BARCELONA'S INDIANAS MANUFACTURE: AN EARLY MANAGEMENT ACCOUNTING IN J.B. SIRES & CO. (1769-1805)[1]

LA MANUFACTURA DE LAS INDIANAS EN BARCELONA: UN INICIO DE CONTABILIDAD DE GESTIÓN EN LA EMPRESA J.B. SIRES & CO. (1769-1805)

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ABSTRACT:

The paper aims to contribute to the debate about the emergence and development of management accounting in Europe by presenting an example of management accounting in Spain in the second half of the eighteenth century. The paper deepens the case of an indianas (cotton canvas printed and dyed) factory in Barcelona, exploring the productive organization and managerial structure using the accounting books of the firm. The firm's methods of production, work organization, product costing, and production quality control are reviewed within the political and economic context of Spain during a period of deep transformation with the enthronement of a new monarchy and a deep change in the economic policy. The evidence presented in the paper support the existence of rudimentary management accounting and control techniques in a private firm in the midst of European industrialization.

RESUMEN:

El artículo se propone de contribuir al debate sobre el surgimiento y desarrollo de la contabilidad de gestión en Europa presentando un ejemplo de la España de la segunda mitad del siglo XVIII. El trabajo profundiza el caso de una fábrica de indianas (telas de algodón impresas y pintadas) en Barcelona, explorando la organización productiva y la estructura gerencial utilizando los libros contables de la empresa. Los métodos de producción, organización del trabajo, producción de productos y control de la calidad de la producción se revisan dentro del contexto político y económico de España durante un período de profunda transformación con la entronización de una nueva monarquía y un profundo cambio en la política económica. La evidencia presentada en el documento apoya la existencia de técnicas de contabilidad y control de gestión rudimentarias En una empresa privada en medio de la industrialización europea.

KEY WORDS:
Management accounting, Indianas manufacture, Barcelona, Eighteenth century

PALABRAS CLAVES:
Contabilidad de gestión, manufactura de indianas, Barcelona, Siglo XVIII

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1. Introduction

The study presents the results of a research on the management organization of Catalan *indianas* manufactures, conducted along the research path lead by Fleischman and Parker (1991) for British firms, highlighting contact points and differences. The reported case is based on a data set by the *indianas* manufacture of Juan Baptista Sires, operating in Barcelona from 1769 to 1815. Interestingly for our purposes, it was a private owned firm operating on the national market in a competitive framework; furthermore, it is a meaningful model of the transformation of manufacture from an artisan-based production to factory model. The case study could be considered a good research sample for accuracy and completeness of survived data and accounting books.

The objective of this study is to enhance the knowledge of the historical antecedents of contemporary management accounting systems through the analyses of its development in a phase of deep transformation of manufacture all over Europe. Such change – well represented in the case study – highlights the characteristics of the process of formation of the modern factory (division of labour, specialization, work organization, technology) and gives the possibility to study the development of new managerial tools associated to the necessities of modernization of the manufacture.

The debate on the nature and definition of management accounting and management instruments has engaged scholars since the beginning of twentieth century. (Church, 1914; Follet, 1927; Urwick, 1928; Holden, Fish and Smith, 1941; Fayol, 1949). In particular, the analysis focused on differences between cost accounting and management accounting. In the UK and US studies, until quite recently, some distinctions between the two categories have been maintained, interpreting the cost accounting as the analysis and measurement of both costs, financial and non-financial, related to the acquisition or use of all interior resources of an organization (Waweru, 2010). Meanwhile, the accounting management is defined as the measurement activity of financial and non-financial values necessary for the formation of managerial decision-making (Horngren, Datar and Foster, 2003). More recently, however, scholars seem to agree on a substantive definition of management accounting as the measurement and reporting of corporate values and flows, which also includes cost accounting (Boyns and Edwards, 2012; Drury, 2004).

At this point, it is clear that the management accounting is based on a combined survey of financial and non-financial data values, representing, therefore, a larger instrument than the cost accounting. In this regard, it is worth, citing the definition given by Boyns and Edwards (2012): “management accounting is the use of accounting information for the purpose of assisting management in carrying out its numerous functions”. In this way, perhaps we can make epistemological clarity about the use of management accounting definition, which, in this form, began to be used by the Anglo-Saxon area scholars only since the 1950s.

Another necessary element of clarification concerns the very nature of management accounting that has its roots in the ontology of accounting systems and their use. Ever since ancient times, and well ahead of the birth of multinational companies or simple capitalists, human activities were economic activities; think of agriculture, trade and manufacturers. To operate, survive and develop, all these activities needed a management, which is configured in

the form of collecting information related to costs, profits and quantities (Boyns and Edwards, 2012). The need for information has changed and grown over time with the rise of the operations and the complexity of the society in which it operates.

According to recent studies, the very idea of management accounting only appeared in the mid-nineteenth century, coinciding with industrial development dictated by the expansion of the railways and of joint stock companies (Chandler, 1962, 1977; Johnson, 1972). While, until then, the cost accounting techniques – here considered as reporting activities related to costs and their inclusion in the production process – were elementary and used relatively little (Fleischman and Tyson, 1993; Loft, 1995).

Specifically, the use of accurate cost accounting depends mainly on the increasing scale of fixed assets and amortization – it is easy to understand the role played by the railway or by the largest industrial enterprise – compared to working capital, which had characterized the commercial and manufacturing enterprise since the Middle Ages. In addition, some traditional management accounting studies have placed this practice exclusively in the area between the United States and Great Britain, while little attention has been given to the possible spread of such practice in other areas (Johnson and Kaplan, 1987; Amat, Carmona and Roberts, 1994).

It is interesting to note that Gutiérrez, Larrinaga and Núñez (2005) attribute to many Anglo-Saxon scholars the idea to place only in the mid-nineteenth century the use of accounting techniques of costs due to the lack of references to management accounting, and more, to the lack of cost accounting practices in previous accounting manuals, without investigating any archival references. The importance of historical research, based on archival sources in order to retrieve a reliable picture of the use of management accounting practices and its correct date, has been recently underlined by Boyns and Edwards (2012). It is a most-valuable work of synthesis, which summarizes the studies started by Johnson (1972), Hoskin and Macve (1986, 1988), Edwards et al. (1995), Boyns and Edwards (1996, 1997a), Fleischman and Parker (1990, 1991), Edwards and Newell (1991), Fleischman and Parker (1996) and, finally, Fleischman and Tyson (1993, 1996).

In this way, it was possible to question the statements of Pollard (1965) and Chandler (1977) about the date of the beginning of the use of cost accounting techniques and their geographical spread. It is shown that, for example, forms of management accounting were already in use in the United States before 1860, among the cotton and textile mills as reported by Johnson (1972, 1981), Porter (1980) and Tyson (1998) or at the Springfield armoury in the 1840s (Hoskin and Macve, 1994). In addition, the British textile sector is an important cornerstone for the emergence and development of a managerial and financial accounting system, as highlighted by Edwards (1989) and Toms (2005). The most recent studies have now demonstrated how these techniques were actually present in geographic areas other than Britain and the United States, as pointed out by Antonelli, Cerbioni and Parbonetti (2002) for the Italian case in mid eighteenth century. While the Spanish case has been deepened by Carmona, Ezzamel and Gutiérrez (1997), Prieto and Larrinaga (2001), Núñez (2002a, 2002b), Carmona and Gómez (2002) and Carmona and Donoso (2004). Another clear example of cost control and the emergence of an early cost accounting procedure is that proposed by Zambon and Zan for the Venice Arsenal between the sixteenth and seventeenth centuries (Zambon and Zan, 2007). Finally, Carvalho, Rodrigues and Craig (2007) present the interesting case study of the Silk Factory Company of Portugal in the eighteenth century (2007), confirming the idea that the core studies focused on public-owned companies.

Rightly, the Spanish case has recently seen a flourishing of studies that have clearly demonstrated the use of accounting techniques of sophisticated occasional costs to support decision-making and management process common in the mid-eighteenth century. These techniques were used in the Royal Factory of tobacco of Seville, even before 1779, as demonstrated by Carmona, Ezzamel and Gutiérrez (1997, 1998) and Alvarez, Gutiérrez and Romero (2002), especially for the control of workers and quality production. Other examples are the monopoly of gunpowder, studied by Núñez Torrado (2002a, 2002b), the Rio Tinto mines, studied by Flores Caballero (1983) and the Real Fabrica of tissues of Ezcaray, studied by Prieto and Larrinaga (2001). While Carmona and Gomez (2002) have studied the management and cost accounting practices used by the Royal Textile Factory of Guadalajara, closest to our proposed case study.

All these works have had the ability to investigate thoroughly the organizational aspects and circumstances that have implemented the introduction and development of cost accounting techniques for the control of business activities – with particular attention to the control of workers and product quality – and the formation of decision-making. What seems clear from these studies is that the management accounting techniques were formed in a set of companies operating in non-competitive markets (monopoly of gunpowder, the Rio Tinto mines) or companies operating in competitive but state-supported markets (Royal Factory of Ezcaray, Royal factory of Guadalajara, Royal tobacco manufacture of Seville) (Gutiérrez, Larrinaga and Núñez, 2005). However, little is still known about the use of such practices by private companies that were operating in the same period in the Spanish market. From this corner, the presented case study has the particularity to be based on a private firm and to be a not Anglo-Saxon one. The distinctive trait and interest of the reported case could be pinpointed in the specific features of Spanish industrial and financial background. The *indianas* manufacture represents the passing of the traditional guild-regulated manufacture and a step forward respect to the cottage industry. The new economic policy adopted by the Bourbon crown following Enlightenment ideas permitted to the new manufacture to grew up basing on a new industrial model. The diffusion of the new cotton manufacture could count on a consolidated textile manufacture know-how already diffused in Catalonia. It is important to highlight that the effects of the weakening of previous guild regulated mode of production and market regulation created the conditions to modernize manufacture organization (working time, work organization and division) and introduce formal control mechanisms such as management accounting. (Amat, 1992; Amat, Carmona and Roberts, 1994; Gutierrez and Romero, 2001).

The paper is structured as follows. The next section introduces the economic and political context of the eighteenth century Spain, paying particular attention to causes of *indianas* manufactures expansion in Catalonia and government efforts to industrial development. The successive sections describe the case studied, its production organization (technology, production, workforce and management) and the accounting system with particular reference to the tools for accounting management adopted by the firm. The results are then presented and interpreted in the conclusion section that also shows the limits of the present investigation.

2. Research methodology and sources

This research has tried to identify, in the accounting system adopted by a factory of

indianas (cotton canvas printed and coloured), the characteristics described by Fleischman and Parker (1991) to define an advanced cost accounting practice. Therefore, the following accounting practices have been identified: the cost control technique, the allocation of indirect costs, the use of information relating to the costs for the formation of business decisions, the control of workforce and, finally, the control of quality.

