge).

[11]R.C. Allen, 'The Great Divergence in European wages and prices from the Middle Ages to the First World War', *Explorations in Economic History*, 38 (2001), 411–47.

[12]S.N. Broadberry, 'Accounting for the Great Divergence', *LSE Economic History Working Papers*, 184 (2013).

[13]D. González Agudo, 'Prices in Toledo (Spain): sixteenth and seventeenth centuries', *Social Science History*, 43 (2019), 269–95.

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chronology of the Little Divergence between Spain and north-western Europe.[14] Similarly, Sara Horrell recalculated the English consumer price index (CPI), identifying eight different CBs between 1260 and 1869 to grasp the shifts in consumption patterns over time.[15]

These examples reveal that one of the fundamental drawbacks of Allen's model is its inadequacy in analysing shifts in consumer behaviour. The assessment of consumer choices and their standardization into a statistical formula can be equally problematic. For example, Luis Felipe Zegarra[16] and Paolo Malanima[17] in Italy proposed models to calculate how a consumer can obtain the necessary nutrients most inexpensively, according to price trends. However, it is unlikely that a consumer in the early modern period was aware that his/her daily diet should include '2,442 calories, 48 g of proteins, 33 g of fat, 19 mg of iron, 1.2 mg of thiamine, 15 mg NE of niacin, 0.7 μg of vitamin B12, 176 μg of folate, and 41 mg of vitamin C'.[18] First, early modern dietetics completely ignored these elements because they tended to rely on other drivers.[19] Second, consumers' food choices are undoubtedly shaped by local culinary traditions, the availability of products and an attempt to save money. For example, for centuries – at least from the eighteenth to the twentieth century – in the countryside of northern Italy, peasants nourished themselves almost exclusively with maize *polenta*, developing a severe avitaminosis called pellagra.[20] Before clinical dietetics, nutrient juices, a combination of macronutrients, micronutrients and energy intake, were highly valued and sought after.[21] Contemporaries were particularly aware of the energy content of food, even if it was not yet possible to measure it. Digestibility was sought after by affluent consumers due to their comfortable lifestyle, while 'heavier', less easily digested food was seen as an advantage by labourers, especially peasants. Therefore, the problem of including consumer behaviours in the models remains.

In summary, 'qualitative' research lacks the 'quantitative' element useful for working out long-term models of urban consumption or for calculating the value of real wages and thereby contribute to the 'great' debates of economic history. However, scholars who tried to create data series including the foodstuffs

[14]E. López Losa and S. Piquero Zarauz, 'Spanish subsistence wages and the Little Divergence in Europe, 1500–1800', *European Review of Economic History*, 25 (2021), 59–84.

[15]S. Horrell, 'Household consumption patterns and the consumer price index, England, 1260–1869', *Economic History Review*, published online on 9 Jan. 2023, 1–28.

[16]L.F. Zegarra, 'Living costs and welfare ratios in Western Europe: new estimates using a linear programming model', *European Review of Economic History*, 26 (2022), 38–61.

[17]P. Malanima, 'Cibo e povertà nell'Italia del Sette e Ottocento', *RiSES. Ricerche di Storia Economica e Sociale (Journal of Economic and Social History)*, 1 (2015), 15–39.

[18]Zegarra, 'Living costs and welfare ratios in Western Europe', 42.

[19]Traditional dietetics were only replaced by modern insights during the nineteenth century: for a broad view on its structure and *tenets*, see K. Albala, *Eating Right in the Renaissance* (Berkeley, 2002).

[20]L. Mocarelli and A. Panjek (eds.), *Maize for the People. Cultivation, Consumption and Trade in the North-Eastern Mediterranean (16th–20th centuries)* (Koper, 2020).

[21]'Good juices', that is, nutrient juices, were a traditional commonplace in the early modern medical literature: such occurrences can be easily spotted in the dietetic handbooks of the time, such as J. Bruyerin-Champier, *De re cibaria* (Lugduni, 1560); C. Durante, *Il tesoro della sanità. Nel qual si insegna il modo di coservar la sanità e prolungar la vita, et si tratta della natura dei cibi et de' rimedii et nocumenti loro* (Venice, 1596); they are still occurrent in later manuals such as *Gli aforismi di Ippocrate illustrati dagli aforismi dei medici più illustri* (Naples, 1852).

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consumed by the inhabitants of specific cities often disregarded food historians' achievements in terms of understanding the main components of early modern diets and the way people accessed their daily food ratio, with implications for prices. Certainly, some studies have attempted to reconcile the two perspectives, such as the publications by González Agudo, López Losa and Piquero Zarauz for Spain mentioned above, proposing geographically and chronologically diversified CBs, according to dietary patterns. Another example is Mauro Rota and Jacob Weisdorf's research on real wages in Rome, where they replace Allen's 'bread equation' with the bread prices settled by the public *Annona* – however, like him, they endorse the idea that people consumed fixed amounts of bread every year for centuries.[22]

This article will combine these approaches (the 'qualitative' and 'quantitative' ones) with respect to northern Italy: we will move from the existing CBs, addressing their shortcomings in the light of local dietary patterns and in view of the 'victualling systems' in Florence, Bologna and Milan. These cities were chosen owing to the following factors. First, prices of the products included in the CBs for Florence and Milan have been published, and in Bologna, a considerable number of archival documents are available to build up a similar price series;[23] therefore, *in practice*, it is possible to set up a comparison. Second, the three cities represent different urban contexts: they belonged to different states (the Duchy of Milan, the Grand Duchy of Tuscany and the Papal States) with similar, but not identical, food trade regulations and local rules on food distribution and price fixing. Third, they were different sizes: Milan was one of the main cities in northern Italy at the time, with 109,000 inhabitants in 1700; Florence can be considered a medium-sized urban centre, with a population between 72,000 and 80,000 inhabitants in the period 1700–1800; Bologna in the same period was a medium-sized city with approximately 63,000 inhabitants.[24] Finally, the three cities had different victualling institutions, as discussed below. Because of their differences and representativeness, a comparison of these three urban settings allows us to ascertain whether the cost of CBs changed in different contexts.

Besides showing the importance of adapting CBs to specific urban contexts, the study provides more reliable baskets and, notably, cost trends. Moreover, the dynamics of the costs themselves allow us to observe the effects of the intervention of the *Annone* in urban food supply mechanisms and, fundamentally, in affecting the purchasing power of the larger strata of the urban population. In other words, reconciling the two approaches (the 'qualitative' and the 'quantitative' ones) will benefit both, producing a more reliable 'quantitative' analysis, and showing the tangible effects over the long run of the mechanisms covered by the 'qualitative' research.

[22]M. Rota and J. Weisdorf, 'Italy and the Little Divergence in wages and prices: new data, new results', *Journal of Economic History*, 80 (2020), 931–60.

[23]Price series in Bologna are caclulated from the average of the selling prices of the foodstuffs and wood reported in the accounting books of noble families and charitable institutions. See the online Appendix A for further information about the data and for the complete price series. In the same Appendix there are also the bibliographical references for the published prices in Milan and Florence.

[24]P. Malanima, 'Italian cities 1300–1800. A quantitative approach', *Rivista di Storia Economica*, 2 (1998), 91–126, at 111–12.

