

**Milk, from medicine to food in Mediterranean Europe: Catalonia, 19th-20th Centuries<sup>1</sup>.**

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**Introduction.**

The spread of fresh milk consumption between the decades of 1870 and 1930, was a significant change in the diet of Europeans. Several authors have associated this change with the improvement in the nutritional state of children and young people during that period, and with the reduction in their rate of mortality<sup>2</sup>. At the same time, other authors have highlighted the growing importance that new agricultural, industrial and trade companies acquired in the European dairy sector<sup>3</sup>.

The majority of these studies, however, have analysed the former processes in the countries of Atlantic Europe. We will provide new information in this communication on milk consumption in Mediterranean Europe; and we will outline the special impact that two factors had on its evolution: new findings in microbiology and nutrition, which occurred from the end of the nineteenth century onwards, and the activities carried out by doctors and several public institutions to promote milk consumption. We will also demonstrate: (a) that environmental, technical and agricultural conditions considerably limited milk consumption in Mediterranean Europe during the nineteenth century, and (b) that overcoming those obstacles required numerous innovations that were not always possible to carry out. As a result, the growth of milk consumption in that part of Europe was very unequal on a territorial scale, and the presence of that product in the Mediterranean diet rarely reached the importance that it had in Atlantic Europe. Lastly, we will discuss how the relationship between income and milk consumption was very distinct on a geographic scale at the end of the nineteenth century, and how it changed significantly in the first third of the twentieth century.

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<sup>2</sup> Beaver (1973, Cussó y Nicolau-Nos (2000).

<sup>3</sup> Teuteberg (1992), Hartog (1995), Vernon (2000).

Our area of research will be the region of Catalonia, located in the upper north-east of the Iberian Peninsula. On one hand, the environmental conditions of this region are relatively diverse, and raising dairy cows has been highly important in some of its counties at various times throughout the twentieth century. On the other hand, economic growth in Catalonia was notable as of the mid-twentieth century and closely associated with the region's early industrialisation and urbanisation. Catalonia is, for the above-mentioned reasons, a suitable framework for the analysis we are proposing (Map 1).

### **1. Quantitative and qualitative evidence for the consumption of fresh milk.**

There is abundant evidence on the growth of fresh milk consumption in Central and Northern Europe from the decade starting in 1870, but few quantitative estimations up until the twentieth century. Nevertheless, those estimates leave little doubt as to the evolution of fresh milk consumption in that part of the Continent: the product was already highly consumed before 1900, and consumption continued to increase until it exceeded, in some cases, 200 l per inhabitant per year in the 1930s (Chart 1).

Various investigations into the evolution of the European dairy sector in that same period also point out: (a) the growth in milk production in those countries in response to the agricultural crises of 1870 and 1880, and (b) the intense transformation the milk trade underwent at the same time and in the same area. The numerous initiatives, for promoting fresh milk consumption, that were developed by doctors and various public institutions and are also well documented<sup>4</sup>.

On the contrary, the information we have gathered from Catalonia, indicates that fresh milk consumption was much lower in the nineteenth century, and that its expansion in the first decades of the twentieth century was only important in the city of Barcelona and a small number of counties.

#### **a) Milk in the Catalan diet in the nineteenth century: a marginal consumption.**

The low consumption of fresh milk in Catalonia up until the first few years of the twentieth century can be seen, for example, in the various medical surveys that doctors carried out in numerous localities, and in the reports that were written by the agricultural engineers of the National Agricultural Service on the situation of Spanish livestock at the end of the nineteenth century.

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<sup>4</sup> Murcott (1999), Atkins (2005), Orland (2005), Burnett and Oddy (2004).

Of the 45 surveys we consulted, for the period from 1798 to 1907, milk consumption was not mentioned in 15 and an intent to quantify it was only made in 7 of those remaining. In those cases, the authors pointed out that milk consumption covered the needs of the population, even though the quantity estimate did not exceed 15 litres per inhabitant per year in five municipalities and in two others it was around 20 to 23 litres. Lastly, in the 21 cases in which the doctors specified the type of milk consumed, cow milk was only predominant in one. Goat milk was predominant in 12, and both types of milk were consumed in eight<sup>5</sup>. In the case of Barcelona, the data from the City Council indicate that average consumption per inhabitant in the city, was situated around 4,32 l in the 1850s, and in 11 l in 1902<sup>6</sup>. The reports on Spanish livestock, confirm those observations. Their authors only mention in those reports that there were dairy cows in the city of Barcelona and a few other localities<sup>7</sup>.

#### **b) Growth of fresh milk consumption in the early decades of the twentieth century.**

The situation discussed above changed significantly in the first third of the twentieth century, but there were important territorial differences (Chart 2). Fresh milk consumption increased between the end of the nineteenth century and the 1930s, but that growth was only important in the city of Barcelona and the province of Gerona. The estimates of chart 2 also indicate: (a) that the growth in consumption in the city of Barcelona was especially important from the end of the nineteenth century until the years of the First World War, and (b) that the growth in the consumption of fresh milk in the province of Gerona occurred later, but was much more intense.