Starting from the large analysis on cost accounting in British manufacturing firms conducted by Boyns and Edwards (1996, 1997a, 1997b, 1997c, 2001), we can make some generalizations that represent a path by which we try to encompass our analysis. First, the two British scholars point out that the cost system was developed mainly following the dimensional growth of the companies and with the increase in the number and complexity of the productions. Furthermore, only in that moment it began to experience integration between trading accounts (financial) and cost accounts within the double-entry bookkeeping system.

According to classic studies of Edwards (1937), Garner (1955) and Johnson and Kaplan (1987), cost accounting has had, until almost the twentieth century, a development on the side lines of financial accounting (Donoso Anes, Giner Inchausti and Ruiz Llopis, 2006). Boyns and Edwards (1997b) show that the practice was spread among British companies during the second half of the nineteenth century to calculate the cost of production on the basis of different business functions next to the distribution (including all functions) of general costs, using information produced for taking strategic decisions and for the control of individual business functions (departments). Even Antonelli, Cerbioni and Parbonetti (2002) identified the implementation of cost accounting systems in the production efficiency and control of making strategic decisions in Italian companies.

The starting point of this paper is the documentation preserved at Archivo Historico de la Ciudad de Barcelona, which keeps the surviving accounting records of a large number of factories, including those of *indianas* (cotton canvas printed and coloured), operating in the city from the 1750s to the so-called "liberal triennium" (1820-1823). In this archive, the accounting records have converged of those factories that reached the end of their productive life, in liquidation or bankruptcy, that were forced to hand over their records to the Audiencia de Barcelona, which operated as a commercial court (Duran y Sanpere, 1958). In particular, the archive keeps the records (borrador de facturas, Libretas de semanadas, copiador de cartas, libros mayor) for 41 manufactures for spinning, weaving, printing and marketing of *indianas* in the period 1760-1860, of which 36 operated between the second half of the eighteenth century and 1815.

Another important documentary source is given by the Biblioteca de Cataluña, which keeps, in the manuscripts section, the account records of the factories of *indianas* of Erasme de Gònima, Baron de Castellet and Bonsoms family. Finally, the Diocesan Archive of Barcelona still keeps the whole documentation of Isidre Català & Co., another important and enduring manufacture of *indianas* operating in the city in the same period.

The account records relating to factories of *indianas* are substantially homogeneous, thanks to the use of a common accounting system. This event made it possible to extract a single representative sample of enterprises whose documentation is kept in the archives of Barcelona.

For the reasons already given by Gutiérrez, Larrinaga and Núñez (2005), the case study described in this study is not directly comparable to the detailed analysis of the use of cost accounting made by Fleischman and Parker (1991). This is verifiable, in regards to the size of the sample, the level of technological evolution and organization of Barcelona's *indianas* factories, compared to British or Scottish cases.

However, the Barcelonese manufacture of *indianas* is a terrific example of transformation of a traditional manufacture – typically based on home production handicraft model – in a centralized factory, with a strong division and specialization of labour and an increased level of technological innovation.

3. The context: the appearance of *indianas* manufactures in Catalonia

The widespread use of cotton accelerated at the beginning of the eighteenth century, when the availability of raw material increased, due to the cultivation of new plantations in the American colonies (by the English and Spanish rulers), in India and China (Farnie, 2004). This prompted on European markets a substantial amount of raw cotton canvas at a much-more competitive price than previous imports from Egypt. In addition, with technological innovations – beginning with James Hargreaves' *Jenny* (1764) and Richard Arkwright's *Mule* (1771) – in the spinning and weaving of cotton, the productivity of this fibre grew enormously, finally supplanting the use of wool in mass textile production (Landes, 1994). Cotton, on the other hand, allows for easy adaptability to machining and proved to be an extremely versatile fibre.

The printing of cotton canvas began to be diffused in Europe during the seventeenth century. In particular, Marseille was the first cotton-printing manufacturing city, thanks to the techniques imported by Armenian artisans in the Provençal town (Thomson, 2003). Only in the following decades did the technique of dyeing cotton canvas become widespread to England and the Netherlands, stimulating the creation of productive centres. The printing technology then passed from France to neighbouring Catalonia, especially after the revocation of the Edict of Nantes in 1685 and the consequent abolition of religious freedom. Many non-Catholic technicians left the motherland to move to countries where there was a more religious tolerance.

In Catalonia, printing and colouring of *indianas* and *calicos* spread belatedly in the eighteenth century, while in other parts of central Europe, this already occurred during the last decades of the previous century. The introduction of *indianas* and *calicos* manufacture in Catalonia was delayed by the considerable resistance from traditional textiles manufacturers, such as silk and wool, who saw in cotton canvas dangerous competitors to a consolidated market segmentation between the two fibres. At first, even in Catalonia, there was an attempt to safeguard the traditional textile fabric manufacturing, ushering in a protectionist policy for the protection of wool and silk, preventing the import of cotton canvas "a la chinesca" (chinese style) (Romeva Ferrer, 1952). However, the change of Spanish consumers' taste regarding cotton canvas and the increase in purchasing power made the internal market particularly attractive for domestic producers. At the middle of the eighteenth century, the rich Catalan mercantile "bourgeoisie" observed the existence of a large domestic market, ready to welcome the new fabrics, subject to "colonization" by French, English and Maltese products and the opportunity to increase its business thanks to a new manufacturing sector based on a mechanism of import-substitution (Martinez Shaw, 1973).

The first Catalan *indianas* manufacturers faced the problem of the lack of a specific know-how about cotton spinning and weaving (mostly restricted to low quality products like the sails for ships or canvas bags). Second, there were no specialists in printing and colouring of cotton cloths, and even less, there were no chemical experts for the preparation of the same colours. Finally, it was necessary to identify a primary source for the supply of the necessary

raw material. Nevertheless, the immigration of skilled workers from nearby France allowed early Catalan pioneers to overcome the lack of specific technical skills.

The mercantilist policy adopted by new King Philip V, of Bourbon, with the prohibition on imports of foreign cotton items, created a favourable context; Barcelona, in the years 1737-1740, saw the installation of the first manufactures of *indianas*, with the first documented example of Jacinto Esteva, resulting in activities already in 1737 (Martinez Shaw, 1973; Thomson, 1992). There was a new phase of manufacture settlements, since the 1750s. During this decade, in the manufacturing context of Barcelona, appeared the companies of Joan Ayguasanosa, Josep Sala i Viber, Mateu Farrà and Augusti Sala. While the manufactures of Joan Francesc Seguì y Feliu and that of Francesc Magarola operated from 1756-1757. According to a report prepared by the Junta de Comercio de Barcelona, in 1761, there were 16 factories of *indianas* who operated a total of 685 looms in the city (BC, Fons Barò de Castellet, 79/1). There were also 48 individual weavers registered for a total of 177 looms. Overall, in 1761, in Barcelona and in the whole area of the Principality of Catalonia, there were in place 907 looms that consumed 6,199 tons of raw cotton per year.

4. The evolution from artisan manufactures to the factory model

We can individuate three elements that, in some way, underline the evolution of manufacture of *indianas* towards the centralized manufacturing model: the use of capital, the organization of labour force and the managerial structures.

The level and quality of capital appear as important elements to discriminate between handicraft productions and the new factory model, especially if one takes into account that the business model adopted by manufacturers of *indianas* was, however, based on the family structure. The latter case may lean towards an identification of factories of *indianas* as most-developed forms of artisan productions. Grau and Lopez (1974) estimated that the average capital of a manufacture of *indianas* with about 12 looms was about 10,000 lliures. Therefore, the presented case study is in line with the average dimension of Barcelona's *indianas* manufactures as reported in Table 1.

Table 1. Average capital of Barcelona's *indianas* manufactures

Firm	**Capital (in Catalan lliures)**	**subscribers**
J.B. Sires & Co.	26.543	Miguel Alegre (21.015) J. B. Sires (5.528)
Serra & Co.	10.374	n.a.
Alegre & Gibert	36.000	n.a.
Esteve Canals & Co.	7.280	Esteve Canals (1.120) Mariangela Regas (1.120) Juan Pau Marti (1.120) Francesc Villar (5.040)
Maria Fomenti Gusta & Co.	27.000	Maria Fomenti Gusta et al.
Isidro Catalá & Co.	26.000	Isidro Català and son

Source: R. Alier, *La fabrica d'indianes de la familia Canals*, «Origens del Capitalisme, Recerques. Historia, Economia, cit., p. 61. AHCB, Fons Comercial, B 141

The traditional textile productions required a small initial capital, mainly consisting of looms and other few tools. Differently, the new factories of *indianas* required a relatively big

amount of capital due to the necessity of a specific building – substantially different from the cottage manufacture site – specific equipment and the acquisition of water supply for the bleaching phases. This was a real rupture with the traditional productive model of the period based on guild handicraft, merchant production and domestic system (Thomson, 1992).

The organization of labour was mainly the result of two factors: the huge amount of workers necessary for the functioning of the factory and the extensive division of labour. If we analyse the structure of work in the textiles workshops (wool, silk and even cotton) that have characterized the European proto-industrial overview, we can see how the organization of work was still deeply tied to a handicraft/guild model, based on the presence of specialized workers in subcontracting of semi-manufactured or in lesser-value transactions (Maixé Altés, 1988). The "fabrica de indianas" (manufacture of printed and dyed cotton canvas) seems to overcome this presumption by presenting itself as a place of production in which the organization of work is essentially centralized. It is based on the specialization of production stages and on internal logistics, in a context of free bargaining of the labour production factor, characterized by a renewed relationship between man and work (Grau and Lopez, 1974; Raveaux and Sanchez, 2010).

Although, in the mid-eighteenth century, the total of workers of Barcelona's *indianas* industry was not so high (it is estimated that there were about 10,000 workers) to talk of a massive expansion of the factory system; it is true that such a transformation, in a few decades, permanently influenced the entire Catalan secondary sector (Miguel Lopez, 1996).

The third element was the managerial structure, mainly based on the distinction between ownership and direction of the factory. This was a clear passing of artisanal structure based on a master craftsman concerned more on the labour as much as managerial tasks (Ogilvie, 2011). The new managerial structure was probably the result of the investment of the commercial capital in the industry and the subsequent concentration of managerial functions in the hands of one individual. In fact a very similar organizational structure was first developed in the Barcelona draper's shops were there was a distinction between the ownership – usually a firm – and direction, entrusted to a salaried *botiguer* (shopkeeper) (Thomson, 1992; BC, Fons Junta de Comercio, Caixa 71).

The enforcement of quality control

Considering that the *indianas* production was mainly based on two different phases, (weaving and dyeing), the product quality was important for different reasons in both phases. For spinning and weaving, the quality was the base for the production of a well-done bolt, light and resistant for the dyeing process. In this case, the quality of raw material was important (the Maltese cotton was better than the New Spain ones) in order to have a bolt with tight and compact wires (Arte de Hacer las indianas, 1791). On the other hand, the dyeing and printing process constituted the high value-added phase so the colours might be brilliant and resistant. This process was the result of a production protocol that preserved the quality of raw materials used and that disciplined the different and subsequent production phases.