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Italian urban CBs: the construction of new data series

Paolo Malanima determined the value of the CBs for the Italian Peninsula more than once.[25] Using Allen's 'bread equation',[26] Malanima proposes a CB for central-northern Italy (Table 1), allowing consumers to consume approximately 2,600 kcal daily.

Beyond the shortcomings outlined below, Malanima's CB rightly highlights the importance of bread (50.62 per cent) in the Mediterranean area. Mauro Rota and Jacob Weisdorf did the same when proposing a CB for the city of Rome (Table 2), much like Allen's CB, but they excluded linen and rounded the rent allowance to 5 per cent.[27]

Table 1. Malanima's CB for central-northern Italy (1300–1850)

	Quantity per year	Kcal/unit	Kcal/day
Food			
Bread	200 kg	2,400	1,315.1
Rye	130 l	2,200	783.6
Meat	15 kg	2,000	82.2
Eggs	40 unit	60	6.6
Olive oil	5 kg	9,000	123.3
Wine	150 l	700	287.7
	Total kcal	*Food*	2,598
Non-food			
Firewood		3,000	3,000

Source: Malanima, 'When did England overtake Italy?', 50.

Table 2. Rota–Weisdorf's CB for Rome (1540–1820)

	Amount	Unit	Calories/day
Food			
Bread	234	kg	1,571
Meat	26	kg	178
Oil	6.2	litres	139
Wine	76	litres	177
Cheese	5.2	kg	54
Eggs	52	pieces	11
Beans	52	litres	369
Total calories			2,500
	Amount	Unit	Mill. BTU/year
Non-food			
Firewood	168	kg	2

Source: Rota and Weisdorf, 'Italy and the Little Divergence', 948.

[25]P. Malanima, 'Measuring the Italian economy, 1300–1861', *Rivista di storia economica*, 3 (2003), 247–64; *idem*, 'An age of decline: product and income in eighteenth–nineteenth century Italy', *Rivista di storia economica*, 1 (2006), 91–134; *idem*, 'I consumi in età moderna. Crescita o declino?', in E. Sori and R. Giulianelli (eds.), *Consumi e dinamiche economiche in età moderna e contemporanea* (Naples, 2011), 43–68; *idem*, 'When did England overtake Italy? Medieval and early modern divergence in prices and wages', *European Review of Economic History*, 17 (2013), 45–70; *idem*, 'Cibo e povertà'.

[26]Allen, 'The Great Divergence in European wages and prices'.

[27]Rota and Weisdorf, 'Italy and the Little Divergence'.

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Table 3. Consumption of foodstuffs in urban Bologna (yearly average, 1787–96)

Product	Unit	Amount	Percentage
Wheat	Tons	11,850	68.5
Minor cereals and legumes	Tons	2,060	12
Meat	Tons	2,429	14
Fish	Tons	471	2.5
Olive oil	Tons	490	3

Source: Guenzi, 'Consumi alimentari e popolazione a Bologna', 333-44, at 336.

Compared to Malanima's basket, the Rota–Weisdorf CB removed the consumption of minor cereals (rye in Malanima's CB) because it was almost absent in the urban environment. For example, in Alberto Guenzi's calculation of the average yearly food consumption for Bologna between 1787 and 1796 (Table 3), only 2,060 tons of minor cereals and legumes were consumed by approximately 67,000 inhabitants (30–5 kg/person). Moreover, in a source dated 1666 these products were not listed among the foodstuffs consumed in the city.[28]

Recent studies confirm that minor cereals were used almost exclusively for animal nutrition (pigeons, chickens, pigs, etc.) within city walls,[29] while legumes were crucial for humans. Therefore, Allen's/Rota–Weisdorf's CB was considered to be the most reliable.

In addition to the differences between the two urban CBs – and related CPIs – proposed to date for the Italian area, both contain similar biases. First, they underestimate wine consumption in early modern cities; second, they refer to bread consumption as if consumers purchased the same quantity daily (thereby obtaining a fixed number of calories), neglecting the role of public food institutions. We will try to address these biases by amending the volume of wine consumed and reassessing how bread consumption should be calculated, considering the intervention of *Annone* in regulating its sale.

We will begin with the Allen/Rota–Weisdorf CB (the most reliable), rebalancing its elements to increase the importance of wine in the supply of calories; thereafter, in this new 'static' CB, we will add the 'institutional' factor in bread purchasing. A change in the evaluation of bread and wine consumption could affect the level and characteristics (in terms of volatility) of CBs' costs, given that in Malanima's and Allen/Rota–Weisdorf's CBs, where wine consumption is underestimated, these two products alone supplied approximately 60–70 per cent of the daily caloric intake.

The civilization of bread and wine

According to Massimo Montanari, when Christianity took hold in the fourth century, the Roman Church chose bread and wine 'as the holy foods by definition, image and instrument of the eucharistic miracle'.[30] This is because of the dietary tradition of the Mediterranean area, where olive oil, bread and wine play a major role in everyday meals. If wine was equally important in the Mediterranean urban diet of the early

[28]L. Dal Pane, *Economia e società a Bologna nell'età del Risorgimento* (Bologna, 1999), 40.
[29]Ongaro, 'I consumi alimentari negli ospedali di antico regime'.
[30]M. Montanari, *La fame e l'abbondanza. Storia dell'alimentazione in Europa* (Rome and Bari, 2019), 24.

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modern period,[31] it is unlikely that its consumption supplied only 7 per cent (Allen/Rota–Weisdorf) or 11 per cent (Malanima) of daily calories, almost the same caloric intake as meat which was consumed far less.[32] The figures assumed by Malanima, Allen and Rota–Weisdorf entail a daily consumption of 0.2–0.4 litres of wine per person, and that explains the low caloric supply. However, contemporary sources show that wine consumption was high in Italian cities. Malanima himself quoted a survey that referred to the city of Florence at the end of the sixteenth century and which stated 0.5 litres as the per capita daily wine consumption.[33] He asserted that, until the eighteenth century, the energy supply from wine consumption was higher than the energy intake from grain consumption; the average consumption roughly corresponded to 1 litre per person per day.[34] The average was calculated including children and women, implying that most men consumed more than 1 litre per day even if, according to Malanima, in the second half of the eighteenth century, daily wine consumption decreased to around 0.5 litres per person, the same as it was two centuries before.

If these figures are conflicting, other sources confirm the significance of wine consumption in early modern cities and suggest higher estimates. According to Donatella Balani, in Turin in the sixteenth and seventeenth centuries, the average consumption was 1.35 litres per person per day – an average confirmed also in 1746 – without any age or gender distinction.[35] Moving to Milan, Stefano Levati confirmed that at the end of the eighteenth century, 1.24 litres was a reliable – and default – estimation of the daily consumption of an adult male.[36] A fiscal source in 1730s Venice, which, because of its nature, almost certainly underestimates the figures, stated that boys less than 18 years old and women consumed 0.67 litres of wine daily; adult males between 18 and 50 years old consumed 1.34 litres daily; and the elderly consumed 1.79 litres daily.[37] Other estimates exceeding 1 litre per day were quoted by Rod Phillips.[38] Furthermore, referring to sixteenth-century Tuscan galleys, Jean-Jacques Hémardinquer suggested 1.14 litres of watered wine (1/4 of water) was consumed daily by the sailors, or 0.8 litres of pure wine.[39] Finally, Robert C. Davis devoted an entire article to the analysis of wine consumption in the Arsenal of Venice,[40] basically confirming our assertions: already in the seventeenth century, the

[31]R. Phillips *A Short History of Wine* (New York, 2000), 202–6.

