From laboratory expertise to litigation: the municipal laboratory of Paris and the Inland Revenue laboratory in London, 1870-1914. A comparative analysis

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Introduction

During the second half of the 19th century increasing attention was devoted to food adulteration in several European countries and in the USA. National and local rules were adopted and their enforcement raised several problems. To start with, who was most qualified to lead with expertise on food and drink: scientists or food professionals? And which kind of expertise was superior: organoleptic or standardised 'scientific' analysis? In turn, these questions are related to the institutional framework in which the laboratories acted. Administrative, police expertise was quite different from judicial expertise, and there were fundamental tensions between local (municipal) and central authorities.
In order to provide a basis for comparison, we will address three points. First, we explore the designation of experts (traders or scientists), the nature of their methods, and the *imprimatur* of their pronouncements.
Second, to these conflicts between traders and scientists, we must add the question of disputes between the State and the municipalities as third-part referees in quality definition.
Third, laboratories' organization will be considered in order to explain the mutual influence between standard expertise and standardized products.

Paris

A general political tendency during the first years of the French Third Republic was to grant municipalities more power. It was in this context that the question of municipal laboratories arose. After an international hygiene conference held in Brussels in 1876 had highlighted the role that the municipal laboratory played in that city, the hygienist congress in Paris (1878) stressed the need of organizing similar laboratories in the main French towns. This was achieved in Paris in 1878, Le Havre 1879, Reims 1882, Rouen 1883, Saint-Etienne and Amiens 1884, and Pau 1885.[1] In these units, medical doctors acted as statisticians and demographers; they were in charge of hygiene, vaccination and food safety problems. This was not only because of budgetary constraints but also because, according to the hygienist credo, prevention had to be 'global' in the sense that it should cover food habits, vaccination, housing, and general education.

We can now ask whether these laboratories were primarily intended to serve traders (for example, wine retail merchants who were suspicious of the composition of the product they bought from wholesalers), consumers (complaining about retailers), or local authorities (the prefecture, the municipality in their campaign against adulterated products). We can also question whether they were supposed to protect public health (and thus the consumer) or to regulate competition (and, thus, the relationship between traders) [2].

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[1] O. Du Mesnil, *Bureaux municipaux d'hygiène. Rapport sur leur mode d'organisation et de fonctionnement*, Paris, imprimerie nationale, 1886, extrait du *Recueil des travaux du Comité consultatif*, 1886, vol. XVI.
[2] For a further development, Stanziani, A. (2005) *Histoire de la qualité alimentaire, 1870-1914* Paris : Seuil

Several municipalities thus decided to adopt their own rules on food adulteration. In Paris, the organization of a municipal laboratory was first mooted in 1876, in particular to detect artificially coloured wines. The laboratory's budget quickly increased during the 1880s. In 1881, the laboratory made 3,958 analyses free of charge and 378 were paid for by private customers. To this, one has to add 2,181 the samples that municipal inspectors had seized, that is 6,517 analyses in total. In 1882, 5,188 analyses were free of charge, 50 for paid by private customers and 5,238 samples came from inspectors. In 1883 almost 15,000 analyses were made. If we now distinguish by products, wine was the most analyzed product: in 1883 almost half of the analyses (7,444) concerned wine, 5,280 of them were free of charge (that is related to watering down), 283 were paid for by private customers and 1,581 were referred by inspectors. Second was milk: in 1883 there were 4,172 analyses as a whole, including 491 free on the request of private individuals, 14 paying, and 3,667 from inspectors.

These figures confirm that wine adulteration was in part a public order question and in part a contractual matter between traders and retailers; whereas milk adulteration mostly concerned public officials, and the tensions between producers, traders and retailers were informally solved. The reasons for this can be found in the different organization of the wine and milk markets: while milk retailers and producers were under trade control, in the wine market regional differences were coupled with increasing conflicts between winegrowers, traders and retailers. This also helps to explain the results obtained by the municipal laboratory and the reactions to its efforts. In fact, despite the sharp increase in analysis, food inspection lagged behind: in 1882, inspectors managed only 5,260 visits to markets, 17,626 to restaurants, grill rooms, dairies, wine merchants cellars, etc., 1,392 to pork-butchers, 3,460 to butchers, 6,317 to grocers, 1,576 to breweries and coffee shops, and 4,347 to other places (bazaars, tanners, etc.).[3]