The Spanish Crown, by the Junta General de Comercio de Barcelona (a government agency designated, among other things, to control the fabrication of *indianas* in Catalonia) implemented the quality control and characteristics of the product in order to have a product of better quality and be able to compete with foreign items (British and French in particular). This kind of quality enforcement conducted by public powers was a common characteristic of European mercantilist states of the eighteenth century. It had the double scope of control of

workers for disciplinary purposes and the production of a high-quality product comparable with abroad (Alvarez, Gutiérrez and Romero, 2002; Carmona, Ezzamel and Gutiérrez 1997, 2002; Carmona and Gomez, 2002; Carvalho, Rodrigues and Craig, 2007).

The order of Charles III of October 4, 1767 had established a rather precise legal framework within which the production activities of *fabricas de indianas* were to take place. In addition to determining the technical specifications to comply with the manufactures, the ordinance stated that the title of *Fabricante* (General manager) should be subject to skills verification by two experts appointed by Junta particular de Gobierno del Comercio de Barcelona (BC, Junta de Comercio, Caixa 201). The ordinance of October of 1767 included a rigid determination of the qualitative characteristics of the bolts. In particular, it was expected that the cotton canvas for the production of "*indianas regulares*" (regular *indianas*) would have to maintain a width measure of 5 Catalans palms for a total of about 140 cm. Furthermore, the norm governed also the minimum number of wires, at least 1,300, which were to constitute the warp.

The contravention of the provisions established by the ordinance would have resulted in the seizure of the irregular bolts and a fine of 50 reales for each irregular canvas. The manufacture and the use of cotton canvas of width less than or equal to the four palms would have been destined for *blavetes* or *blauetes* (cotton blue dyed canvas) for purposes other than the production of *indianas*. The *cotonadas* (cotton printed canvas in bright colours) should have a 4-Catalans palms width (85 cm ca.), while the warp had to be constituted by at least 1,100 wires[2].

5. The case study: The J.B. Sires & Co.

The first information we have about the manufacturer Juan Baptista Sires dates back to 1769, the date of the first book that reports accounts of several individuals for the supply of *indianas* and *pezze* (bolts) (AHCB, Fons Comercial, B 228). Arguably, Sires' company existed for some years, founded by Juan Baptista, probably in the early 1760s, thanks to the experience acquired in colouration by Sires, who was the son of a Barcelona's *droguero* (a trader of products for the colouring of textiles). A much-more comprehensive document dates from 1770, when the company settled under the name of J.B Sires & Co. was officially founded and based in the *carrer* (road) Trentaclaus, in the Raval district of Barcelona (Vicente, 2000).

The new established company had a duration of six years and involved the merger of the two existing factories of *indianas*, one named Alegre y Gibert and the other named J. B. Sires[3]. The capital of the company, as reported in the deed of incorporation, was divided into

[2] Catalan weight measures: 1 quintar = 41,6 Kg; 1 quartero = 2,6 Kg. Catalan length measures: 1 palm = 21 cm; ca. = 1 cuarta. Catalan money: 1 lliura = 20 solds = 240 diners; 1 Spanish real = 2 Catalan solds.

[3] Charter act of J.B. Sires & Co. (1770)
In the name of Lord, amen.
About the company and its items undersigned by Maria Antonia Alegre y Gibert, Miguel Alegre y Roig, mother and son and Agusti Gibert y Xurrich husband, all from the honorable city of Barcelona and all living in that city by one side and on the other side Juan Baptista Sires, merchant living in the city of Barcelona. Both the two parts agree and undersign the following conditions, pacts and agreement.
Firstly is agreed between the parts to establish and undersign a good, real and loyal company and firm for the time of five years and half, starting from the next 12 September 1770 until 11 march 1776. The company has the effect to continue with the union of two factories of indianas owned by the parts. The first settled in Carrer de Trentaclaus under the name of Alegre y Gibert and with the protection of Nra

equal parts, paid by Agustì Gibert, his wife Maria Antonia and her son Miguel Alegre that subscribed 18.000 Catalan lliures. While Juan Baptista Sires did not pay up capital but brought his know-how and undertook repaying the three members any excess of capital above the deposited 18,000 lliures, which eventually resulted from the inventory. The deed specifies that the capital was calculated according to the contributions of the members, made up of tools and instruments preserved in their factory. Such objects were included in an inventory realized by Juan Baptista Sires (BC, Fons Barò de Castellet, 82/3).

In the same deed, the partners Alegre and Gibert appointed Juan Baptista Sires as *fabricante* (factory manager) with the authority to take any action necessary for the activities of the factory, with the exception of money borrowing without the authorization of Alegre and Gilbert (BC, Fons Barò de Castellet, 82/3). In this way, the majority shareholders made sure of the indebtedness control of the company and limited the financial choices of the administrator. Given the activity of the manager, Juan Baptista Sires received 450 lliures a year. Moreover, in case of operating losses, the administrator contributed to the settlement for an eighth, while the leftover was distributed among the other partners. The deed of incorporation, finally, included two exclusive duties for the manager that did not perform any business or manufacturing activity on its own if not for the benefit of the company; furthermore, he was obliged to bind its share of capital in that of the company, with explicit prohibition to collect it until the expiration thereof. In addition, in the administrative control and management of the factory, Juan Baptista Sires was commissioned to keep accounting books with the help of an apprentice.

In 1772, the partners expanded the base of the company admitting into the social structure Alegre y Gibert & Co., a commercial company owned by Miguel Alegre and by the shareholder Agusti Gibert Jr. The company Alegre & Gibert was, however, the bearer of a pioneering and extensive experience in the trade of new cotton products (Vicente, 2006). As result from the inventory drawn up on the merger of manufactures, the capital amounted to 26,543 Catalan lliures (equally to the current assets of the company), of which 21,015 Catalan lliures were by Alegre and 5,528 by Juan Baptista Sires (AHCB, Fons Comercial, B 228). It is important to note that was considered only the circulating capital (money, raw materials and finished *indianas*) without any attention to the fixed capital (tools and machines).

In the division of roles between the partners of J. B. Sires & Co., Juan Baptista Sires took the office of *fabricante* (general manager), with the responsibility of overseeing all the production phases (weaving, preparation of colours, stains, application process on raw canvas, etc.). Furthermore, he had the charge of selecting the staff and allocating it to different productive phases (Molas Ribalta, 1985). Francesc Fraginals took care of the commercial side, dispatching the finished *indianas* to customers; while Joseph Aymar took charge of the colour manufacturer, with the responsibility of overseeing the preparation and use of colours and stains and the application on the rough canvas. Both Fraginals and Aymar were old business partners of Juan Baptista Sires. The difference between technical management and accounting and administrative management of the factory was common among manufacturers of *indianas* of Barcelona. Differentiation came to be even more selective in the moment of greatest development of such a manufacture, in the second half of the eighteenth century, with

Senora dels Dolors, Santa Eulalia y San Antonio de Padua and the factory of Sires settled in Carrer de Sant Pau under the protection of Santa Anna. The new factory will have the protection of Nra Senora del Dolores, santa Eulalia, sant Antoni de Padua y Santa Anna.
Source : B.C., Fons Barò de Castellet, 82/3

the simultaneous presence of a *mayordomo de pintados* (colouring supervisor) and a *mayordomo de tejidos* (weaving supervisor) (Molas Ribalta, 1985; ADB, Archivo Paroquial de S. Maria del Mar, Caja 68).

Technology and production

The real peculiarity of the production of *indianas* is not located in the weaving process itself as in the process of colouring and printing the raw canvas. It is obvious that the quality of the semi-finished product was an essential element for the benefit of the final quality of the product. The process of tissue staining was held in the *prat* (bleaching field). The *prat* had to be near fresh and clean water, had to be sloping in order to facilitate water flow and finally had to be wide enough to permit the settlement of machinery (Ardit, 1819).

In the *prat*, raw canvases were washed and dried in the sun to allow weathering to facilitate bleaching, and then they were stretched on wooden trestles. At first, the paintings were washed in running water by force of arms, repeating the operation several times. Over the years, this procedure was improved by the introduction of *lavadero*, a series of opposing grooved cylinders, placed inside the channel of water, through which the canvases passed repeatedly. The washing operation was followed by beating, in which the paintings were arranged on a table large enough to hold them in full and, literally, beaten by a wooden mallet driven by a water mechanism (Ardit, 1819). After the washing, the raw canvas passed to the real bleaching process. This operation was done by means of steam with a *caldera* (a metallic vat) or with chemical agents such as potash or muriatic acid. The steam system was the cheapest – the one used by JB Sires & Co. – and was based on a copper vat large enough to contain the canvases (about five to eight feet deep and five feet in diameter).

This process allowed the bleaching of about 30 to 40 pieces at a time. The pieces were placed in the vat, immersed in a solution of lye (caustic soda), completely covered, and then the cap was closed and sealed with a strip of leather; finally, a fire was lit below the vat. A very similar system was also used for the dye bath with the *Adrianople* and *carmine* red (Arte de hacer las indianas, 1791).

The printing process began with the creation of the mould. It was engraved directly on a wood support or on a wooden support coated with a copper foil or directly made in brass. In general, carrying out the wooden moulds when it came to simple designs with larger and less-precise contours was preferred; conversely, the use of metal moulds answered the need to prevent mixing of the wood grain with the contours of incision. A designer realized the model, generally on the instructions of the manufacturer, according to those that were the tastes of the moment. According to documentation of J.B. Sires & Co., the mould-pressed procedure was used until the end of the 1780s, only replaced by the press cylinder in the new century. The operation was carried on by placing the paintings to be printed on a sturdy table, secured to the ground, placed on a gentle slope to allow the outflow of the exceeding mordant and colour. (Arte de hacer las indianas, 1791). After being printed, the canvas was gently lifted by a worker and placed on an easel for drying in a special environment artificially heated by stoves or through skylights that filtered sunlight.