[32]F. Braudel, *Civilization and Capitalism, 15th–18th Century*, vol. I: *The Structure of Everyday Life* (Berkeley and Los Angeles, 1992), 194–9; Montanari, *La fame e l'abbondanza*, 94–8; M.A. Visceglia, 'I consumi in Italia in età moderna', in R. Romano (ed.), *Storia dell'economia italiana*, vol. II: *L'età moderna: verso la crisi* (Turin, 1991) 211–41, at 218–20.

[33]P. Malanima, *La fine del primato. Crisi e riconversione nell'Italia del Seicento* (Milan, 1998), 30.

[34]P. Malanima, *L'economia italiana. Dalla crescita medievale alla crescita moderna* (Bologna, 2002), 248.

[35]D. Balani, 'Il commercio del vino nella Torino Sei-Settecentesca', in R. Comba (ed.), *Vigne e vini nel Piemonte moderno* (Cuneo, 1992), 439–59, at 454.

[36]S. Levati, 'Il commercio del vino tra Milano e il Piemonte nella seconda metà del XVIII secolo', in Comba (ed.), *Vigne e vini*, 491–505, at 494 and 502.

[37]S. Levati, 'Vino, osti e osterie nell'Italia centro-settentrionale tra XVIII e XIX secolo', in M. Cavallera, S.A. Conca Messina and B.A. Raviola (eds.), *Le vie del cibo. Italia settentrionale (secc. XVI–XX)* (Rome, 2019), 235–47, at 237–9.

[38]R. Phillips, *Alcohol: A History* (Chapel Hill, 2014), 153–84.

[39]J. Hémardinquer, 'Sur les galères de Toscane au XVI^{e} siècle', in J. Hémardinquer (ed.), *Pour une histoire de l'alimentation* (Paris, 1970), 85–92, at 86.

[40]R.C. Davis, 'Venetian shipbuilders and the fountain of wine', *Past & Present*, 156 (1997), 55–86.

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Venetian shipbuilders received more than 2 litres of *bevanda* (two parts of water and one of wine) per day, that is, around 0.8 litres of pure wine. Over the course of the eighteenth century, the figures increased markedly, reaching more than 3 litres of *bevanda* per day, that is, around 1 litre of pure wine.[41] Considering all this information, we believe it is plausible to estimate the daily consumption of 1 litre of wine per day.

In summary, wine consumption was higher than that estimated by Allen, Malanima and Rota–Weisdorf. According to Massimo Livi Bacci, the cost-to-calorie ratio was the most affordable for wine, slightly lower than for wheat and beans, up to five times lower than for meat, four times lower than for cheese and six times lower than for eggs.[42] In addition, the wines consumed in the early modern period were not as strong as those consumed today. According to Malanima's CB, 1 litre of wine should have supplied 700 kcal, which corresponds to an alcohol content of 12.5 per cent; in Allen's and Rota–Weisdorf's CBs, wine supplies 850 kcal/litre, entailing an alcohol content of 15.5 per cent.[43] These values overestimate the strength of wine; by contrast, Livi Bacci suggests a caloric value of approximately 315 kcal/litre, which implies an alcohol content of 5.5 per cent – a figure that is probably too low.[44] Early modern wine was almost entirely consumed in one year, and subsequently was defined as being almost vinegar, which implies a very short shelf life, that is, an alcohol content of at least 9–10 per cent. Therefore, in our CBs, we hypothesize a 10 per cent alcohol content and, consequently, around 550 kcal per litre, and, as anticipated, a consumption of 1 litre per day (22 per cent of the daily calories).

This estimated alcohol content is confirmed by Davis' research on the Venetian Arsenal, which found that the Venetian shipbuilders were supplied by the Serenissima with *bevanda*, which comprised two parts water because it was made with southern wine coming from the southern Adriatic coast, Spanish Puglia and even the Greek islands. Because of its origin, this kind of wine was quite strong – to quote Davis, 'sometimes far above 12 per cent' of alcohol content – and, therefore, it was diluted to reach 4.5–5.5 per cent of alcohol content.[45] If the *Arsenalotti*, given the importance of their role in the functioning of the Venetian military and trading structure, benefited from this 'aromatic wine…of the fragrant, perfuming kind', the ordinary people (in Venice but also in Bologna, Milan and Florence, as sources attest) drank local wines, that were lighter compared to the southern ones because of the lower sugar content and could be diluted with water at the ratio 1:1 in order to reach the same alcohol content (around 5 per cent) of the *bevanda*.[46] This confirms that the

[41] *Ibid.*, 78.

[42] M. Livi Bacci, *Popolazione e alimentazione: saggio sulla storia demografica europea* (Bologna, 1987), 134–5.

[43] Calories can be deduced from alcohol content: alcohol contains approximately 7 calories/gram, and weight 0.79 grams/litre. Alcohol content is expressed in volumetric percentage; therefore, for example, 15.5 per cent alcohol content means 155 mg alcohol, to be multiplied per 0.79 grams (to observe the caloric supply of 1 litre), then to be multiplied per 7 calories. The formula is: Cal. = (mg. alcohol*0.79)*7.

[44] Livi Bacci, *Popolazione e alimentazione*, 134.

[45] Davis, 'Venetian shipbuilders', 62. The importance of the differences in the alcohol content of the beverages that are included in the consumption basket has been stressed also by Craig Muldrew, referring to the beer consumed in the early modern English countryside (C. Muldrew, *Food, Energy and the Creation of Industriousness. Work and Material Culture in Agrarian England, 1550–1780* (Cambridge, 2011), 65–83.

[46] Davis, 'Venetian shipbuilders', 61, 63 (n. 24), 71.

alcohol content of pure wine was approximately 10 per cent in the local wines consumed in our three case-studies, especially by the lower strata of the population, which could not afford imported wines.

Another point that needs to be clarified is whether early modern citizens consumed pure wine or half wine (the so-called *vinello*), that is, wine mixed with water. The caloric intake and the quantity (and cost) of wine consumed change depending on whether we assume the daily consumption of 1 litre of pure or half wine. The available literature explicitly suggests that consumption of *vinello* predominated in the countryside;[47] however, it is difficult to trace urban habits, even if archival documents suggest that pure wine was the most widely consumed, at least in Bologna.[48] However, the costs of the CBs are not significantly different, regardless of whether they include pure wine or half wine.