Milk consumption in the city of Barcelona per inhabitant and year intensely increased from around 12 litres at the start of the century to around 60 l during the First World War, and settled around 78 l in the 1930s. As chart 3 suggests, fresh milk consumption in the city of Barcelona in those years, must have been among the highest in Spain and Italy at the urban level. In the rest of the region, milk consumption was still very low around 1923 and, afterwards, only increased significantly in Gerona. Milk consumption reached 170 l per inhabitant per year, in that province, in the 1930s, and achieved levels that were quite similar to those that existed in Atlantic Europe and in a

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<sup>5</sup> Those surveys –or *Topografías Médico-Sanitarias*- are in the Archivo de la Real Academia de Medicina y Cirugía de Barcelona.

<sup>6</sup> Vila (1979), p.12; Nicolau-Nos and Pujol-Andreu (2004) pp.114-117.

<sup>7</sup> Dirección General de Agricultura, Industria y Comercio (1892), vol I, pp. 295-296, 304-305, 307, 318-323, 384, 396-397; vol.II, pp. 408, 412-413, 414.

few provinces in the north of Spain. In contrast, consumption of fresh milk increased very little in Lerida, Tarragona, and the greater part of the province of Barcelona.

Growth of milk consumption in Barcelona can also be seen in the changes undergone in the trade of fresh milk in the city. At the start of the nineteenth century, a great part of the milk supply for Barcelona still came from goats and cows that were brought in the city daily, and returned in the evening to the farms they had come from. By around 1900, this type of trade had disappeared and the milk supply came mostly from the 180 urban cowsheds that had 1,404 cows. Milk from neighbouring counties was also sold in another kind of establishment – dairies or milk-shops – but this trade was not important: close to 5 million of the 6 or 7 million litres that were consumed annually at that time came from urban cowsheds and between 1 and 2 million came from nearby farms<sup>8</sup>.

During the years of the First World War, urban milk production was around 25.2 million litres annually, and sales of outside milk was approximately 13 millions litres. In that period, therefore, production from urban cowsheds continued to be fundamental in supplying the city, but milk brought in from outside was much more important than at the start of the century. In the 1920s and 1930s, the importance of those sources of supply became inverted and that change caused a deep re-organisation of the fresh milk market in the city. The number of cows in the city showed practically no variation – i.e. 7,500- and urban milk production remained at a standstill around 30 million litres. In contrast, the number of dairies increased to 1,751 and the milk sold from those establishments up to 50 million litres. The business concentration in the trade sector increased simultaneously. If before the First World War outside milk was sold by small traders, by the 1930s, 15 companies commercialised 78% of the milk that entered the city<sup>9</sup>.

There is further evidence of the evolution of fresh milk consumption in Gerona. The agricultural engineers of the National Agricultural Service observed that, for the entire province, raising milk cows was unimportant in 1917 but increased rapidly in the following decades<sup>10</sup>.

## **2. The characteristic's of milk and social acceptance of a new food.**

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<sup>8</sup> Ayuntamiento de Barcelona (1902) p.526; (1906) p.521.

<sup>9</sup> Pujol-Andreu (2002) pp.208-213).

<sup>10</sup> Junta Consultiva Agronómica (1920) p.267; Llovet (1934) pp.9-11.

Before explaining the different processes that we have just described, it is worthwhile to remember some of the characteristics of milk. In the first place, milk contains a large quantity of water and its content of proteins and calories, by unit of weight or volume, are therefore, quite low. Its calorie content is only higher than that of some fruits and vegetables, tea or coffee. Its protein content -without distinguishing their quality- is only higher than all fruits and vegetables and drinks. Milk's calcium and vitamin content are important but these nutritional advantages were not understood and valued until the twentieth century. Secondly, milk is an ideal culture for many microorganisms that contaminate it shortly after cows are milked. However, those germs were not discovered until after Pasteur conducted his studies in the 1860s and their elimination, using pasteurisation and sterilisation techniques, did not become generalised until the twentieth century was under way.

**a) Traditional uses for fresh milk.**

In short, until the end of the nineteenth century, fresh milk was not valued as an important food in the population's diet and it was even considered dangerous to consume it<sup>11</sup>. Firstly, specialists and the population in general gave higher importance to foods with a high density of glucids, lipids and proteins, and in terms of that criteria milk competed poorly with cereals, tubers, legumes, vegetable oils or animal-based foods. Secondly, milk was a product that had to be consumed within a short period of time after milking, so that lowered its uses and the number of those who used it.

In spite of those inconveniences, consumption of fresh milk was recommended in situations of extreme weakness, due to illness or old age. Light or liquid diets were recommended under those circumstances, and at that time there were few alternatives to milk. The product could also be consumed as a complement to other foods; for example, it could be mixed with cereals or tubers to increase their energetic density, or to accompany the consumption of stimulants such as tea, coffee or cocoa. Consumption of cow or goat milk only was recommended for infants in very limited cases. For example, when the infant had syphilis or other infectious diseases or when the mother's milk or that of other women was not available.