The mordanting completed the printing process. This could occur during the printing process of the most delicate decorations or by a successive bath to fix the colours. Specifically, the bath was necessary to fix colours, such as flesh colour, coffee, red, yellow and olive green. To carry out the bath, the stainer used a kneading trough that contained three cylinders through which the canvas was passed repeatedly while bathing in the mordanting solution. At the end of this operation, the canvas was placed on a dryer. The dryer was placed in a special

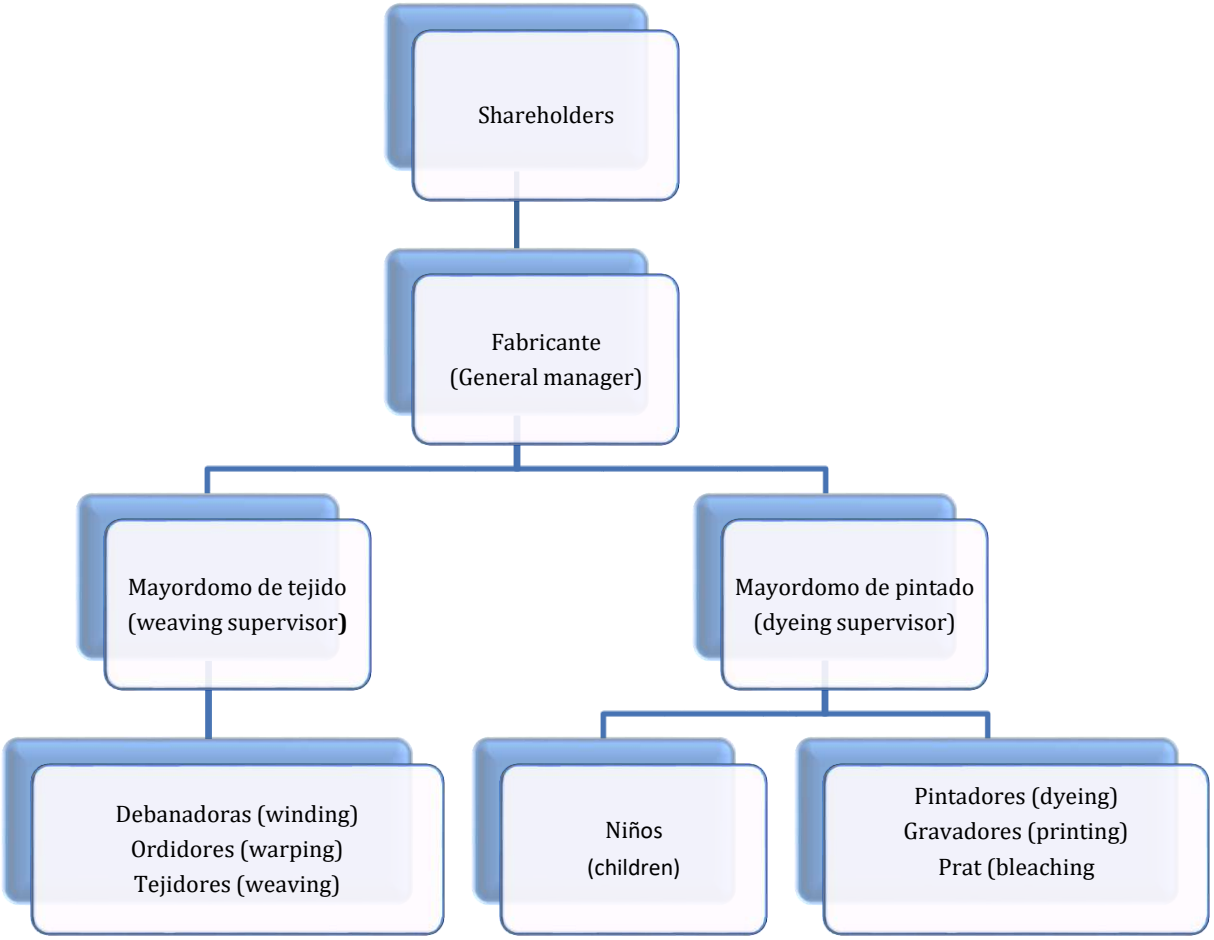
room set up in the factory and artificially heated, because the paintings had to dry quickly and did not have to remain exposed to the elements that could degrade the colours and designs (Arte de hacer las indianas, 1791).

The work organization

The structure of labour within the J.B. Sires & Co. factory, as well as homologous factories of Barcelona, was based on an organization headed by the general manager (*fabricante*) (see figure 1). The manager sometimes coincided with the owner (or one of the owners of the factory) and had its origins in the manufacturing craft (Vicente, 2000). Juan Baptista Sires, in fact, had significant experience as a manufacturing and trading *droguero*, a seller of dyeing products; experience then poured inside the factory. This was quite usual at that time in Barcelona[4]. The activity of the *fabricante* was regulated by the instructions, usually included in the records of the firm. The *fabricante* could not sign contracts or make purchases without the prior consent of the administrator; that consent had to be referred to a particular "register of approvals". Such consent had to precede all operations of purchase of material useful to the factory and for the work connected with it. The work of *fabricante* was rewarded with a monthly salary paid on the profits of the manufacture and with the benefit of free housing (in a special room built inside the main body of the workshop) (ADB, Arxiu S.ta Maria del Mar, Caja 68). In the manufacture of Isidro Catalá, the partners decided to appoint two different *fabricantes*, one for *indianas* and another for dyeing and printing, entrusting two technical experts with the coordination of the two main production processes. Next to the figure of the *fabricante* – which in some ways was ahead of that of the owner of the factory – there was the *mayordomo.* He had the task of supervising the proper execution of all phases of production; a person of trust, often a family member with experience, was very frequently in the textile industry (ADB, Arxiu S.ta Maria del Mar, Caja 68).

Figure 1. J.B. Sires & Co. factory organization

[4] Another example of this is provided by the manufacture of Llorens & Sevilla (which flowed into the most-famous manufacture of Isidre Català), for which the members decided to appoint Bernat Llorens as *fabricante* delimiting his powers only to the technical direction of manufacture (ADB, Arxiu S.ta Maria del Mar, Caja 68).



Below these positions that we can define as managerial, the real organization of the work of the factory took place (see figure 1). First, there were the *debanadoras*, female workers specialized in unravelling spools of yarn and wrap – worked out by rural artisan manufacturers – stored in the warehouses of the factory. It was a job typically assigned to women for two reasons; first, it was considered a generic and unskilled job, for this reason, during the eighteenth century, reserved for workers with lower skills and lower capacity to contract. Furthermore, there was a technical issue related to the small female hands, more suitable to perform the steps of winding the bobbins (Ayala, 1987). Another category of workers was constituted by *ordidores*, which were occupied with the correct positioning of the wires of cotton on the loom, according to the expected number for each type of canvas. The *tejidores* took care of the production of raw canvas, working with the loom. The *peons* were, however, unskilled workers in charge of the transport of heavy operations, such as canvas washing and mordanting. This first level of workers was completed by *niños*, child labour force, in an intermediate position, to support activities of weaving and dyeing (Boy, 1839). Among these little workers, future *pintadores* and *gravadores* were allegedly recruited; this represented a sort of training path within the factory, to learn the skills necessary to become a skilled worker.

The second tier was made by the *gravadores*, skilled workers for the preparation of the moulds for printing the canvas. The moulds were made by following drawings of the same

gravadores or acquired externally. The work was completed by *pintadores,* applying the mould to the rough canvas with colours. The *prat* workers formed the last major category of factory staff. They were skilled workers in the operations of bleaching, drying and preparation of canvases; such workers carried on their tasks in the *prat* (yard or field for drying and exposing raw canvases to the sun to be whitened) away from the main body of the factory and placed near a watercourse. The labour of the workers of the *prat* was particularly burdensome, as the same were also in charge of the surveillance of canvases left to dry, the reason for which being they were often housed in buildings located within the same *prat*.

In a primitive phase of the work organization, prior to labour regulation, the duration and stability of it only responded to productive reasons. This means that workforce level was a key to regulating productivity and (almost) fixed costs. It is difficult to establish parameters for working hours in the factory. As for agricultural activities, even for manufacturing, working hours coincided with the presence of sunlight. In fact, the conventions in use in the eighteenth century deemed a workday duration of about 12 hours, from dawn to noon, then after a break of an hour or two, depending on the type of work and, above all, the owner of the factory, work continued until sunset. Seasonal conditions and weather influenced the workday, being shorter and very cloudy in the winter months and longest during the sunny summer days (Boy, 1839).

The work was distributed from Monday to Saturday, except on Sundays and holidays of religious precept, the only consideration for work suspension (Ayala, 1987). This trend is clear from the records of the weekly payroll of J.B. Sires & Co., which, however, emphasize that the production cycle of *indianas* was a continuous cycle and not susceptible to breaks. For this reason, the workers assigned to the *prat*, worked on numerous Sundays in order to handle the load of bleach and dry cloth ready to be printed and coloured with the start of the new week. All other holidays did not involve an interruption of the work except for the time strictly necessary for the participation in the mass.

The workforce

The workforce within the factory had a substantial numerical instability, closely linked to the production steps and exogenous factors that might influence them. The chronicles report, with a certain frequency, the halt in production of many *indianas* factories of Barcelona, caused by the lack of supply of raw cotton from Maltese importers (Torrella Niubó, 1961).

The J.B. Sires & Co., from a point of view of the labour employed, was an average big business in the sector, with about 110 workers and 40 looms. In 1739, the Serra & Co. manufacture, with royal privilege, boasted 48 looms and 117 workers, while in 1746, the great factory Sebastià Canals of Barcelona counted as many as 300 workers with 100 looms (Vicente, 2006). The number of workers employed in the production process, however, is not an exclusive index of the size scale of the workshop, because we must first keep in mind that manufacturing process of the semi-finished products frequently was outsourced. In addition, almost all the manufacturers of *indianas* in Barcelona – but the example was common to most of the European countries – were located within the city walls, so with little space available. In 1760, the Swiss factories of *indianas* of Neuchatel occupied, on average, 47 workers, while in Geneva, the average went up to 235. In the same year, in Mulhouse, in Alsace, the average of the workers employed was 267. The contrast was only given in the Swiss factory of Jean Rodolphe Wetter, who, unique among private entrepreneurs, employed about 600 workers in 1762. Clearly, these figures seem insubstantial compared to the numbers of the big factories,

like the French Royal Manufactures of Villeneuve in Languedoc with 3,000 workers employed or Abbeville, which could count on 4,000 workers (Thomson, 1992).

The differentiation of workers by gender and age is one of the main themes of the historiography on industrial development. Moreover, the question of the division of labour was already highlighted by Adam Smith as a central element of the modernization of the economy. In this sense, the spread of the factory system had also led to a segmentation of the labour market, which had all the characteristics of the new system compared to handicraft manufacturing or proto-industrial complex. The cotton manufacture demanded dedication to new production procedures, compliance with work schedules and tasks, close supervision and acquiescence for machines that workers do not had the property, unlike what happened in the corporation manufacturing system (Galbi, 1997). Then the ability was necessary to work together with other people in a closed space and with the disappearance of personal and direct bargaining between shopkeeper and worker, definitively the depersonalization of work (Landes, 1993).

In the *indianas* production, the labour force was divided vertically into three broad categories: male, child and female, according to a scheme widely used until recent times. Of particular interest is the consistency of these categories; specifically female employment was constituted by *debanadoras*, which, as seen, formed the bottom of the production function. It was, essentially, unskilled workforce, so much so that this function, in the course of the life of J.B. Sires & Co., was outsourced at a time when the company preferred to focus only on high value-added functions. The second category of workers was made up of the *niños*, child workers, with an average age between 7 and 15 years.

Table 2. J.B. Sires & Co. Female and child workers (percentage on total) 1779-1798

Year	% female workers	% child workers	Total amount of female and child workers
1779	21,75%	14,92%	36,67%
1780	21,59%	14,79%	36,38%
1782	18,56%	21,45%	40,01%
1784	19,62%	17,75%	37,37%
1787	21,03%	17,66%	38,69%
1792	8,29%	19,74%	28,03%
1794	0,00%	35,67%	35,67%
1798	0,00%	35,78%	35,78%

Source: Elaboration on data AHCB, *Fons Comercial*, B 241 (1779); B 242 (1780); B 244 (1782); B 246 (1784); B 250 (1787); B 253 (1792); B 256 (1794); B 258 (1798).