In summary, we worked out new urban CBs for Milan, Bologna and Florence (supplementary material: Appendixes B and C), using the Rota–Weisdorf CB as the basis, increasing wine consumption to 365 litres per year (assuming solely pure wine) and to 182.5 litres per year (assuming watered wine). To do this, while maintaining a total daily supply of approximately 2,500 kcal, we modified other products according to their weight in the Rota–Weisdorf CB: in addition to wine, bread supplied 67.7 per cent of the remaining calories, meat 7.7 per cent, olive oil 5.9 per cent, cheese 2.3 per cent, eggs 0.5 per cent and beans 15.9 per cent. This implies that if wine supplied 550 calories per day or 275 calories per day, bread should have supplied, respectively, 1,319.32 and 1,505.37 calories per day, meat 149.48 and 170.56 calories per day, olive oil 116.73 and 133.19 calories per day, cheese 45.35 and 51.74 calories per day, eggs 9.24 and 10.54 calories per day and beans 309.88 and 353.6 calories per day. When we review the resulting costs of CBs in Bologna, Milan and Florence (Figure 1), three features stand out: first, the different levels of cost in different Italian cities. For Bologna, the averages for the CBs, including pure wine and half wine, are,

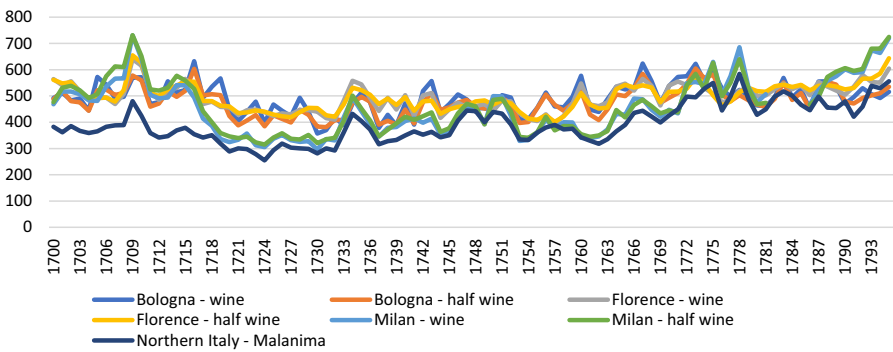

Figure 1. Yearly cost of the CBs (silver grams).
Sources: For Bologna, Milan and Florence, see supplementary material: Appendix B. For northern Italy, see Malanima, 'When did England overtake Italy?', 68–70.

[47]P. Malanima, *Il lusso dei contadini: consume e industrie nelle campagne toscane del Sei et Settecento* (Bologna, 1990), 138; G. Federico and P. Martinelli, 'Italy to 1938', in K. Anderson and V. Pinilla (eds.), *Wine Globalization: A New Comparative History* (Cambridge, 2018), 130–52, at 138–9.

[48]Ongaro, 'I consumi alimentari negli ospedali di antico regime'.

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respectively, 492.2 and 478.6 silver grams per year; in Florence, 495.7 and 496.6 silver grams per year; and in Milan 455.8 and 463.3 silver grams per year. Second, the costs of CBs, including pure wine and half wine, are similar: slightly higher in Bologna, almost identical in Florence and slightly lower in Milan. We can assume that, in this case, if CBs include fixed quantities of products, the choice of whether to consume pure wine or half wine did not significantly affect the cost for consumers. Third, the costs of all the CBs are higher than Malanima's, but they show similar trends: in Bologna the pure wine CB and half wine CB are approximately 20 per cent and 17 per cent more expensive, respectively; Milanese CBs are 13 per cent and 15 per cent more expensive; and Florentine CBs are approximately 20 per cent more expensive.

Although these CBs reflect increasing wine consumption, we are still dealing with 'static' CBs, which assumes that for a century, citizens obtained their daily calories from fixed quantities of products: as anticipated, this is unlikely. The reason, in our view, does not lie in the ability of urban consumers to evaluate the best and most economical way to obtain all their nutrients, as proposed by Zegarra[49] and Malanima.[50] This would imply that consumers were aware of all the calories, vitamins, proteins and so on they needed for their everyday life, in addition to being aware of the quantities of these nutrients in every foodstuff; however, this is hard to believe.

In our opinion, the daily patterns of urban diet – that is, the quantities of products consumed – were strongly affected by consumption habits. In other words, the awareness of the low cost of bread, wine and, to a certain extent, beans and olive oil in terms of the caloric intake shaped the consumption habits in Italian cities across centuries, relegating other foodstuffs (eggs, meat and cheese) to a minor role. Therefore, even if the *quantity* of each product that was consumed may have varied according to price trends and product availability, and, as we will argue below, because of the intervention of the public authorities, the *ratio* remained the same. Unlike most literature on living standards, we cannot neglect the role of urban public institutions in affecting citizens' diets.

The urban victualling systems and the 'dynamic' CBs

During the early modern period, in the Italian Peninsula and other areas of Europe, such as the Low Countries,[51] London,[52] Gdańsk, Cracow, Warsaw, Frankfurt, Geneva and Barcelona,[53] the relationship between urban consumers and the supply of foodstuffs (especially wheat and bread) was integrated into a complex system, in which market dynamics and public intervention interacted.[54] The role of public institutions was to ensure the supply of products at reasonable prices to urban inhabitants while safeguarding the interests of producers.[55] It was a difficult task, and victualling systems therefore evolved over time according to the specific geographical, social, institutional and economic contexts. Despite obvious differences, the various forms of public intervention share some common traits: the mediation

[49]Zegarra, 'Living costs and welfare ratios in Western Europe'.
[50]Malanima, 'Cibo e povertà'.
[51]J. de Vries, *The Price of Bread. Regulating the Market in the Dutch Republic* (Cambridge, 2019).
[52]Braudel, *Civilization and Capitalism*, 139.
[53]W. Kula, *Measures and Men* (Princeton, 1986), 73–8.
[54]Clerici, 'Italian victualling systems', 4.
[55]*Ibid.*, 8.

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between the diverse interests represented by consumers and producers and the crucial role in supplying products to the lower strata of the urban population. While landowners derived foodstuffs directly from their properties and were able to grind wheat and bake bread on their own estates, the labouring classes depended on wages in-kind, urban butcher shops, agricultural commodity markets and bakers to feed themselves and their families. Therefore, to evaluate the cost of CBs, the purchasing power of an average worker, and, more broadly, the evolution of living standards in cities, we need to consider how markets functioned within city walls, the role played by public institutions and the factors determining the level of prices.

As mentioned above, a large body of literature covers how public institutions responsible for victualling functioned in the region of Italy, focusing specifically on the *Annone* in pre-unification Italian cities.[56] Leaving aside the complex functioning of these institutions, the wide range of products they controlled and the specific features of their evolution across the Peninsula, we focus here on their role in the supply of bread to the population. The first element worth highlighting is the pervasiveness of public control over the entire bread supply chain: from the introduction of wheat within city walls to the control of the price at which wheat was sold (setting a 'fair' maximum price according to recorded market transactions), including control of the quality of bread and setting the weight of the loaf. For the purpose of this study, this last point is particularly important: indeed, throughout almost all of the Peninsula, there was constant mediation between 'the interest of the consumers (abundant and cheap supply), bakers (good earnings), landowners (lucrative sale of the produce) and public authorities (social peace and good fiscal revenues)'.[57] Public officials registered the wheat prices weekly, and based on the wheat price and the assessment of the fixed costs that the bakers bore for bread production, they fixed the weight of the loaves of bread to be sold at a set price. Given that the weight of the loaf remained unchanged within specific wheat price ranges, it changed only a few times throughout the year. This strategy had numerous advantages: first, it guaranteed, at least theoretically, reasonable earnings for the bakers despite variable market conditions; second, the weight of the loaves never increased or decreased too much, ensuring an adequate amount of bread for the urban consumer; and third, the fact that the price of bread remained stable safeguarded the purchasing power of consumers, creating the idea (even if, to some extent, an illusory one) of impressive price stability, even in years of critical market conditions.