However, despite their increase in number, these controls were limited as compared to the size of Paris. For wine alone, every day, 16 to 20 inspectors sampled five bistros. This means, that many bistros were never inspected in a year. 43 inspectors dealt with butchers, and 20 with grocers, restaurants, etc, however they were not empowered to seize samples, only to destroy foodstuffs that were clearly unsuitable for consumption.[4] Overall, the probability that a food or drink retailer was visited was remote and his incentive to renounce fraud was low, unless his reputation for quality was well-established.

This efficiency problem was related to another broader question, that is the raising of a national market and the local nature of rules and their enforcement. Different municipal laboratories used different methods of analysis, and the question arose about how to prevent meat refused in Lyon, for instance, being accepted in Paris. The only solution consisted in establishing an official view on methods of analysis valid for all the municipal laboratories; but this could be done only if these laboratories were submitted to state rather than municipal rules. This is to say that the

[3] Ch. Girard, Préfecture de police, *Documents sur les falsifications des matières alimentaires et sur les travaux du laboratoire municipal,* deuxième rapport, Paris, G. Masson, 1887

[4] Dr. Hogg, (1881) De l'organisation de l'inspection des substances alimentaires, *Revue d'Hygiène et de Police Sanitaire*, 431-450.

creation of a national market was inseparable from that of national regulatory institutions. As a result, economic lobbies strongly opposed any public laboratory analysis despite the fact that inspection was rare: leading figures in these associations feared a negative reputational effect.

The debate thus focused on the methods of the analysis. Municipal administrations and a part of public opinion were favourable to science, whose methods were presented as 'objective'. As a result, the traditional organoleptic analysis (wine tasting, smelling milk) of food professionals was set in opposition to chemical expertise. This mirrored the problem of quality measures for foodstuffs and drink: food traders stressed that, as these items were not standardized products, it was impossible to conclude about adulteration only on the grounds of chemical analysis. For example, how could one demonstrate that an excess of water in wine (or in milk) was due to the producer rather than to 'nature'? For their part, scientists sought to list the main components and acceptable values for every product. This supposed the possibility of establishing a correspondence between the standardization of products and of expertise; unfortunately, for most of our period, this was more a project than a reality.
Organolpetic expertise was based on the experience and professional skill of food traders and wine merchants. However, such professional skill met increasing difficulties when increasingly confronted at the end of the nineteenth century with the wide use of organic chemistry. When they were defendants in a trial, traders maintained they were not scientists and, as such, could not identify artificial substances in wine or other 'natural' products. But, at the same time, they argued that 'natural' products such as wine could not be evaluated only on the ground of a chemical analysis. Scientists might confuse bad vintages with adulterated products. On these grounds, traders and professional associations criticized the stance of the Paris laboratory in identifying upper and lower limits for several components of wine beyond which adulteration was presumed.[5]

Because of such criticisms, the Ministry of the Interior asked the Director of the laboratory, C. Girard, and the Prefect for a detailed report. In his report, Girard denied the fact that the laboratory made use only of chemical analysis for wine, pointing out that tasting (dégustation) was also used, particularly for the top rank wines. His concern was not just with food safety but also with adulteration. He displayed a contempt for the profit motive of capitalist food industry and advocated the disclosure of detailed information about the composition of foods. Here we need to make a distinction between two different phases in product quality: ex-ante (information on labels or in contracts) and ex-post (laboratory analysis). Girard entered the ex-ante debate but he and his laboratory were responsible only for ex-post problems of evaluating already sold products. His attitudes gave traders a solid basis for their complaints and led the debate on to the legal value of expertise. As the Prefect explained in his report, the laboratory was just a simple source of information and its

[5] AN F 12 7417, Feuilles d'analyse du laboratoire de Paris, Janvier 1884.

analyses constituted only indices of presumption, not clear evidence for legal judgements.[6]