In Atlantic Europe, therefore, fresh milk was not highly valued in the second half of the 19<sup>th</sup> centuries. Its principal nutritive advantages were unknown and its

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<sup>11</sup> Atkins (1992), Murcott (1999).

hygienic state could not be guaranteed. In our opinion, if milk consumption was high at that time in that part of the Continent, it was due to the combination of three circumstances. Firstly, because environmental conditions were very favourable for raising cattle to produce meat, cheese and/or butter. In others words, foods with high concentrations of animal fats and proteins. Secondly, because temperature conditions delayed the contamination of the product. In third place, because trade networks and shipping infrastructures were more developed. In short, in Atlantic Europe: (a) the milk supply was high, even though it was a secondary product for many cattle farms, (b) environmental conditions facilitated its conservation, and (c) it could be shipped to the main centres of consumption relatively quickly. It is therefore reasonable that, in that part of Europe the relative prices of milk were more reduced than in Mediterranean Europe<sup>12</sup>, and that its consumption was greatly related to income levels<sup>13</sup>.

In contrast to this, in Catalonia, environmental conditions favoured a growing specialisation in vineyards, olive groves and fruit trees in the nineteenth century, and this greatly limited cattle farming for food production. Livestock farming became concentrated in the northernmost counties -which also happened to be the worst connected to the main urban centres- and became especially oriented towards producing draught animals<sup>14</sup>. Therefore, consumption of beef, cheese, butter and fresh cow milk was very low in Catalonia until the end of the nineteenth century and the protein, glucid and fat needs of the population, were mainly covered by consuming mutton, cereals, legumes and olive oil<sup>15</sup>.

Furthermore, under the region's climatic conditions - high temperature in spring and summer - milk deteriorated more easily than at other latitudes, and the risk of contracting infections from consuming it increased. It is not difficult, therefore, to understand the low consumption of milk in Catalonia in the nineteenth century. In contrast to Central and Northern Europe, technical and environmental conditions caused the milk supply to be very low and made its commercialisation much more difficult. Nevertheless, even though consuming fresh milk could be dangerous for one's health, there were few substitutes when a light diet was called for. It is no surprise that it was highly consumed in hospitals and that its use for therapeutic ends was also noticed by

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<sup>12</sup> The terms of trade between milk and sugar around 1900, were: 2,25-2,5 l: 1 kg in Barcelona and Madrid; 3-3,8:1 in Paris, Munich and Berne; and 4-4,41:1 in Berlin, Brussels and Hamburg.

<sup>13</sup> Rew (1904a) p.421; (1904b) p.391.

<sup>14</sup> Garrabou and Pujol-Andreu (1987), Pujol-Andreu (1998).

<sup>15</sup> Cussó and Garrabou (2003-2004), Nicolau-Nos and Pujol-Andreu (2004).

doctors and other professionals<sup>16</sup>.

To summarise, in Catalonia there was a very low supply of milk, and its consumption was restricted to those groups for which there were few substitutes. It is no wonder, then, that its relative price was high, and that its consumption was less conditioned by income levels than in Atlantic Europe. An adult male in Barcelona in the 1880s earned an average of 2.5 to 4.5 pesetas and the price of milk per litre was 0.4 to 0.5 pesetas. At those prices, it is obvious that higher income earning groups acquired milk when they needed it, whereas the majority of the population had more problems obtaining it if not hospitalised, or if it was not possible to obtain it by other means –i.e. from private charity, or from one's own goats. In any case, under normal health conditions, milk consumption was very low and was not greatly related to income levels.

#### **b) Milk's new characteristics and the transformation of the dairy sector.**

In the first third of the twentieth century, progress made in the science of microbiology and the discovery of the micro-nutrients needed for a balanced diet – vitamins and minerals- changed the population's concept of fresh milk and demand for it grew and took on a new significance. Activities conducted by doctors and various public institutions were strategic in that growth. Other factors favouring it were: the use of cooling, pasteurisation and sterilisation techniques, the spread of new kinds of baby bottles using sterilised milk, and the increase in consumption of coffee and cocoa.

Activities by doctors are particularly patent in: (a) the recommendations included in numerous books and magazine articles on paediatric, childcare and nutritional subjects, which were published in those years, (b) the diets they prescribed in hospitals, (c) their active participation in creating *Gouttes de Lait*, and (d) the new diets that they promoted in various primary schools such as the municipal school "El Bosque" in Barcelona. In 1923, the Director of the Agricultural Technical Services of Catalonia also indicated that the growth in milk consumption could be the result of "that those who are healthy also put into practice the advice given to the ill"<sup>17</sup>.

Municipal governments also actively participated in the demand's growth. These institutions adapted the guidelines on milk hygiene to new-found scientific knowledge, and accented the quality controls placed on milk that was sold. To these ends, the

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<sup>16</sup> Vila (1979) pp119-128.

<sup>17</sup> Raventós (1923) pp.30-31.

Barcelona Town Council: (a) placed stricter hygiene conditions on cowshed dairies, and forced them to re-locate to districts with lower population densities, (b) stipulated the characteristics that milk containers should have so as to transport milk to city, (c) created new administrative bodies and centres for analyses, and (d) set up two central facilities in order to better monitor its quality<sup>18</sup>.