In a few cases, the system was more complicated. For example, in Venice, bakers and consumers collected 'debits' and 'credits' from public authorities according to dynamic market conditions to avoid excessive fluctuations in bread weight. For example, in years of high wheat prices, bakers experienced a decrease in earnings (the 'credit') in order to maintain the bread weight at a reasonable level (i.e. the 'debit' of consumers). Therefore, when the price of wheat decreased, bread weight was artificially kept slightly low so that bakers could recover their 'credit', while consumers repaid their 'debit'.[58]

Focusing on Bologna, Milan and Florence, it is worth noting the significance of public control on bread production and, notably, loaf weight. Guenzi has examined

[56]Corritore (ed.), *Un problema negletto*; Clerici (ed.), *Italian Victualling Systems.*

[57]Clerici, 'Italian victualling systems', 20–1.

[58]I. Mattozzi, F. Bolelli, C. Chiasera and D. Sabbioni, 'Il politico e il pane a Venezia (1570–1650): calmieri e governo della sussistenza', *Società e Storia*, 20 (1983), 271–303.

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the functioning of the victualling system in Bologna in depth, and specifically the role of public institutions in controlling wheat prices and bread weights.[59] Roughly stated, Bologna – unlike other areas of the Italian Peninsula – did not have a stable public institution for managing the public stockpiles of wheat. The local *Assunteria di Abbondanza* (literally, 'abundance office') was established only when wheat supply from the countryside was scarce, meaning that public authorities had to purchase it from other areas of the Papal States or abroad. Despite this peculiarity, Bologna's public control over wheat prices and bread production was probably the most pervasive. In Milan, Florence or, for example, Ferrara, public authorities simply registered the market price of wheat and fixed the 'right' maximum price every week; in Bologna, the *calmiere* (fixed price) of wheat directly interfered with the process of price formation, being an instrument to assure landowners' income. The *calmiere* was calculated to guarantee the competitiveness of local wheat based on the price of wheat in bordering provinces and transportation costs. The set price would be raised to attract stocks from bordering areas only when the wheat supplied to the city by landowners had all been sold.[60] The weight of bread underwent a similar control: the weight of one loaf of *pane da scaffa* (i.e. 'commercial' bread) priced at two *bolognini* (around 0.54 silver grams on average in the period 1700–97) varied according to a chart that linked the price of wheat to the corresponding weight of bread. The table was based on the bakers' costs, such as flour, taxes, firewood and workers' wages, and strict control was implemented to ensure that the bread was sold at a fixed weight and quality.[61]

In Milan, the *Tribunale di Provvisione* (involving the *Vicario* and the *XII di Provvisione*) and the *Giudice alle Vettovaglie* controlled wheat price and bread weight.[62] While the *Giudice alle Vettovaglie* supervised bakeries, monitored legal compliance and performed a judicial role, the *Tribunale di Provvisione* recorded wheat prices in the *Broletto* market and set the maximum wheat price.[63] The set wheat price was crucial to setting, in its turn, the *weight* of the *pane da soldo* (priced at one *soldo*) and the *price* of the *pane da staio* (the bread sold by weight). The evidence from numerous trials involving Milanese bakers relating to the cost of the two kinds of bread,[64] suggests that the two *calmieri* (setting weights and prices) had parallel levels and trends in order to prevent consumers from purchasing solely the *pane da soldo* or the *pane da staio*. Moreover, these documents confirm that the medium-lower strata of the population purchased mainly *pane da soldo*, the one sold for a fixed price, whose weight was stipulated by the *Tribunale di Provvisione*. During the

[59]A. Guenzi, 'Il "calmiero del formento": controllo del prezzo del pane e difesa della rendita terriera a Bologna nei secoli XVII e XVIII', *Annali della Fondazione Luigi Einaudi*, 11 (1977), 143–201; *idem*, 'Un mercato regolato: pane e fornai a Bologna nell'età moderna', *Quaderni Storici*, 13 (1978), 370–97; *idem*, 'Il frumento e la città: il caso di Bologna nell'età moderna', *Quaderni Storici*, 16 (1981), 153–67; *idem*, *Pane e fornai a Bologna in età moderna* (Venice, 1982).

[60]Guenzi, 'Il "calmiero del formento"'; *idem*, 'Il frumento e la città'; *idem*, *Pane e fornai.*

[61]Guenzi, 'Un mercato regolato'; *idem*, *Pane e fornai.*

[62]L. Parziale, *Nutrire la città. Produzione e commercio alimentare a Milano tra Cinque e Seicento* (Milan, 2009), 40–3; A. Grab, *La politica del pane. Le riforme annonarie in Lombardia nell'età teresiana e giuseppina* (Milan, 1986).

[63]L. Maffi and L. Mocarelli, 'Complexity and efficiency: Milan in the seventeenth and eighteenth centuries', in Clerici (ed.), *Italian Victualling Systems*, 39–70; Parziale, *Nutrire la città*, 105–11.

[64]Biblioteca Civica Trivulziana (BCT), Municipal Historical Archives of Milan, archive collection *Materie*, folders 643, 693–713.

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eighteenth century, other kinds of bread prepared using different cereals (such as maize) were produced by urban bakers; however, according to contemporary sources, 80 per cent of the cereal consumption in Milan consisted of wheat.[65] In 1782, bread production was liberalized in Milan, and the setting of bread weight by public authorities was abolished; however, the municipal archives reveal that again in 1784, the weight was artificially set: it was a short-lived liberalization.[66]

In Florence, as in Milan, the *Abbondanza* (victualling office) registered wheat prices on the market and used a table to fix the weight of loaves that bakers sold for eight *soldi*, based on production costs and fair earnings for the bakers;[67] *Grascia* officials set the weight for the bakers themselves.[68] In Florence too, the purchase of bread at a set price and publicly controlled weight affected most of the urban population. According to Pult Quaglia, more than half of the population typically relied on bakeries, that is, those who did not produce bread at home or received only part of their requirements as in-kind wages.[69] Moreover, this percentage could increase to 90 per cent during scarce harvests.

In summary, most of the urban population – especially the medium-lower strata – in Bologna, Milan and Florence purchased bread loaves for almost the entire eighteenth century at a set price: two *bolognini* in Bologna, one *soldo* in Milan and eight *soldi* in Florence. The weights of the loaves changed, but their costs did not. Therefore, it is misleading to calculate the costs of CBs without considering how and at what price consumers obtained their daily bread; this is the more important given that the trend in the weight of bread did not follow the trend in the price of wheat exactly. Indeed, the tables used by the public authorities in Bologna, Milan and Florence to fix bread weight functioned using specific brackets: bread weight did not vary until the wheat price reached a specific level and remained stable until the wheat price reached the next critical level. This means that bread weights were far more stable than wheat prices, and therefore, the cost of purchasing specific quantities of bread – the CBs' costs – showed far more stable trends than those suggested in the literature.