Despite this attempt to defuse the debate, criticisms did not stop and even increased during the following years, to the extent that some judges in the 1890s even raised doubts about using laboratory analysis, even as simple indices.[7] This was so because the chemical analysis of foodstuffs and wine still faced serious difficulties in the accuracy and stability of its observations. For example, the watering down of wine cannot be detected if the added water is below 20 per cent of the volume.[8]

In 1896 a special Commission was set up at the Ministry of Finance. It was charged with an attempt to identify standard criteria for analyzing wines and alcohol generally. It was not by chance that this Commission was formed only of scientists, with no representative of the business associations.[9] This was an attempt made by civil servants both to reduce contestation and to coordinate different branches of the administration (that is municipal as well as different ministry laboratories). Science was supposed to be the strong unifying and legitimizing factor.

The Commission indicated the most appropriate methods of analysis but it added that administrative expertise as practised in municipal and fiscal laboratories was only one piece of evidence, among others, in a judicial trial. Guilt could only be attributed on the grounds of several concomitant factors (letters, accounting, testimonies). These suggestions left unsolved the problem of the institutional setting in which the standardization of expertise had to be placed: could municipalities be left in charge with these services? How were local and central institutions to be coordinated?

These questions deeply affected not only the economic dynamics but also the institutional equilibrium of the Third Republic and in particular the relationship between municipalities and the central state. The tensions were such that the Commission's recommendations were not translated into rules until, at the beginning of the twentieth century, a new general law on fraud and falsification laid out a basis for expertise. The general law on food adulteration of 1905 was followed in July 1906 by a Ministerial Decree confirming the creation of a new Service for the Repression of Frauds at the Ministry of Agriculture. The decree detailed the organization of laboratories and their methods of analysis. Still the relationship between these new central laboratories and the previous municipal laboratories had to be clarified: should the municipal laboratories be curtailed, and, if not, should they be dependant on the Ministry of Agriculture?

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6 AN F 12 7417, Préfecture de Police au Ministre du Commerce, 9 Mars 1883.
7 AN BB 18 6025, Lettre du Préfet de Paris au Ministre de l'Intérieur, 18 Mars 1895.
8 *Ibid.*.
9 AN F 12 6873, Décret du Président de la République sur la Constitution d'une Commission d'Expert auprès du Ministère des Finances

A circular issued by this Ministry stated that municipal laboratories could survive only by agreement and, then, under the control of the Minister of Agriculture.[10] This meant that, unlike in the first years of the Third Republic, now the balance of power had shifted from municipalities towards the central government. The reform was not without its problems; the laboratory of Paris, in particular, refused to submit to the Service of Repression of Fraud and contested the value of its selected methods of analysis. The result was that the Ministry refused the laboratory official status and the courts refused to take its analyses into consideration.[11]

London

The situation in England and Wales was similar in some ways. Laboratory expertise was fragmented and of uncertain authority. First, there were local authorities in London and in some of the larger industrial cities such as Manchester and Liverpool that took it upon themselves to establish means of detecting food frauds from the middle of the nineteenth century onwards. It is important to note that these initiatives were limited in scope: (a) at first to microscopic and physical analysis, (b) to the most adulterated foods, such as milk, and (c) with little or no impact upon small towns and rural areas until the end of the century. Second, laboratories were set up in the 1870s and 1880s by some of the larger food companies, although their work was more concerned with the quality of supplies to their factories than with protection for the consumer.[12] Third, the official laboratory was in Somerset House, London, and was known variously as the Board of Inland Revenue Chemical Laboratory (1849-1894), the Government Laboratory (1884-1911), and the Government Chemist's Department (1911-1959). For our present purposes, this laboratory derived its power from the 1875 Sale of Food and Drugs Act and acted as a chemical Court of Appeal, sitting in judgment upon the efforts of local authority analysts.[13]

Analysts were professionalized by the 1875 Act, but their appointment at the local level was not compulsory until 1899.[14] Their professional interests were looked after by the Society of Public Analysts (SPA), which from the outset developed into a focus of opposition to Somerset House. On appeal, the latter frequently overturned the results of Local Authority analysts, and this led to a great deal of friction. In the case of milk, for instance, it was in as much as a half of cases that Somerset House

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[10] AN BB 18 6055, Note interne du Ministère de la Justice, no date.