But the growth in demand for milk that the previously mentioned activities generated, could only be partially met. To increase Catalonia's fresh milk supply, it became necessary to change the breeds of cattle, increase in a substantial manner the availability of feeds and forage, and improve shipping infrastructures. When we consider these aspects of the new dairy sector that developed in the region as of the end of the nineteenth century, become more understandable: (a) the special importance that the city of Barcelona had in transforming the dairy sector in Catalonia, and (b) the different trends that the evolution of fresh milk consumption in the region followed.

The city of Barcelona was not just an important focal point for disseminating consumers' new preferences. In the 1880s, the city's herdsmen began using Swiss and Dutch cows and they weaned the calves four or five days after their birth, and sold them to those rural farms that could fatten them. Not long afterwards, in nearby counties, the number of dairy farms increased, and as a result: (a) importation of Swiss and Dutch cows also increased, and (b) the successive crossing of those animals with autochthonal breeds changed the composition of the region's cattle herds and their productive orientation<sup>19</sup>.

However, those changes only materialised in some Catalan counties. Those counties were the ones with suitable environmental conditions for farming the new livestock and that due to different means –importation or new crop rotations – could increase their availability of feeds and forages. In the south of the province of Lérida, the growth of irrigated lands and the use of mineral and chemical fertilisers also increased the availability of those resources<sup>20</sup>. In those counties, however, the new irrigated lands were very uneven and the temperatures in spring and summer too high for raising cattle.

In addition, although the shipping infrastructures improved, in the 1930s, they were still too deficient for shipping milk over great distances: the rail network did not

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<sup>18</sup> Institut Municipal de la Salut (1991) pp.31-74, 75-104, 171-192 ; Ayuntamiento de Barcelona (1902) p.531, (1903) p.408; Mas Alemany (1935) p.31.

<sup>19</sup> Pujol-Andreu (2003) pp.266-268.

reach many production areas and was too slow; the road system was sparse once outside of Barcelona; and shipping the product by lorry only took on importance after the First World War. Moreover, refrigerated lorries were only used in a few cases. Lastly, in the 1920s and 1930s, cooling, pasteurisation and sterilisation techniques spread among the large companies that supplied the city of Barcelona, but very little in the rest of the region<sup>21</sup>.

The consequences were: (a) the province of Lérida became a feed and forage exporter, (b) cattle farming for supplying milk to the capital became concentrated in the easternmost counties of the province of Barcelona, and (c) the northernmost counties of the province of Lérida and especially those of Gerona, specialised in the raising and reproduction of cattle (map 2).

Finally, at the same time that the previously mentioned processes were making progress, the growth in milk production in Barcelona slowed down in the same measure as productive possibilities were exhausted, and in Gerona opposite occurred, but the commercialisation of milk did not cross provincial limits. Therefore, in the 1920s and 1930s, consumption of fresh cow milk in the city of Barcelona only increased by 18 litres per inhabitant per year, whereas in Gerona it increased by more than 140 l. As a result, in the latter decade, the price of milk was 0.40 pesetas per litre in Gerona, 0.60 in the province of Barcelona and 0.70 in the capital of the region.

### **3. The fresh milk market in Barcelona between 1900 and 1930: an analytical approximation.**

Based on the previous exposition, we can uphold two conclusions with respect to the changes that the fresh milk market in the city of Barcelona underwent between 1900 and 1935.

The first is that the aggregate demand function with respect to prices moved to the right and became more elastic. Two factors favoured these changes: the new information consumers acquired on milk's characteristics and the city's intense demographic growth. Another factor, that we can only suggest, was the rise in earnings that many families in Barcelona must have experienced. About this factor, however, we can say little: we know that real salaries increased but we do not know the repercussions

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<sup>20</sup> Pujol-Andreu (1998) pp.158-169.

<sup>21</sup> Generalitat de Catalunya (1937) p.12; Reparaz (1928), pp.279-280; Mas Alemany (1935) p.33; Llovet (1938) p.157.

such increases had on earnings and family budgets. The second conclusion is that the supply function was very inelastic with respect to prices, and moved in the same direction as demand, although in this case there was a special intensity between 1900 and the years of the First World War.

The evolution of milk prices between 1898 and 1935 seems to confirm the former results, although a more thorough study of this variable would require other factors to be taken into consideration. The current prices of milk were very stable until the First World War, when the price of other foods were increasing, but as of that time they increased greatly and ended at very high levels (Graph 1). Real prices initially decreased until 1920, but behaved very differently afterwards: they increased intensely until 1922 and never returned to the low levels of 1920 (Graph 2). Moreover, the relative prices of milk in the 1930s were not very different from those of the end of the nineteenth century.

To summarise, we believe graph 3 to be a good approximation of the different situations, which the fresh milk market in Barcelona operated under around 1900 (1), 1920 (2) and 1930 (3). On the graph, we represent: (a) the changes of the demand ( $D_1; D_2; D_3$ ) and supply ( $S_1, S_2, S_3$ ) milk functions with respect to prices, and (b) the growth that gross earnings of producers and traders of the product experienced:  $(A_1 = P_1 * Q_1) < (A_2 = P_2 * Q_2) < (A_3 = P_3 * Q_3)$ , where  $P_i$  is the price of milk in constant pesetas and  $Q_i$  the quantities of milk consumed in the city.