According to data reported by Thomson (2005), employment within the manufacturing of *indianas* was divided between about 55% men, 25% children and 20% women. This figure, according to the English scholar, was somewhat stable within the industrial sector and the results of J.B. Sires & Co., as can be seen from the table 2, and

corroborated the claim. It is interesting to note that the figures of female labour remained stable for about a decade until the early 1790s, when it was drastically reduced and then disappeared as a result of a reorganization of the productive functions (Gullikson, 1991). What appears clear in our case study is that the female workers were compressed and their work outsourced at a certain point (due to the fact that was mainly unskilled and related to a labour intensive production phase) in favour of child workers that were necessary to implement the most value-added production phases (colouring and dyeing) (Goldin and Sokoloff, 1982).

We can verify a wage differentiation applied to the female workforce, paid on the basis of the quantity and quality of production, with average wages lower than those of their male colleagues. The fiscal accounts of J.B. Sires & Co. reported that the *debanadoras* were mainly piece-workers, paid on the amount of yarn prepared for weaving and by the qualitative characteristics of it. In this sense, there may be a wage differentiation within the category, between the most experienced workers – capable of producing larger quantities of yarn prepared for higher quality – and those with less experience.

The accounting system

The factory system at the base of the manufacturing model represented an innovative element in the path towards industrialization of the textile sector. The modernization of the production mode based on centralization of manufacture, standardization and diffusion of technology and division of labour was unquestionably the most remarkable progress in the transformation of industry (Mokyr, 2010). At the same time, such transformation represented also the modernization of the governance processes (Johnson, 1981).

The use of double-entry bookkeeping in Spanish accounting systems dates from the second half of the sixteenth century, when the first legislative provision, first by Charles V and later by Philip II, prescribed for merchants and bankers working in the Kingdom of Castile to keep accounts in double-entry registers with a balancing method. In 1592, this prescription was extended to the Real Hacienda accounting books, expanding, in fact, the application of the double-entry bookkeeping also to the public sector (Hernández-Esteve, 1985, 1996). During the following century, the accounting knowledge had little diffusion and evolution – probably because of the continuing economic crisis that hit the Spanish Empire – as demonstrated by the very limited publishing of treaties on the subject. Throughout the seventeenth century, the only two accounting treaties published in Spanish were printed in Amsterdam by Sephardic Jews, respectively, in 1697 and in 1706 (Hernández-Esteve, 1981; Lepore, 2005).

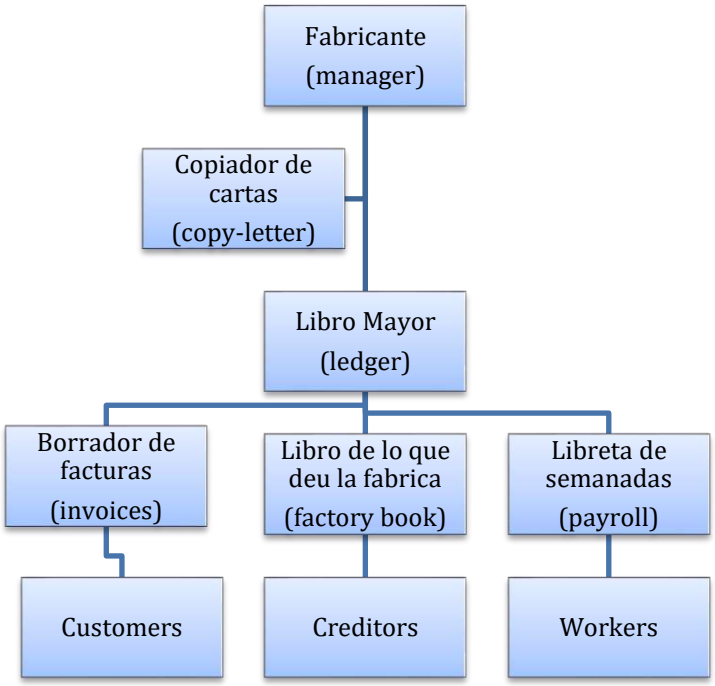
In 1737, following the issue by Philip V of the ordinances for the Consulado of Bilbao, the obligation was established for wholesalers to maintain at least four books (Gárate, 1995; Hernández-Esteve, 1996; Carmona and Gómez, 2002). The prescribed books, to be kept in single or double-entry, were:

1) *Borrador* or *manual* (journal)
2) *Libro mayor* (ledger), also bound and numbered on each page, with the letterhead of the merchant and the indication of the used period;
3) *borrador de facturas* or *libro de facturas* (invoices book, to write down all the merchandises purchased and sold), bound and numbered;
4) *Copiador de cartas* (copy-letter)

The Royal Ordnances of 1766 (BC, Junta de Comercio, Caixa 71) only prescribed for the factories of *indianas* the adoption of two books: one invoice register and a factory book, both to be kept in chronological order but not the adoption of the double-entry bookkeeping. The adoption of such accounting system, essentially based on the pattern planned for the commercial activities of the Consulado de Bilbao, could be intended as an encoding of institutional principles into rules (prescribed by the ordnances) and routines (the practice in use by Barcelona's merchants).
The accounting system of J. B. Sires & Co. was based on the following books (see figure 2):

- *Libro Mayor* (ledger)
- *Borrador de Facturas* (invoice registers)
- *Libre de lo que deu la fabrica* (factory book)
- *Libreta de semanadas* (detailed payroll)
- *Copiador de Cartas* (copy-letter)

Figure 2. J.B. Sires & Co. accounting system



Essentially, the factory's accounting system was based on two categories of books:

1) Book for internal operations: *Libreta de semanadas* (payroll),
2) Books for external operations: *Libro mayor* (ledger), *Libro de lo que deu la fabrica* (factory book), *Borrador de facturas* (invoices) and *Copiador de cartas* (copy-letter).

The emoluments paid to workers employed by the factory were registered in the *Libreta de semanadas,* categorized according to the degree of specialization. The recordings

were made on a weekly basis, and each register contains registrations about a full calendar year. For lower value-added functions, characterized by a piece-worker organization, the numbers of pieces produced were also noted (see illustration and table 1 in appendix). In the same register, on the side-lines, the weekly expenses for factory operating costs were reported, such as purchases of raw materials, purchases of dyes and chemicals mordant, maintenance and payment of customs duties for the purchase of cotton yarn from abroad (see illustration 2 in appendix). These former entries represent a sort of draft recorded day by day during the working week. In this way, the *Libreta de semanadas* also seems to have the functions of the journal, although only for factory expenses, considering the absence of the journal as prescribed for merchants in the ordinances of the Tribunal of Commerce of Bilbao (Hernández-Esteve, 1996). Some examples of *Libreta* have a summary entry at the end of the accounting period that reports the total amount spent by the factory for the emoluments and salaries.

The Company of Joseph Rovira – working in Barcelona between 1770 and 1805, with 35 looms and about 90 workers – reports in the *Libreta de semanadas* an inventory that shows the value of the tools and machines owned by the factory. The document has an opening balance sheet in which, date-based, they present the loans and debts of the company for the previous fiscal year. This case can explain the consideration of the overhead costs by the Rovira company and the need to report, albeit in elementary and rough shape, the characteristic elements of the amortization of capital assets. Unlike the case of J. B. Sires, the Joseph Rovira factory has a *Libreta de Semanadas,* in which are reported the working days but not the number of produced pieces. This would leave one to assume greater control of production phases and a better assessment of the quality of work done by the factory workers, reducing the need of control of produced quantities.

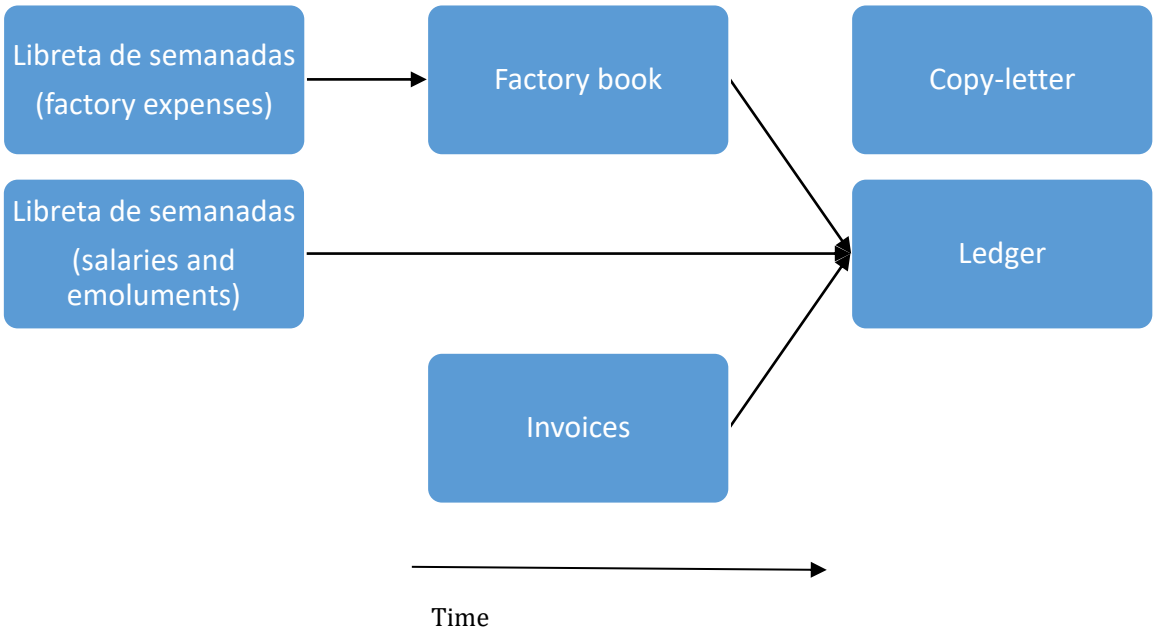
The *Libre de lo que deu la fabrica* (factory book) was an accounting book to register all debts and payments made in the factory (AHCB, Fondo Comercial, B 247 – B 269). In particular, in all surviving books, were first noted the operations for received loans; typically, this operation referred to credits received in the previous year. Second, followed the expenses for the purchase of raw material (cotton in yarn or canvas), for dyes and mordant, and for the maintenance of the machines or the same factory, already recorded in the *Libreta de semanadas*. The register shows the notation of the debit items under the heading *deu dare,* while the balance item is recorded under *avere*.

The *borrador de facturas* was a book where all receivables were recorded in chronological order. There were registered all the customer data, the amount and often the quality of acquired *indianas*, the purchase price and the cost of packaging. In addition, each record noted the reference to the specific pages of the *libro mayor* (ledger). The book does not present a final summary account.