[11] Décrets du 19 Mars 1907 (*JO* du 7 Avril 1907) et du 13 Juin 1907 *(JO* du 20 Juin 1907) ; AN BB 18 6031, Rapport du Procureur Général de la Cour de Cassation au Ministre de la Justice, 27 Avril 1909.

[12] In 1881 in London, the Aylesbury Dairy Co. began taking 10-20,000 samples of milk a year and gradually they built up the world's largest database.

[13] There had been previous Acts in 1860 and 1872 that had been ineffective.

[14] Dyer B, Mitchell C A, 1932 *The Society of Public Analysts and Other Analytical Chemists: some reminiscences of its first fifty years and a review of its activities* (Heffer, Cambridge).

prevailed.[15] The SPA accused government scientists of being unqualified and of using inappropriate methods of analysis. Disputes frequently spilled over into the trade press and sometimes even into popular newspapers. The editor of *Food and Sanitation*, for instance, praised the approach adopted in Paris but was bitterly critical of Somerset House. In 1894 he spoke of the "wretched, ignorant, and utterly untrustworthy system of food analysis at Somerset House". It was a "poor, bungling department struggling to perform work for which it has not got the skill or knowledge". In his opinion, "scientifically the Somerset House chemists are dead, and there exists no shadow of an excuse for their remaining unburied."

There were in essence two problems here, equally relevant in both Paris and London: definitions of the 'natural', and the 'knowability' of the world through laboratory science. First, food is, of course, organic and therefore variable in its qualities through both time and space. But eliminating fraudulent foodstuffs by defining the compositional characteristics found in the 'genuine' article proved to be exceptionally difficult in our study period. There are seasonal variations, and also differences from district to district, and sometimes even from field to field. Anyone familiar with the wonderful complexities of wine vintages knows this from subtle differences in taste that are the result, not just of the grapes used and the methods of fermentation and storage, but also of soil and micro-climate. With milk, there were attempts on both sides of the Channel to state the acceptable constituents. In Paris in 1897 a Municipal Commission concluded that this should be 3.0 per cent butterfat and 8.5 per cent solids non fat, the same as the British Sale of Milk Regulations in 1901.[16] The neat congruence is deceptive, however, because the previous decade had seen heated debates about 'genuine' milk and what it was reasonable to ask of farmers. In London, participants included (a) the dairy lobby, who pointed to seasonal alternations of rich and 'thin' milk; (b) local authority public analysts, who wanted a high standard; and (c) Somerset House, who, without consultation, implemented a low standard. It was only with detailed empirical agronomic research in the early twentieth century that it was possible to put this issue on the sounder footing of observed regularities.

Second, food science matured in the second half of the nineteenth century with developments in organic chemistry. There had been delays earlier because of the difficulty of dealing with organic materials in a precise manner. Accuracy was important for deriving quality standards but, in the case of milk, use of the 'lactometer' from about 1800 proved to be most unsatisfactory. The instrument was a modified hydrometer that floated in a milk sample, and the specific gravity (weight per volume) inferred from the volume of displacement was an indication of whether the milk had

[15] 47 per cent of milk analyses were challenged in the period 1875-88. French & Phillips, 2000, 45.

[16] P. Budin, *Commission municipale d'étude de l'alimentation par le lait, rapport general* (1897).

been tampered with by watering, or was whole and therefore natural.[17] In reality lactometers were far from fool-proof. For instance, cream decreases the density of milk and a sample's specific gravity can therefore readily be manipulated by skimming part of the cream to raise the density and then adding water to reduce it back to the original reading.
The application of chemical techniques to food analysis increased from the 1870s. However, there was fierce rivalry between the proponents of different techniques and significant scientific disagreements emerged about the validity of the methods and their results.