Finally, the stability that the victualling systems brought to the purchasing power of the urban population was also related to a broader reluctance to consider changes in bread production costs. Bakers often submitted petitions seeking updates on the tables used by public institutions to fix bread weight; however, they rarely succeeded. In Bologna, the *Tariffa Giustinianea* (the table used to fix bread weight according to wheat price, production costs and bakers' earnings) remained valid and unchanged from 1606 to 1772, and was then substituted by the *Tariffa Brancinforti*.[70] Similarly, in Milan, no sign of change was identified in the weight calculation of the *pane da soldo* from the second half of the seventeenth century to 1771. A shift took place in

[65]Maffi and Mocarelli, 'Complexity and efficiency', 44.

[66]BCT, Municipal Historical Archives of Milan, archive collection *Materie*, folder 643.

[67]O. Gori, 'Mercato e prezzi del grano a Firenze nel secolo XVIII', *Archivio Storico Italiano*, 147 (1989), 525–623, at 533, 551–2; A.M. Pult Quaglia, *'Per provvedere ai popoli'. Il sistema annonario nella Toscana dei Medici* (Florence, 1990), 144–8.

[68]The *Magistrato della Grascia* was an office (similar to the *Abbondanza* one) that monitored the food trade within and outside the Florentine state. More information can be found in Pult Quaglia, *'Per provvedere ai popoli'*, 144.

[69]*Ibid.*, 169–72.

[70]Guenzi, *Pane e fornai*, 24.

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1770 when the monopoly of the 13 bakers was abolished, the tax they had to pay until that date to maintain their privilege – which was part of their production costs – ended, and the *dazio macina* (milling tax) was reduced.[71] This entailed lower production costs; therefore, in the new table, the weight of bread to be produced according to specific wheat prices was increased. In Florence, there are no clues to indicate the duration of the tables; however, based on the costs used to calculate bread weight, it seems there was a similar continuity. According to Pult Quaglia, in 1651, costs were estimated to be approximately 1.257 *lire*, and 73 years later, in 1724, approximately 1.25 *lire* – an almost identical figure.[72] Given that the prices of firewood, salt and probably even the wages of bakery employees were affected by far more significant fluctuations, it is evident that this element of continuity facilitated the stabilizing role of victualling systems in terms of the purchasing power of consumers.

Having ascertained the crucial role of public institutions in affecting the way the urban population accessed bread and, to a great extent, the price they paid for their daily supply of calories from it, how should we include bread in the calculation of the CBs?

The starting point is that it is impossible to use wheat prices as an indicator of bread cost, given that the relationship was strongly mediated by public authorities fixing bread weight. The second point involves the mechanism of how victualling institutions functioned: urban consumers purchased a *fluctuating quantity* of bread (in terms of weight) for a *fixed cost*. How can we translate this to CBs made from a *fixed quantity* of bread at *fluctuating costs*? If an early modern citizen purchased a fixed quantity of bread daily, public intervention in modifying bread weight – rather than its cost – would have been senseless. For example, if the weight of a loaf decreased by 10 per cent, the consumer would have had to purchase one loaf *plus* 10 per cent of another loaf to reach their fixed daily supply of calories. In other words, the stabilizing and mediating effect of public intervention would have been futile, in addition to the practical problems (in terms of coins) of payment for, for example, 10 per cent of a loaf.[73]

Therefore, it is far more reasonable to assume that urban consumers did not purchase a *fixed quantity* of bread at a *variable cost* but, in contrast, purchased a *variable quantity* of bread (according to the changing weight of the loaves) at a *fixed cost*. Therefore, in constructing our CBs, we started with a fixed weight of bread purchased by consumers every year (on average) at a fixed price. Thereafter, we evaluated the caloric supply that the bread itself ensured, together with wine, estimating the balance of the 2,500 calories per day that other CB products should supply. We decided to use a fixed volume of wine (550 calories/day) and half wine (275 calories/day), given that the sources indicate average consumption. Next, we calculated the percentage of calories supplied by meat, cheese, eggs, olive oil and beans based on their percentages in the previously proposed fixed CBs. Before proceeding, clarification is needed regarding the reason underlying the decision to maintain the same proportions of foodstuffs included in the CB when the weight of the bread changed. Indeed, one foodstuff may have been preferred over another

[71]Grab, *La politica del pane*, 107–11.
[72]Pult Quaglia, *'Per provvedere ai popoli'*, 148.
[73]De Vries, *The Price of Bread*, 32–5.

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depending on its caloric content and price. Our choice depends on two key factors: first, there is no reason why the food habits – themselves the product of cultural and dietary factors – that led to the construction of the 'normal' CB, should have changed in response to changes in the weight of bread. In other words, it is implausible that, besides bread and wine, citizens started to eat only beans, for example, because they were less expensive than meat when the weight of bread fell; if this was normal behaviour, it should also have been practised in years of 'normal' bread weight. The reasons underlying the behaviour of a variegated diet were social habits and contemporary dietary guidelines;[74] for example, consumption of meat was believed to be essential 'for a healthy body', even if in terms of cost/calories, beans were more economical.[75] To quote David Gentilcore, since the Renaissance 'nourishment was defined as the ability for a food to be converted into the substance and fabric of the human body, those substances most similar to the body [i.e. meat] were also considered the most nourishing, and so the most healthy'.[76] Moreover, even if meat consumption during the early modern period decreased compared to the medieval period, or, at least, salted meat took the place of much of the fresh meat in the diets of the poorest strata of the population, it never disappeared from household tables. During the eighteenth century, its consumption increased again.[77] This could be perceived as uneconomical; nonetheless, besides the 'social' and 'dietary' explanations, the maintenance of such proportions in the CBs' foodstuffs also relies on economic reasons, and this is the second factor that leads us to maintain such proportions in the CBs: if we look at the relationship between calories supplied and price of each foodstuff, as proposed by Massimo Livi Bacci,[78] beans provided the same amount of calories as bread at the same cost. Therefore, if we exclude bread and wine from the CBs, beans supplied almost 50 per cent of the caloric intake; olive oil, with almost the same cost/calorie ratio as bread and wine, but less elastic in terms of amounts consumed – around 18.5 per cent; and the remaining percentage was divided between meat (around 24 per cent because of the dietary reasons recalled above), cheese (7 per cent) and eggs (1.5 per cent). Cheese and eggs were the most expensive products in terms of cost/calorie ratio. Therefore, we did not prioritize an increase in the consumption of one product when the weight of bread decreased (because of food habits and dietary guidelines) and we maintained the predominance of some foodstuffs (beans, for example) given their convenience in economic terms.