The *borrador de facturas* was preceded by a name's column in which the customer names were annotated with the reference to the pages of the register in which they reported related transactions (Hernandez Esteve and Prieto Moreno, 2008). In some cases, it occurred in the surviving registers until the end of the eighteenth century; the closed operations were barred with two cross lines. This practice appears later abandoned and the records do not show signs denoting the balance of the operations. A possible hypothesis is that the functions of the journal – not yet officially adopted by the *indianas* manufacturers – were carried out by the *Libreta de semanadas* for the expenses and by the *borrador de facturas* for incomes (see figure 3).

The information of books for internal operations were integrated with the books for external operations, while all data finally flowed into the ledger.

Figure 3. Chronological connection between accounting books of J.B. Sires & Co.



The *copiador de cartas* was a complementary book to the accounting system, in which business correspondence was reported. All correspondence was transcribed in chronological order, noting the sender or recipient and the subject of the message. The fact that this register had been delivered to the city archive makes us guess that it was necessary in order to rebuild the commercial activity and the definition of any debtor or creditor items.

Finally, the surviving records does not allow us to understand if the return on capital was an extraordinary item in the accounting system or if his absence is attributable to the loss of part of the books. Only in two surviving factory books, the first registration consisted of the amounts due to the two partners, Miguel Alegre and Juan Baptista Sires, as remuneration of the paid-up capital (AHCB, Fondo Comercial, B 255 – B 256). We could hypothesize that the profits were not distributed systematically and thus were retained as self-funding from the company. The accounting books of J. B. Sires are devoid of useful elements to evaluate the assets, which also have to be of some significance, given the presence of looms, tables for colouring, tools and presses for printing. As seen, the only inventory survived covers the process of fusion of J. B. Sires & Co., which allowed us to have a very general framework on the type of plants present in the factory, the tools used and their value, reported according to the purchase price.

As we can see, the accounting system developed by J.B. Sires presents some differences compared to ordinances of Tribunal of Commerce of Bilbao. The differences could be individuated in the nature of accounting system and in its functioning. Firstly, the

ordinances of Tribunal of Commerce of Bilbao were conceived for merchants. At the beginning of eighteenth century, the manufacture, not only in Spain, was essentially based on an artisan model direct consequence of guild-regulated craftsmanship. It means that the "accounting necessity" for the manufacturers was quite limited. In the same period, Spanish firms adopted different accounting systems based on single-entry bookkeeping, according to the necessity of control of people involved in the business (Disertacion Critica y Apologetica, 1793; Capelo, 2007). Moreover, the necessity to shift towards a double-entry bookkeeping system – that effectively widespread only in the nineteenth century among Barcelona's cotton mills – and the adoption of the journal and of the auxiliary books, to control and record items and values, could be considered as the consequence of the transformation of production mode for manufactures of *indianas*. In this way, the accounting system adopted by Barcelona's *indianas* manufactures could be considered as an intermediate developing phase between the traditional mercantile accounting system (single-entry bookkeeping based) and the new industrial accounting (double-entry bookkeeping based) that widespread at the beginning of the new century.

The management accounting

The management accounting system of J. B. Sires was primarily based on the calculation of the production costs of the different stages. Taking into account that, in the second half of the eighteenth century, the production of *indianas* was still considered a labour-intensive activity, we can explain why the attention of the company's managers was focused mainly on labour costs rather than on the machines that still did not constitute a real problem for depreciation.

The *Libreta de semanadas* was the main tool to exercise control of costs and was structured to differentiate the working components used in the production phases. The workers were divided by production phase: unwinding, warping, spinning, weaving, and then dyeing and printing. The list of employees, the amount of product produced and the agreed price per unit of product were reported for low added-value stages of production (unwinding, spinning and weaving). While, for the high value-added phases (dyeing and printing), the weekly salary paid to the workers was reported, whether or not the quantity was produced (see illustration and table 1 in appendix). The differentiation between skilled and unskilled labour was given by the pay discrepancy, since workers in dyeing and printing activities received a salary commensurate to the time worked and not the quantities produced. Thanks to this system, J.B Sires could control on a weekly basis the costs generated by the work, divided for each phase.

The *Libreta de semanadas* also reported the quantities produced, annotating them in an added column. Such indications are differentiated for each production phase and summarized in total at the end of the weekly sheet in order to achieve the synthesis data. The production data are reported in different units of measure. The unravelled cotton is reported in Catalan pounds, while the weaved *indianas* are recorded by their quality. The work of weavers is measured by the quantity. Every kind of bolt (raw *indianas*) is marked by a number: 13, 15 and 17, depending on the quality of the canvas and finally *indianatas (indianas*), the most valuable product of the factory but not the most sold. In fact, the lower-quality bolts had a wide market, especially among Spanish colonies. In the last part of the *Libreta* are annotated the *pintadores* (dyers), *gravadores* (printers, designers), *peons* (servants) and *niños* (child workers) (see illustration and table 1 in appendix). All these categories received a salary equal to the number of worked days, as well as *prat* (employees at the

canvases bleaching).

The calculation of production cost

The main concern for J.B. Sires management was the control of production costs. As seen, the *indianas* production was still a labour-intensive process, so the control of labour costs was the principal problem for the management. The tool used to reach such a result was the *libreta de semanadas*, which could be considered the primitive management accounting tool. The register, as seen, reports the cost for work divided in the production phases (departments). So we can consider the different productive phases as different cost centres. In that way, the management could periodically control the trend of costs in every single production phase, acting when necessary in reducing it. The accounting system appears not only as a tool to control financial flows but also as a decision-support tool for the *fabricante* (general manager). In many cases, such as the reported one, there was a further specialization in the control and management process due to the presence of a *Mayordomo de tejido* (weaving supervisor) and *Mayordomo del pintado* (dyeing supervisor). In this case, two different managers took account of every process developed inside that branch, finally reporting to the main fabricante (general manager), who controlled the two main production phases of the *indianas* manufacture separately.

The libreta de Semanadas reports, very carefully, the production costs for cotton unwinding in Catalan dinars per pound and the quantity produced by each piece-worker. In the same way, the bolts produced by warpers and weavers with the individual cost for a single type of bolt are reported. The first part of the *libreta* gives us quantity produced and quality reached by preparatory semi-finished product (raw bolt to be bleached and dyed). The second part of the *libreta* reports the wages paid to salaried workers (printers, dyers, bleachers) that represent the high value-added phases of the whole production process. Of course, it represents an operational tool for management decision process, in order to regulate quantities and quality produced.

The other relevant costs, such as raw materials (cotton, colours, mordant), were reported firstly in *libreta de semanadas* soon after the work costs and subsequently, as a sort of specific cost centre, in *libro de lo que deu la fabrica* (factory book). These entries followed a chronological order. Therefore, they were recorded accordingly to the date of payment. Finally, the integration of cost accounting and financial accounting can be found in the ledger. Differently from Seville Royal Tobacco Factory, in the Sires factory, there were no physical control procedures. So the accounting system was not enforced by personal control procedures to guarantee the correct use of raw material (Carmona, Ezzamel and Gutiérrez, 1997). The cost of raw materials is calculated precisely with a clear distinction among real costs for yarn cotton, costs for custom and transportation, costs for mordant and tools (see table 3).

Table 3. *Libreta de semanadas* 1st week 3 to 10 January 1784, expenses paid by J.B. Sires factory (transcript, see illustration 2 in appendix)

Payment of 2 quintars of garrofas (carobs); 16 sold per quintars; 4 quarteros of sego (tallow)	6.10.0
Payment to the directors of spun cotton company for the releasing receipt of December 18, 1783 (purchase of spun cotton)	300.0.0
Payment of 2 quintars of garrofas (carobs) at the same	6.10.0

price; 4 quarteros of sego (tallow)	
Payment for escandall (value appraisal) for cotton	0.7.5
Payment to the custom for import duties on 1 bala (bale) of cotton purchased from Juan Pacce	22.5.5
Payment for Busana and 4 quartas of oil	1.2.0
Payment for 3 quintars of bundles	1.14.11
Total of overhead costs	339.4.3
Work remuneration (as reported in illustration 2 in appendix)	276.3.7
Total amount of factory costs paid in the week	615.7.10

The *fabricante* could measure the production costs on a weekly basis using data from *libreta de semanadas*. This kind of information were possibly used to regulate the production and adjust it following the demand of *indianas* by the market and at the end of the year to measure the whole production process. These data flowed together in the annual balance sheet that reported all the yearly production with the different qualities of *indianas* produced, their quantities and individual prices. The annual balance also reported all raw materials used by the factory, debts and credit and financial movements (see illustration 3 in appendix).

6. Conclusion

In the last decades, accounting history literature based on primary sources: business records, institutional documents has questioned about the assumption that modern cost accounting emerged in the late nineteenth century. Among others, Fleischman and Parker (1991) have shown that a well-developed knowledge and use of cost accounting was present in the pioneer companies of the British industrial revolution already in 1760's. Most of the merit of such researches is actually conceded to Anglo-Saxon scholars for British or US case studies. Gutiérrez, Larrinaga, and Núñez (2005), applying Fleischman and Parker's (1991) model to Spain in the last 40 years of eighteenth century and examining primary as well as secondary sources shown that the knowledge and use of cost accounting also existed in Spain. The case study reported in the paper is less extended than the ones examined by Fleischman and Parker (1991), but closer to it because it deals with pioneers of industrial revolution. Furthermore it has close tight with the case represented by Gutiérrez, Larrinaga, and Núñez (2005), for period studied and the time series examined. It is significant to highlight that the emergence of modern cost accounting is dated at about the same time in both surveys. Despite we are talking about industrial revolution, British and Spanish contexts were different in terms of institutions, bureaucratization, monopolies and governmental intervention. As reported by Gutiérrez, Larrinaga, and Núñez (2005), most of Spanish companies suffered economic failure at the end of the eighteenth and the beginning of the nineteenth century for wide modification in the international context (French Revolution, war with England, independence of most of the American colonies).

It could be said, basing on current literature, that advanced cost management techniques were associated with industrialization more than industrial revolution in both the British and Spanish cases. Following a process that occurred to most continental European

countries in the second half of nineteenth century. What the presented case study suggests is that management accounting techniques in embryo were developed under the pressure of an increasing developed manufacture acting in a competitive field.