Building a scientific consensus about 'genuine' food and about the methods of detecting fraud was achieved in four ways. First, food chemistry came to be increasingly dominated by industrial interests. It was they who invested the most in testing and in the creation of industrial-scale databases of observations under all possible conditions. Quantification and standardized laboratory protocols were intended to establish 'technologies of trust' in controversial areas.[18] Thus, in the year 1924, the London laboratories of the United Dairies examined seven times more samples of milk and cream than all of the local authorities in England and Wales put together.[19] Henry Droop Richmond, who was Analyst to the Aylesbury Dairy Company for twenty years, in his laboratories alone processed 330,000 samples.[20] Along with Express Dairies, the Cooperative Wholesale Society, and a number of others, these companies dominated research. Few textbooks were available at the turn of the century and Richmond led the field, in Britain at least, with his *The Laboratory Book of Dairy Analysis* (three editions: 1905, 1912, 1925) and his *Dairy Chemistry* (five editions: 1899, 1914, 1920, 1942, 1953), the latter of which was described as '*the* reference book' for all analysts.[21]

Second, methods of testing and laboratory expertise were increasingly geared to expense and timeliness of techniques of analysis. This was more important than the ultimate degree of precision that could be achieved. For milk, the Babcock technique was a favourite in the 1890s, where sulphuric acid was used to dissolve everything in the milk except

[17] Normal cow's milk has an average specific gravity of 1.032 as against 1.000 for water.
[18] The observation series of daily milk samples established a number of features of cow biology that had not previously been appreciated. First, genuine milk was discovered to be highly variable in its constituents due to a wide range of factors. Second, the early, rather simplistic, focus on butter fat had distorted the industry's understanding of genuine milk and encouraged farmers to engineer a regression to an annual mean for that ingredient, to the neglect of other elements.
[19] Maggs J H, 1924, "The organization of United Dairies (Ltd)" in *Proceedings of the World's Dairy Congress, Washington DC, October 2, 3, Philadelphia PA, October 4, Syracuse NY, October 5, 6, 8, 9, 10, 1923* Eds L A Rogers, K D Lenoir (Government Printing Office, Washington, DC) Volume I, pp 235-41.
[20] He found an average composition of 3.75 per cent fat, 4.70 per cent milk sugar, 3.00 per cent casein, 0.40 per cent albumin, 0.75 per cent ash, and 0.06 per cent other constituents.
[21] Hughes E B, 1960 "Pure food for the people: the manufacturers' contribution" in *Pure Food and Pure Food Legislation: Papers of the 1960 Centenary Conference* Ed A J Amos (Butterworths, London) pp 21-39.

the fat. The mixture was then rapidly rotated in a centrifuge to separate the fat and a percentage figure could be read off on the graduated neck of the special bottle provided. The time whirling the samples tied up the expensive equipment, however, and Gerber acido-butyrometry method eventually triumphed because of the convenience of its apparatus.

Third, both industrial and state chemistry came to rely upon impartial third parties to provide a gloss of objectivity to their work. In 1900 the newly established National Physical Laboratory (NPL) was called in to guarantee the accuracy of Gerber bottles and subsequently they became pre-eminent in the standardization of equipment and techniques generally. The bottles soon were an important element in the income stream of the NPL and may therefore be fairly said to have had a central role in its early years. Gerber bottles were vital to the dairy industry, not only to monitor quality and reduce adulteration but also to reassure farmers who sold their milk to butter factories that they were being paid sufficient for the fat content of their milk.[22]

Fourth, deployment of the law was crucial. In fact, it was through the application of the anti-adulteration laws in Britain and France that scientific expertise was tested. As Porter observes, “courts have been particularly stubborn in believing that science should mean the straightforward application of general laws to particular circumstances”.[23] For Bauman, the sovereignty of the modern intellect “is the power to define and to make the definitions stick - everything that eludes unequivocal allocation is an anomaly and a challenge”.[24] But science is in reality more complex and less certain than these expectations demand, with the result that “the testimony of real living scientists often holds up rather badly in the adversarial courtroom situation” and “research done according to the standards of scientists is often not impersonal and law-like enough to stand up to political and judicial scrutiny.” As a result, the science of food analysis had to adjust to the requirements of the law and lawyers if convictions were to be obtained and adulteration eliminated. Laboratories had to be run with reference to methods of analysis known to be acceptable to the courts, and at levels of efficiency in the processing of samples and the reporting of results that would stand up in court. Local authority inspectors had to become authoritative and personable ‘experts’, behind whom there was an administrative and scientific weight that was beyond question.