We also believe that the income elasticity of the demand for fresh milk tended to increase during the first third of the twentieth century, although we still do not have sufficient data on this aspect of demand. We discussed earlier that in Barcelona, and generally throughout Catalonia, the demand function of fresh milk with respect to income was very inelastic. The principal motive for sustaining this affirmation was that at that time milk was basically consumed in situations of extreme weakness due to illness or old age. Nevertheless, between 1900 and 1935, uses of milk increased in the measure that its nutritive advantages became better known, and consumption of it spread among children and adults. In the 1930s, however, consumption of the product in Barcelona was still much lower than that of many regions and cities in Atlantic Europe. Moreover, the relative prices of milk continued to be high in that decade in the city of Barcelona, and it is highly likely that the new findings on the nutritive advantages of milk initially spread more quickly among the middle and upper classes. In our opinion, therefore, it is highly likely that in Barcelona, as in the greater part of the region, the

demand function of fresh milk with respect to income would tend to become more elastic between 1900 and 1935.

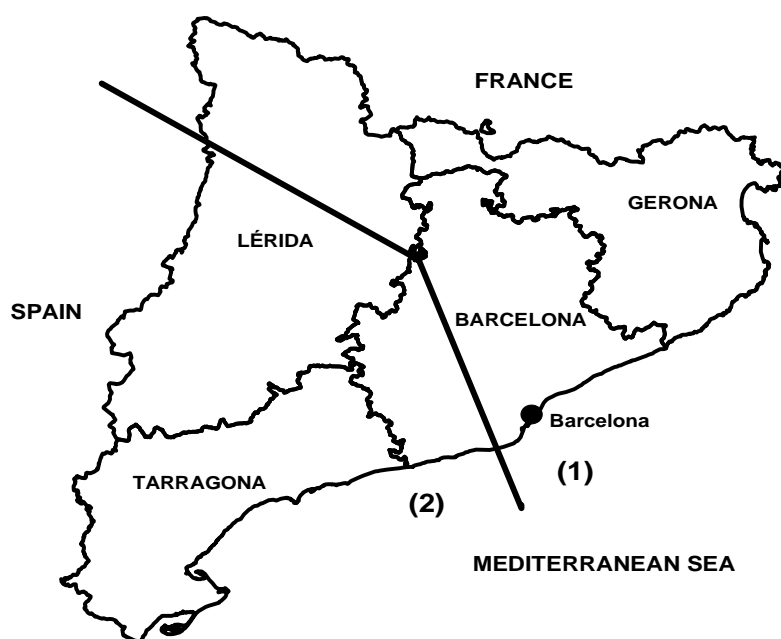
#### **4. Conclusions.**

Firstly, we have argued that the growth of fresh milk consumption in Catalonia was closely related to the new preferences that grew among consumers: scientific progress in the fields of microbiology and nutrition; the activities carried out by doctors and various public institutions to promote it, and the spread -although late and very localised- of cooling, pasteurisation and sterilisation techniques. Secondly, our study confirms that the growth in milk consumption was closely related to environmental conditions, the development of trade networks, and processes urbanisation. With respect to this latter factor, we have seen how new consumer preferences spread from the city of Barcelona and how that initiated a transformation of cattle herds in the region. Thirdly, we believe that in this city the demand function for fresh milk with respect to income was very inelastic at the end of the nineteenth century, and that it tended to become more elastic between 1900 and 1935. Based on these results, three working hypotheses on the evolution of fresh milk consumption in Western Europe during that period of time can be maintained.

The first is that the influence of urbanisation on the growth in fresh milk consumption had a special significance in Mediterranean Europe, because in that part of the continent, cities had a great influence on transforming the productive sector. The second hypothesis, is that the relative prices of milk were always lower in Atlantic Europe than in Mediterranean Europe. The third hypothesis is that the relationship between income and consumption of fresh milk changed significantly when the nutritive properties of the product became better known. In Mediterranean Europe, it tended to increase and in Atlantic Europe to become lower, as a result, in this case, because its consumption was much more generalised.

## Appendix.

Map 1: Provinces and counties that are mentioned in the text and delimitation of the principal climatic areas of Catalonia.



- (1) Area with high rainfall and moderate temperatures in spring and summer.  
 (2) Area with low rainfall and high temperatures in spring and summer.

Chart 1: Fresh milk consumption in Central and Northern Europe between 1870 and 1930 (litres per inhabitant per year)<sup>(1)</sup>.