Returning to our CBs' construction, after calculating the calories supplied by each foodstuff, the final step has been the evaluation of the quantities of products consumed according to the supply of calories and, finally, calculating the cost of each product.[79] This procedure allowed us to maintain the proportions within the CBs, while simultaneously highlighting variation in the choices of consumers

[74]D. Gentilcore, 'Il pane nell'Europa moderna tra dietetica e alimentazione (secoli XVI–XVIII)', in G. Archetti (ed.), *La civiltà del pane. Storia, tecniche e simboli dal Mediterraneo all'Atlantico. Atti del Convegno internazionale di studi (Brescia, 1–6 dicembre 2014)* (Spoleto, 2015), 459–77, at 463.

[75]D. Gentilcore, *Food and Health in Early Modern Europe. Diet, Medicine and Society, 1450–1800* (London and New York, 2016), 19, 106.

[76]*Ibid.*, 19.

[77]*Ibid.*, 19, 58, 63; Montanari, *La fame e l'abbondanza*, 91–8, 131.

[78]Livi Bacci, *Popolazione e alimentazione*, 134.

[79]An explanation of practical calculations to create 'dynamic' consumption baskets is given in supplementary material: Appendix C.

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according to the fluctuations in bread weight. These variations in the CBs' composition could be highly significant because the weight of loaves diminished during years of high prices, and consumers had to depend on other products to obtain their daily calorie requirements. Similarly, loaves could be larger during years of abundance, and the consumption of other products reduced significantly. In Bologna in 1774 – a year of famine – the weight of a loaf dropped to 0.37 kg;[80] By contrast, during the 1720s, it was usually more than 0.7 kg. Similarly, in Florence in 1795, when Italy was ravaged by war, one third of a loaf weighed 0.30 kg, and, as in Bologna, it reached its maximum during the 1720s when the weight of a loaf was almost always more than 1.8 kg (i.e. 0.6 kg for one third of loaf). In Milan, the dynamics were almost the same: a significant decrease in bread weight during wars and famines (between 0.2 and 0.3 kg for two loaves during the period 1700–17, 1770s and 1790s), then an increase during years of low wheat prices, reaching 0.64 kg for two loaves, as in Bologna and Florence, during the 1720s. In addition to these pronounced fluctuations, the daily ratio we assigned to a consumer in each city was, on average, around 0.5 kg in Bologna (one loaf), 0.48 kg in Florence (1/3 of a loaf) and 0.41 kg in Milan (two loaves).

The new CBs confirm the predominance of bread and wine in the Mediterranean area; in Bologna, CBs, including pure wine and half wine, together with bread, supplied, on average, 75 per cent and 64 per cent of the daily calories, respectively; in Milan, 62 per cent and 51 per cent, respectively; and in Florence, 68 per cent and 59 per cent, respectively. These figures seem to be confirmed by the secondary literature; for example, the average number of products (wheat, other cereals, meat, olive oil, etc.) consumed in Bologna between 1787 and 1796, proposed by Alberto Guenzi, suggests that almost 70 per cent of calories came from wheat,[81] although wine is not included in the figures. Livi Bacci refers to similar percentages,[82] and these proportions are close to those in the CBs provided so far. According to Rota–Weisdorf and Allen, 70 per cent of the total calories came from bread and wine, while in Malanima's CB, the percentage decreased to approximately 61.5 per cent.

Even if the proportions remain identical, dynamic CBs differ based on costs. First, the only CB available for northern Italy (including Florence) is Malanima's. The new CBs for Bologna, Milan and Florence show three different cost levels, coinciding with the diverse living costs in the three cities. This is understandable if we consider their demographic, economic and institutional differences and the differences in the price levels of the various products. When comparing our CBs (Figure 2), we decided to use the costs of the CBs, including pure wine, instead of half wine. As anticipated, archival evidence seems to confirm the consumption of pure wine within city walls, whereas half wine was widely consumed in the countryside. It is plausible that urban consumers preferred pure wine because it guaranteed monetary savings in terms of overall caloric supply.

On average, Malanima's CB is slightly more inexpensive than Bologna's, Florence's and Milan's dynamic ones: -19.5 per cent, -22.5 per cent and -17.8 per cent. These significant differences lead to the assumption that living costs were higher than

[80]L. Mocarelli and G. Ongaro, 'La gestione dei rifornimenti granari in periodi di scarsità: Milano e Bologna a confronto (XVIII sec.)', in A. Clemente and S. Russo (eds.), *La polizia de' grani. Mercati, regole e crisi di sussistenza nelle economie di Antico Regime* (Soveria Mannelli, 2019), 37–51.

[81]A. Guenzi, 'Consumi alimentari e popolazione a Bologna in età moderna', in *La demografia storica delle città italiane* (Bologna, 1980), 333–44, at 336–7.

[82]Livi Bacci, *Popolazione e alimentazione*, 134–5.

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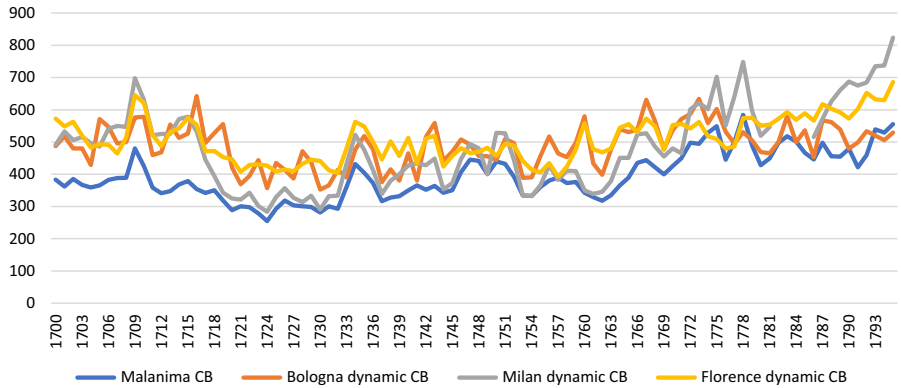

Figure 2. Costs of Malanima's CB and dynamic CBs for Bologna, Milan and Florence (in silver grams, 1700–95). *Sources:* For Bologna, Milan and Florence, see supplementary material: Appendix B. For northern Italy, see Malanima, 'When did England overtake Italy?', 68–70

those proposed by Malanima. The price trends are certainly similar, being the correlation coefficients between the series between 0.6 and 0.9 (0.74 on average), even though the price levels differ.

This finding clearly highlights the importance of elaborating CBs for specific cities given the peculiarities of each case-study, but another feature differentiates Malanima's CB, the 'static' CBs and the dynamic ones. Given the stabilizing role of *Annone*, one would expect the cost stability of CBs to improve. The data analysis suggests that Milan is an exception because the coefficient of variation of the dynamic CB series (25.5) is higher than that of Malanima (18.4). In contrast, in Florence and Bologna, the effect of public intervention in regulating bread weight is apparent. In Florence, the coefficient of variation of the CB's cost is 13.1, which is 28.8 per cent lower than that of Malanima; in Bologna, it is 13.4–27.3 per cent lower. Therefore, in these cities, consumers were less affected by variations in their purchasing power and living costs because of the role played by the *Annone* in stabilizing the bread price, although the amount of bread purchased would have varied.[83] However, the 'ineffectiveness' in this sense of the Milanese *Annona* may have been illusory; indeed, wheat prices were far more variable in Milan than in Bologna and Florence. During the period 1700–72[84] in Milan, the coefficient of variation is, on average, almost 40 per cent, compared to 20 per cent in Florence and 18 per cent in Bologna. Unlike Milan and Florence, the wheat price in Bologna was fixed by public authorities, and therefore, the limited price oscillations caused by the *Annona* probably occurred at this stage. Thus, there was greater variation in the weight of bread in Milan. Moreover, if we consider that without public intervention, bread prices would have varied according to the fluctuations in the price of wheat, the lowering effect on the coefficients of variations in Milan (from 40 per cent for wheat to 29 per cent for bread weight) compared to Florence (from 20 per cent for wheat to 15.88 for bread weight) and Bologna (18 per cent for wheat to 17.6 for bread weight) prove, on the contrary, the significance of the impact of the Milanese *Annona.* Indeed, the latter lowered the coefficient of variation

[83]Kula, *Measures and Men*, 72.