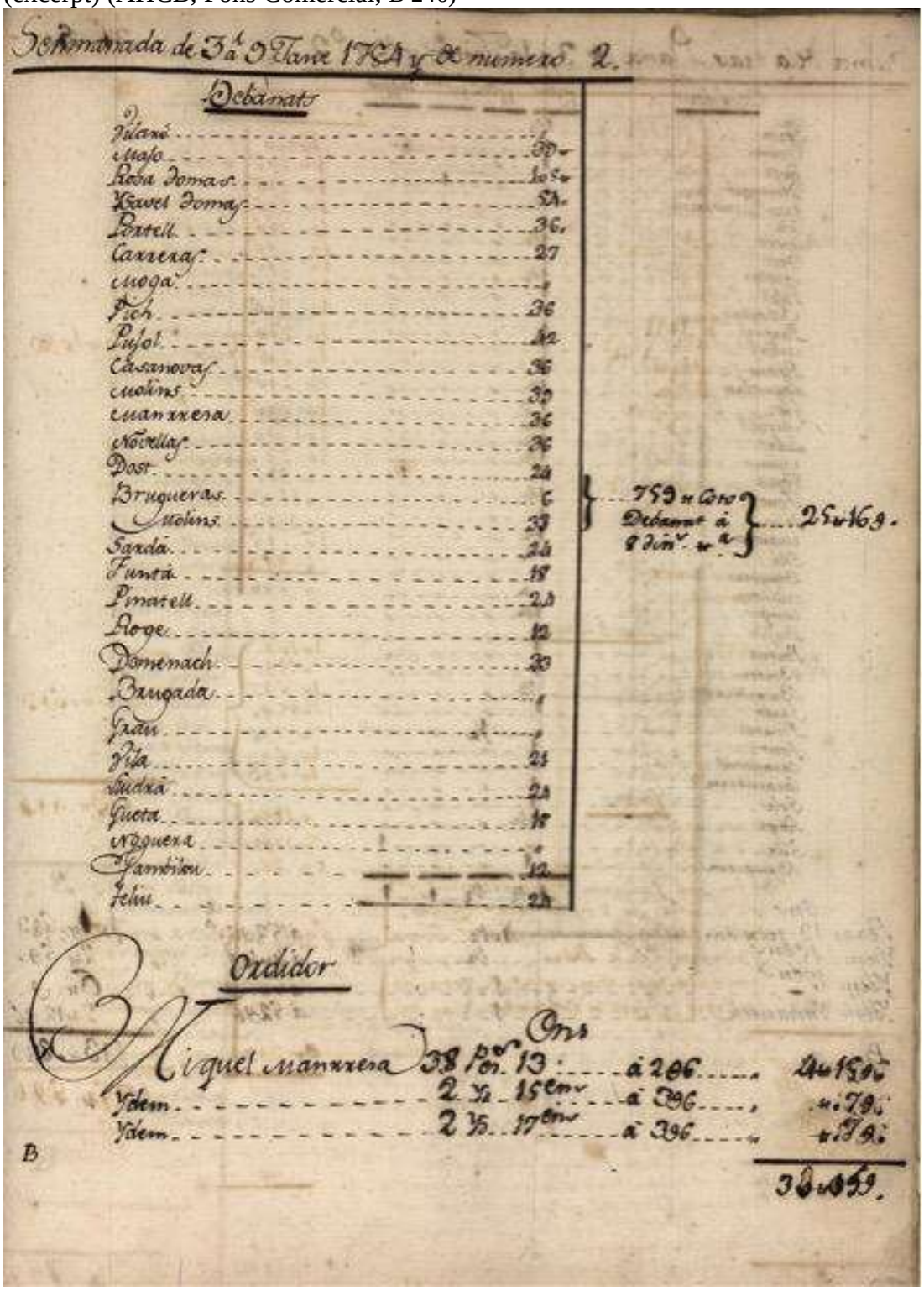
As suggested by Carmona and Gómez (2002) and Gutiérrez, Larrinaga, and Núñez (2005), the evidence reported in this paper supports the idea that the origins of management accounting are the result of economic and political reasons. For this we can consider arguments like the competition existent within the textile industry that was closed to strangers but open to national actors. This was a factor of increasing complexity in the textile manufacture and managers required information for decision-making. Moreover, we should consider the adoption of technology and the necessity to measure the performance of the machines in the production process, which for the first time set the problem of their costs and depreciation. Another important point highlighted by the paper is the organization of workforce. The *indianas* production is finally based on a factory model, far from the traditional handicraft system. In such model, the workforce skills are determinant for production phases and it is important for management to measure the productivity and quality. In this sense, our results indicate that Juan Baptista Sires & Co. implemented standards to control the activities of both the management and the labour force in order to determine production costs (Gutierrez and Romero, 2005). The sources evidence have shown that our case study developed elementary but effective practices of overhead allocation to product cost. In particular, we have observed that the salaries of workers were divided by department (and production phases) and there was a clear allocation of industrial costs (such as raw cotton, dyes, tools) separated by administrative ones (customs, fixing, transports). Admittedly, such apportionment did not constitute a modern and stable calculation; rather it represents an elementary idea of cost centres. Furthermore, there is a strong political factor to be considered, the advancement of national industry and attempts to increase international prestige - enforced by the Spanish Crown by Charles III new political economy - impacted on managers' decision-making. In this sense, the case reported is completely different from the monopolies analysed in previous researches. New product, new technology, new work organization represent the specificity of a new production model that could be considered as the joining link between the proto-industrial manufacture and the new factory model.

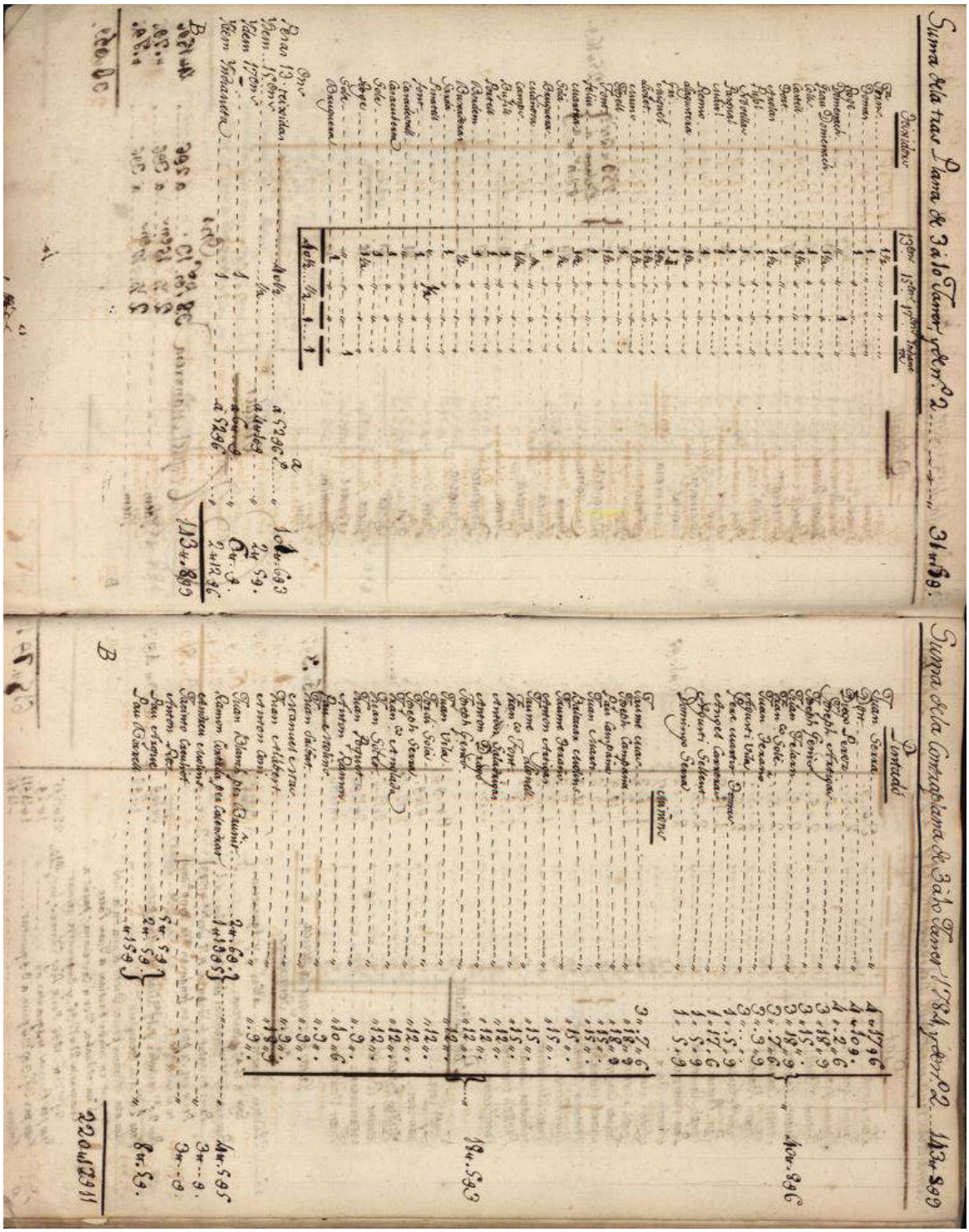
Finally, the paper argues that there is a sort of dualism, which should be taken into account when explaining the process of formation of a management accounting system within Barcelona's *indianas* manufactures. From outside the changes in political and economic frameworks in Spain; inside, the development of a new mode of production that needed span of control for new technology adopted and division and specialization of labour.

The research, admittedly, bears some limitations that may encourage future work. First, the cotton printing and dyeing was not the only industrial sector of eighteenth century Spain, so further researches in other sectors as cotton spinning, wool, silk, linen or steel mills, may provide some insights into the generalizability of our conclusions. The presented case study as a characteristic significance but it is not possible to consider it an extensive example. In particular, it would be significant to study the extent to which cost accounting of other Spanish textile manufactories had a specific character. In a similar vein, comparative studies may also shed light on the extent to which such ad hoc calculations were used to determine production.

APPENDIX

Illustration 1. J.B. Sires & Co., *Libreta de semanadas*. Week from January 3rd to 10th 1784 (excerpt) (AHCB, Fons Comercial, B 246)