|                     | 1870/95 <sup>(2)</sup> | c.1900    | c.1910     | c.1930               |                   | c.1900         | c.1910 | c.1930             |
|---------------------|------------------------|-----------|------------|----------------------|-------------------|----------------|--------|--------------------|
| <b>UK</b>           | <b>40-60</b>           | <b>70</b> |            | <b>95</b>            | <b>HOLLAND</b>    |                |        |                    |
| London              | 52                     |           |            | 139                  | Amsterdam         |                |        | 145 <sup>(3)</sup> |
| Manchester          | 109                    |           |            |                      | <b>NORWAY</b>     | <b>150-160</b> |        | <b>190</b>         |
| Towns               | 64-122                 |           |            |                      | Oslo              |                |        | 194 <sup>(3)</sup> |
| <b>SWITZER-LAND</b> | <b>115</b>             |           | <b>312</b> |                      | <b>SWEDEN</b>     | <b>180</b>     |        |                    |
| Zurich              |                        |           |            | 216-252              | Stockholm         |                |        | 252-288            |
| Lucerne             |                        |           |            | 324                  | <b>DENMARK</b>    | <b>180</b>     |        |                    |
| Bern                |                        |           |            | 270                  | Copenhagen        |                |        | 260                |
| <b>FRANCE</b>       |                        | <b>72</b> |            |                      | <b>W. GERMANY</b> |                |        |                    |
| Paris               | 60                     |           |            | 72-90                | Saxony            | 120            |        |                    |
| Strasbourg          |                        |           |            | 158 <sup>(3)</sup>   | Munich            |                | 158    |                    |
| Lyon                |                        |           |            | 72 <sup>(3)</sup>    | Stuttgart         |                | 180    |                    |
| Toulouse            |                        |           |            | 60-79 <sup>(3)</sup> | Flensburg         |                | 180    |                    |
| <b>AUSTRIA</b>      |                        |           |            |                      | Hamburg           |                |        | 155                |
| Viena               |                        |           |            | 180-185              | Berlin            |                |        | 90-130             |

**Sources:** Based on Rew (1892) p.251, 266, 272; (1904a) p. 419, 421-426; Bulharowski (1929) p. 7; Llovet (1934) p.15; Carrasco (1934) p.673, Mas Alemany (1935) p. 27; Atkins (2005b) p.26; Orland (2005) p.222, Kajærnes (1995) p. 104; Schärer (1995) p.21.

**Notes:** (1) When varying estimates were found, we indicated the highest and the lowest. (2) Different

years between 1870 and 1895 (3) Probably at the end of the 1920s.

Chart 2: Milk consumption in Catalonia between 1900 and the 1930s.

|                        | c.1900 | c.1918 | c.1923 |     | c.1933            |     |
|------------------------|--------|--------|--------|-----|-------------------|-----|
|                        | (a)    | (a)    | (a)    | (b) | (a)               | (b) |
| <b>Provinces</b>       |        |        |        |     |                   |     |
| <b>BARCELONA</b>       |        |        | 53     | 87  | 55 <sup>(1)</sup> | 96  |
| <i>Capital</i>         | 12     | 60     |        |     | 78                | 98  |
| <i>Other provinces</i> |        |        |        |     | 23                |     |
| <b>GERONA</b>          |        |        | 25     | 80  | 172               | 92  |
| <b>LERIDA</b>          |        |        | 20     | 75  | 24                | 75  |
| <b>TARRAGONA</b>       |        |        | 13     | 23  | 34                | 21  |

a): litres/inhabitant and year (b): % of cow milk

**Source:** Based on Dirección General de Estadística (1922-1929), Instituto Geográfico Catastral y de Estadística (1932-1943), Más Alemany (1935) p. 28, Llovet (1938) pp.158-159, Asociación General de Ganaderos (c.1923) pp. 82-83, 90-91, 94-95, 106-107, and Ministerio de Agricultura (1934), pp. 96-103.