The gradual accumulation of case law after the Sale of Food and Drugs Acts of 1860, 1872, 1875, 1879, 1899 and 1928, and the issue by successive governments of regulations and explanatory circulars, fostered a changing understanding of the thresholds of legality with regard to food.

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[22] National Physical Laboratory, 1903 *Regulations for the Examination of Lister-Gerber and Other Similar Milk Testing Apparatus* [National Physical Laboratory, Teddington].

[23] Porter T M, 1995 *Trust in Numbers: the Pursuit of Objectivity in Science and Public Life* (Princeton University Press, Princeton, NJ).

[24] Bauman Z, 1991 *Modernity and Ambivalence* (Cornell University Press, Ithaca, NY).

However, the law was unable to eliminate the fuzziness of science. On the contrary, it revealed, in its pedantic reverence of the statutory text, uncertainties that no-one, from farmer to retailer to scientist had ever foreseen. It also created injustice by convicting innocent parties and releasing the guilty; it undermined informal trust that had existed in the trade for decades and encouraged the substitution of complex contractual obligations; and the legal profession flourished on a rash of milk cases (Table 2) that eventually, by their sheer number and high profile, led to political consequences.

Table 2. Issues in milk litigation, 1870-1914

- Warranty - written undertaking that milk would be whole and untampered with.
- Appeal to the cow – poor milk legal if shown to be unadulterated.
- Grigg v. Smith (1917) - no need for milk to be the outcome of an entire or uninterrupted milking

By 1914 much of the heat had gone out of the dispute between the SPA and what by now was called the Government Chemist's Laboratory. This was because the methodology of milk analysis was broadly agreed upon and the controversy had shifted to the courts and the politics were now between farmers' representatives and the legislators.

Conclusion

The process of urbanization went along with the rise of a national market and, therefore, in the number of intermediaries. This phenomenon, together with the entry of chemistry in the agro-business production raised serious information asymmetry problems, and sometimes it even broke agreements on the definition of the quality of products. This situation of generalized uncertainty gave raise to the attempts made by economic lobbies to conquer market share by turning legal rules and market institutions to their profit. This was mostly done by obtaining official definitions of quality and adulteration of a given product which, in turn, made possible to exclude some of their competitors from the market. Although the legislative and regulatory frameworks were somewhat different between France and England, in both countries the evidence seems to suggest that commercial interests were dominant. It was in this context that the question of product expertise arose.

In London, as in Paris, different interests of economic association as well as the lack of coordination between central state administrations encouraged municipalities to offer their own services for food inspection and analysis. In France, this issue fitted with the broader tendency in the first years of the Third Republic to decentralize consistent powers to municipalities. Municipal laboratories came supply this service to both public, official and private contractors. As such, public expertise was submitted to the same critique as private transactions, and organolpetic expertise was opposed to chemical analysis. This opposition was that between two criteria of product evaluation, two notions of the law (one close to administrative-police rules the second to judicial law) and, least but not the last, to two different forms of intersection between law and economics. Scientific analysis led to macro forms of regulation while

organolpetic expertises was much more anchored to micro contractual arrangements.

In France, unlike other countries (for example Great Britain of Germany) these confrontations were solved in that way, standardized expertise won upon organoleptic forms of it, while the State took the power of municipalities on food control. This process went along with a passage of food security and food quality rules from civil and/or penal versus administrative penal rules. This issue actually took place in a broader transformation (to which it contributed too) of the Third Republic from local versus highly centralized forms of power.
On the contrary, in Britain, centralization was much less pronounced than in France and, more important, was different in character. Product quality was increasingly linked in our period to a series of centrally defined rules that were negotiated by civil servants and representatives of the food industry. These were empowered by a combination of laws and official regulations, which were then tested and enforced by the courts, starting at the local level in the magistrate's courts and in a small number of cases appealed to the High Court. As a result, commercial and administrative rules and legal debate were inevitably bound together.