[84]This period has been chosen because we have complete data for all three cities.

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by 27.5 per cent, while the Florentine public institution was 20.6 per cent and the Bolognese one just 2.2 per cent.

Final remarks

The construction of an urban CB and the related costs is a complex task that inevitably leads to approximations and estimates. In this article, we have discussed the limitations of existing urban CBs for the Italian Peninsula, especially in evaluating contemporary consumption habits and the mechanisms through which consumers obtained their daily calories. We accepted the statement based on the Rota–Weisdorf CB and Allen's 'respectability basket' that the basic caloric intake of a worker should be at least 2,500 calories per day; it may have been higher, and the wealthiest part of the population probably consumed more than this figure. However, in this article we have focused on the cost of the basket that ensured the performance of normal (and, usually, highly laborious) working tasks. This would allow some money savings when the bread weight increased, perhaps counterbalancing the periods in which it decreased and the CB's cost grew. We have also argued that Allen and Rota–Weisdorf's CBs should be revisited in terms of the beverages that were consumed: in the English CB, Allen suggests the daily consumption of 0.5 litres of beer,[85] while other researchers argue that its consumption may have been far more significant.[86] Similarly, in the Mediterranean area, the urban CBs include a low volume of wine, even though the sources and authors who proposed the CBs indicate higher wine consumption. Even an average of 1 litre per day could be considered an underestimate of the usual daily consumption in the Mediterranean region. Moreover, the secondary literature attributes wine with a caloric supply per litre that is too high for early modern products – wine's caloric content depends on its alcohol content, and according to existing CBs, wine should contain 12.5–15.5 per cent of alcohol. These figures are appropriate for contemporary wines, which are made using specific production processes aimed at increasing alcohol content to meet consumers' tastes and improve wine preservation. However, in the early modern period, wine was much less alcoholic; the alcohol content could not exceed a certain level (approximately 9–10 per cent) which would have ensured a shelf life of only a year. It is likely that the alcohol content did not exceed this percentage. Therefore, in the construction of our CBs for Florence, Bologna and Milan, we increased the wine consumption but, at the same time, we decreased the caloric supply per litre and chose to propose an alcohol content of 10 per cent, that is, a calorie intake of 550 calories per litre.

In addition to a misleading evaluation of the role of wine in CBs, the existing historiography has neglected the role of victualling systems in European cities, specifically in the Italian Peninsula. Public intervention was fundamental in the mediation between the market and consumers, especially in the purchase of bread, which, along with wine, was the main component of the baskets. The fact that *Annone* aimed at controlling bread weight rather than price – varying the former and stabilizing the latter across decades – affected the way consumers purchased their daily portion of bread, that is, its quantity and cost. If consumers had purchased the

[85]Allen, 'The Great Divergence in European wages and prices', 421.
[86]Muldrew, *Food, Energy and the Creation of Industriousness*, 65–83.

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same amount of bread daily, this kind of intervention by victualling institutions would have been senseless. Therefore, it is plausible that consumers purchased bread of the same *worth* daily, paying a fixed cost for the loaves and receiving a variable quantity based on the weight fixed by public authorities.

On this basis, we created 'dynamic' baskets for Florence, Bologna and Milan, including the increased role of wine in the CBs (using 1 litre of wine as the average consumption) and the fact that consumers purchased a varying amount of bread (on average, 0.4 kg). Therefore, the role played by other products in the baskets varied according to the weight of bread; during years of famine or war (i.e. high wheat prices) the decrease in the size of loaves caused an increase in the consumption of other products in the basket and vice versa. The resulting CBs showed that the stabilizing role of public institutions through the control of bread weight did not significantly affect the *level* of CBs' cost, rather their *stability* across time, which was clearly significant in determining the population's purchasing power. This seems to have been more evident in Bologna and Florence, where the costs of the CBs are much lower in terms of the coefficient of variation than the cost of the northern Italian CB proposed by Malanima. Initially, in Milan, the local *Annona* seems to have failed in its 'stabilizing' role, as the coefficient of variation of the CB's cost was higher than Malanima's; however, if we look at the wheat price trend in the three cities, we realize that, on the contrary, the Milanese public institution was even more successful in limiting the oscillations in bread weight (i.e. in effect the price of bread), given the far greater variations in wheat prices.

This review of CBs' costs raises the question of how our findings relate to the debate on the 'Little Divergence'. Although Allen's calculation of the cost of the English CB may need to be re-evaluated by changing the proportions between the various foodstuffs, and especially the role played by beer consumption, we can still use the estimates as a point of comparision with the costs of the CBs in the Italian area which, as anticipated, are not very different from Malanima's CPI, and in some cases are higher. This means that if we calculate real wages using the nominal wages proposed by Malanima for northern Italy[87] and the cost of our CBs in Bologna, Milan and Florence, on average, daily real wages are 19 per cent lower in Bologna, 16 per cent in Milan and 22 per cent in Florence than Malanima's calculations. These findings from analysis of the cost of the CBs therefore strengthen Allen's argument for an English high-wage economy, compared to lower wages in Mediterranean Europe and for the 'Little Divergence'. However, in terms of real wages, the coefficient of variation (i.e. wage stability across time) changes, is higher in Milan (+29 per cent) but lower in Bologna (-23.5 per cent) and Florence (-27.3 per cent).

However, these calculations have been made using the existing series of nominal wages, which have been strongly criticized in recent publications;[88] therefore, a reconsideration of the nominal wages used, together with the calculation of new costs of the CBs, can shed new light on the supposed Little Divergence. Moreover, because bread and wine were at the centre of the system of in-kind payments (often in fixed amounts), there would have been even greater stability in terms of how urban

[87]Malanima, 'When did England overtake Italy?', 68–70.

[88]See for example J. Hatcher and J.Z. Stephenson (eds.), *Seven Centuries of Unreal Wages. The Unreliable Data, Sources and Methods that Have Been Used for Measuring Standards of Living in the Past* (London, 2019).

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consumers were able to achieve their daily caloric intake. Revision of the composition of nominal wages, in terms of monetary and in-kind parts, therefore, will also contribute to the redefinition of consumers' purchasing power that we have attempted in this article. However, this would require more extended development and is likely to be the topic of another study.

Supplementary materials. The supplementary material for this article can be found at http://doi.org/10.1017/S0963926823000366.

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