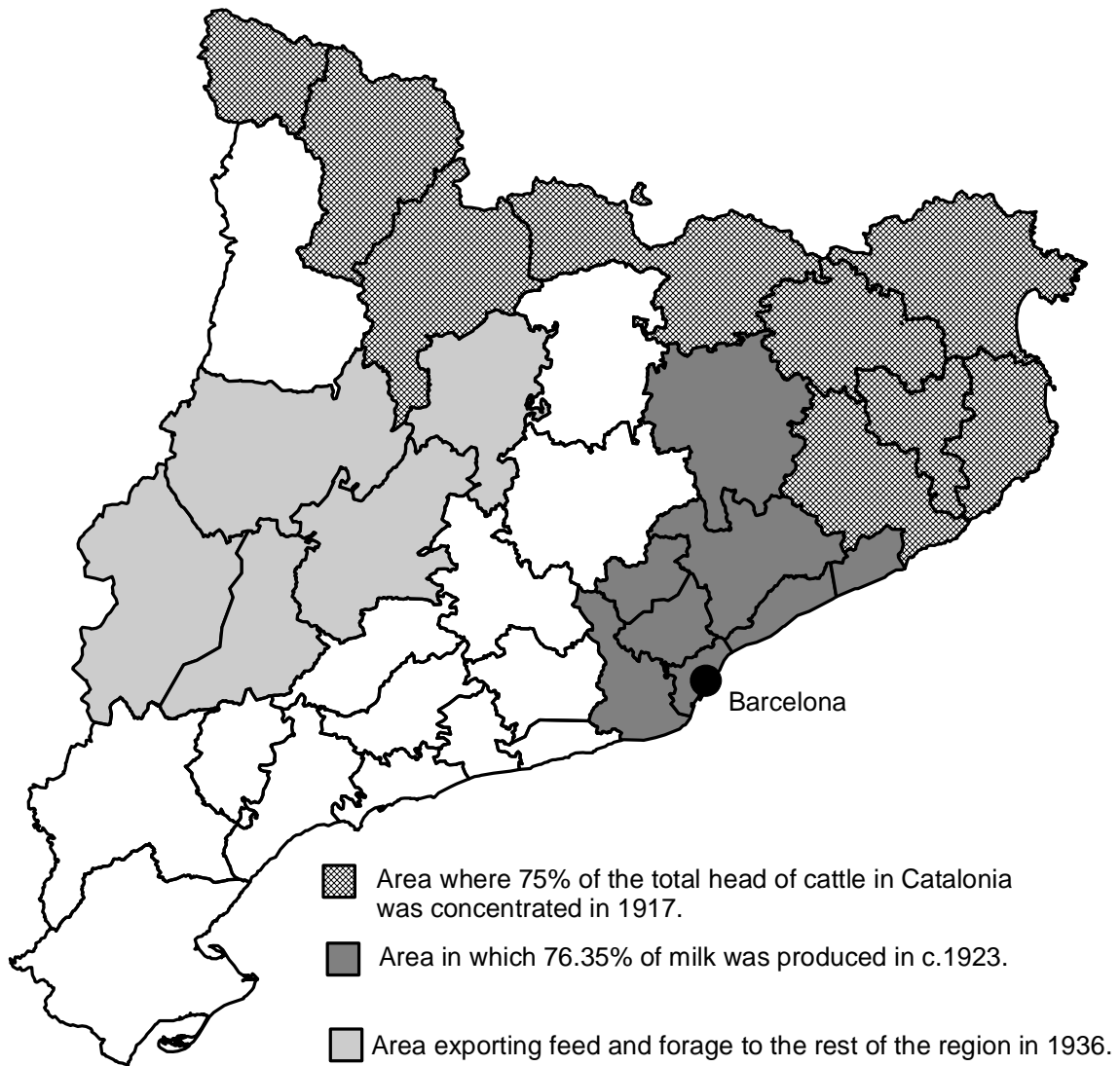
**Notes:** (1) We have corrected the source's data for this year, taking into consideration the milk production of the cowshed dairies in the capital.

Chart 3: Consumption of fresh cow milk in some cities in Spain and Italy around 1930 (litres per inhabitant and year).

|           |       |       |    |
|-----------|-------|-------|----|
| Barcelona | 78    | Milan | 60 |
| Madrid    | 70-73 | Rome  | 38 |
| Saragossa | 36-40 |       |    |
| Seville   | 33-38 |       |    |

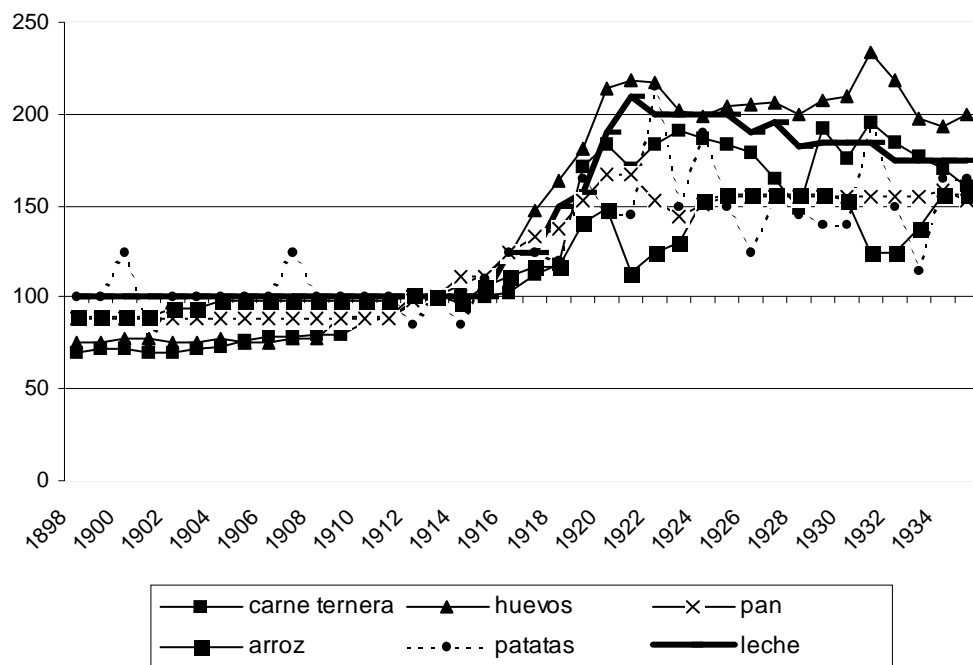
**Sources:** Based on Bulharowski (1929) p. 7, Más Alemany (1935) p. 28, Llovet (1934) p. 15, Carrasco (1935) pp.671-673, and Ministerio de Agricultura (1934), pp. 96-103

Map 2: Principal areas of specialisation in the Catalan dairy sector.



**Source:** Based on Junta Consultiva Agronómica (1920) pp. 204, 233, 259, 281; Asociación General de Ganaderos (c.1923) pp. 82, 90, 94, 106; Pujol-Andreu (2002).

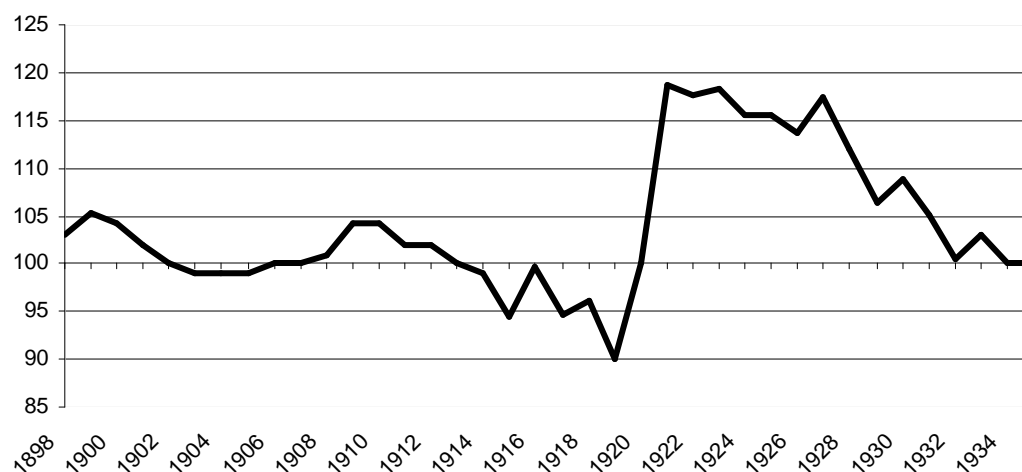
Graph 2: Retail current price index of the foods indicated in the city of Barcelona (base 100 in 1913).



Sources:

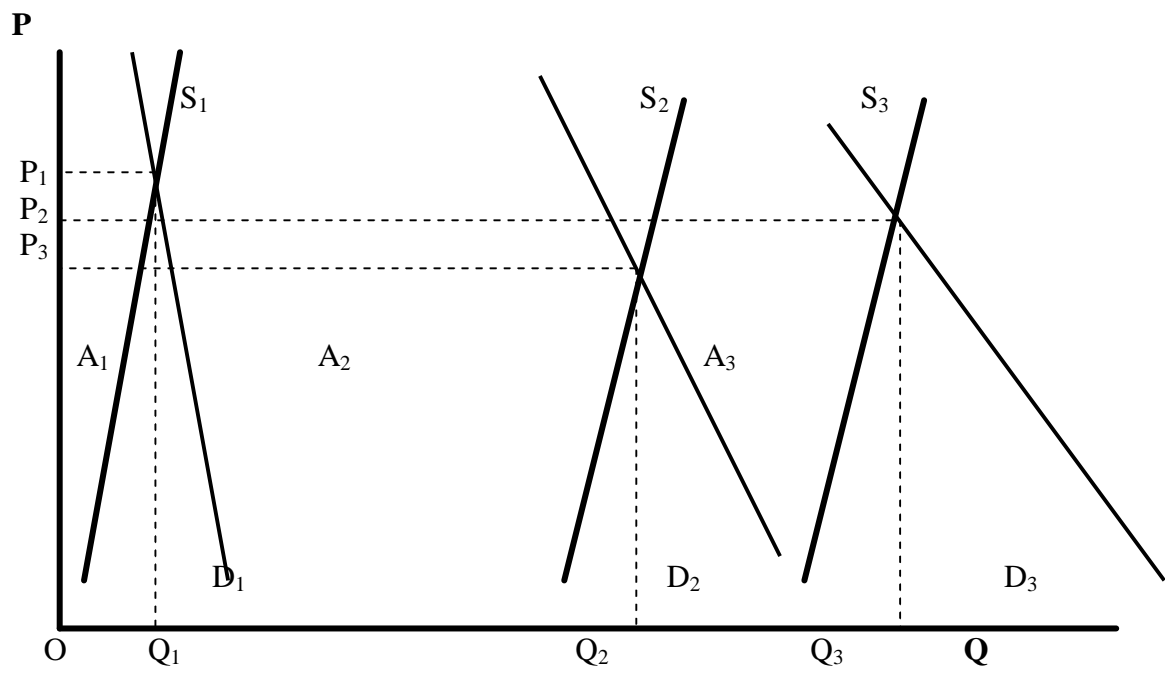
Based on Arxiu Històric Municipal de Barcelona (Governació, series A-B, 165, 153, 4254, 4255, 4256 y 125; serie D, 153, 125, 165, 180, 198, 241, 270, 289, 368, 369, 370, 376, 524); *Anuario Estadístico de la Ciudad de Barcelona* (1902-1923). *Anuario Estadístico de España* (1913-1935), *Memorias Comerciales de la Cámara de Comercio de Barcelona* (1913-1936) and Maluquer de Motes (2005) pp. 1290-1291.

Graph 3: Real retail price index of milk in Barcelona, according to the Price Retail Index in that city (base 100 en 1913)



Sources: Based on the same sources of graph 2..

Graph 3: The milk market in Barcelona around 1890, 1918 and 1933.



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