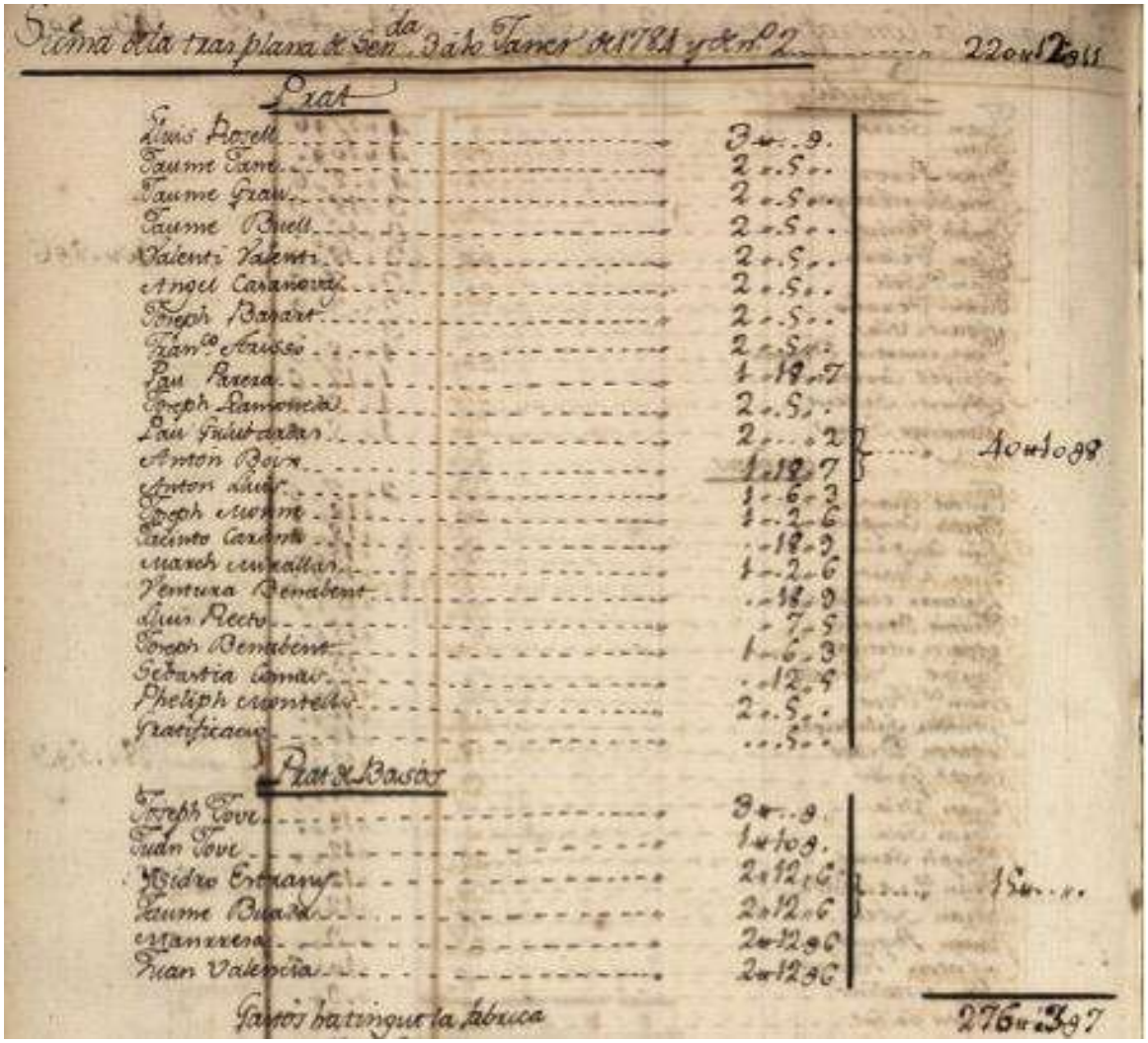


Table 1. (transcript excerpt of illustration 1) J.B. Sires & Co., *Libreta de semanadas*. Week from January 3rd to 10th 1784. All the amounts are (in Catalan lliures, solds and dinars)

Libreta de Semanadas week, from January 3 to 10, 1784

Unwinding

Worker's name	Quantity produced (in Catalan pounds)	Remuneration for the whole workers
Vilanò	39	20,8
Moyo	105	
Rosa Tomas	54	
Isavel Tomas	36	
Portell	36	
Carreras	27	
Moga	0	

Pich	36		
Pujol	42		
Casanovas	36		
Molins	39		
Mannesa	36		
Novellas	36		
Dost	24		
Brugueras	6		
Molins	33		
Sandà	24		
Funtà	18		
Pinatell	24		
Roge	12		
Domenech	33		
Brugada	0		
Grau	0		
Sudrià	24		
Vila	21		
Gueta	18		
Noguera	0		
Gambilon	12		
Feliu	24		
Quantity produced by the department	759 pounds of cotton		
Production cost	8 Catalan dinars per pound	Department's amount	25.16.0

Warping

Worker's name	**Quantity produced (in bolts)**	**Remuneration**
Miguel Mannera	38 (13 palms)	4.15.0
	2 (*indianas* 15 palms)	0.7.0
	2 (*indianas* 17 palms)	0.7.0
Quantity produced by the department	42	Department's amount 6.1.0

Weaving

	Quantity Produced

Worker's name	Item 13	Item 15	Item 17	indianatas	Remuneration for the whole workers
Juan	1 1/2	0	0	0	143.8.6
Tomas	1	0	0	0	
Roge	1	0	0	0	
Domenech	0	0	1	0	
Grau Domenech	1 1/2	0	0	0	
Colls	1	0	0	0	
Castell	1 1/2	0	0	0	
Dort	1	0	0	0	
Arolas	1 1/2	0	0	0	
Pujol	1	0	0	0	
Novellas	1	0	0	0	
Pasqual	1	0	0	0	
Udriol	1	0	0	0	
Remio	1	0	0	0	
Saguntera	1 1/2	0	0	0	
Gui	1 1/2	0	0	0	
Miguel	1 1/2	0	0	0	
Lloret	1 1/2	0	0	0	
Meno	1 1/2	0	0	0	
Torell	1	0	0	0	
Font	1 1/2	0	0	0	
Feliu	1	0	0	0	
Mantra	1 1/2	0	0	0	
Solà	1/2	0	0	0	
Bruguera	1	0	0	0	
Mañosa	1 1/2	0	0	0	
Camps	1 1/2	0	0	0	
Bufill	1	0	0	0	
Portell	1	0	0	0	
Bordem	1	0	0	0	
Buxaderas	1/2	0	0	0	
Sardà	1	0	0	0	
Pinatell	0	1/2	0	0	

Font	1	0	0	0	
Caradevall	0	0	0	0	
Casacuberta	1	0	0	0	
Sole	1	0	0	0	
Roge	1 1/2	0	0	0	
Sole	0	0	0	1	
Bruguera	1	0	0	0	
Quantity produced by the department (in bolts)	40 1/2	1/2	1	1	
Production cost	101.6.3	2.5.0	6.0.0	2.12.6	
Department's amount					143.8.6

Dyeing

Worker's name	**Week salary**		
Juan Serra	4.17.6		
Dom	4.10.0		
Diego Perez	4.2.6		
Joseph Artigau	3.18.9		
Joseph Gemis	3.15.0		
Juan Felan	3.18.9		
Francisco Solé	3.7.6		
Juan Feraño	3.3.9		
Agustì Vila	3.0.0		
Pere Martin Tomas	1.5.9		
Angel Carreras	1.17.6		
Agustì Sellent	1.5.9		
Domingo Serra	1.5.9		
		Department's amount	40.8.6

Child workers

Worker's name	**Week salary**		
Jaume Mas	3.7.6		
Joseph Campaña	0.18.9		
Pau Campaña	0.18.9		
Juan Martì	0.15.0		
Baltasar Molins	0.15.0		
Jaume Teranò	0.15.0		
Anton Artigas	0.15.0		

Jaume Lionell	0.15.0		
Francisco Font	0.15.0		
Anton Saladrigas	0.12.0		
Anton Drago	0.12.0		
Joseph Genis	0.12.0		
Juan Vila	0.12.0		
Jordi Solà	0.12.0		
Joseph Serra	0.12.0		
Francisco Anglada	0.12.0		
Juan Soler	0.12.0		
Juan Poquet	0.9.0		
Anton Ramon	0.10.6		
Pau Molins	0.9.0		
Juan Salbat	0.9.0		
Manuel Mas	0.9.0		
Juan Alabert	0.18.9		
Anton Comi	0.9.0		
		Department's amount	7.1.9

Printing

Worker's name	**Week salary**		
Juan Blanch	2.6.0		
Ramon Contrada	1.19.5		
Andreu Molins	3.0.0		
Jacinto Crabiet	3.0.0		
Anton Ros	5.5.0		
Pau Argue	2.5.0		
Pau Borell	0.15.0		
		Department's amount	18.10.0

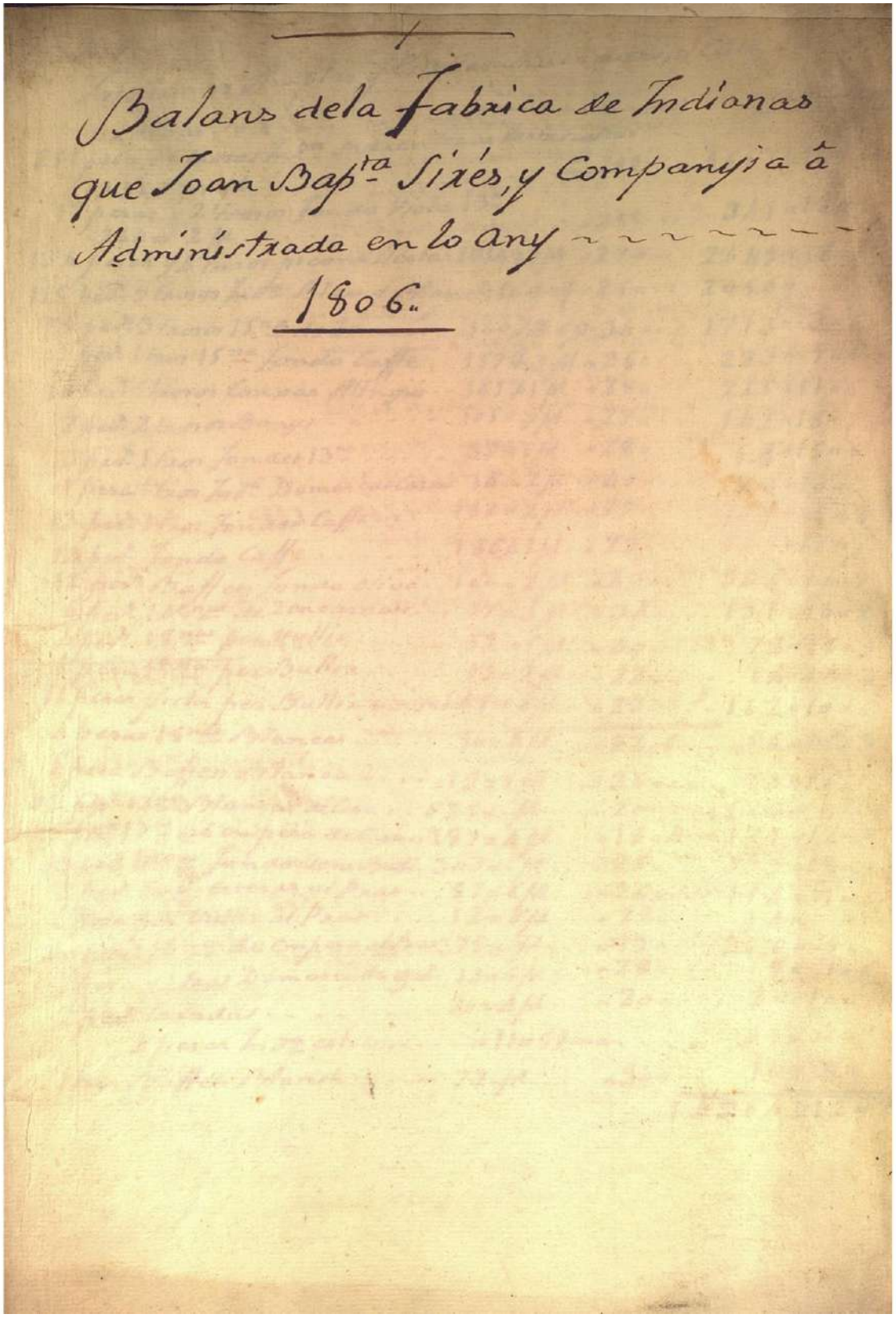
Bleaching and Drying

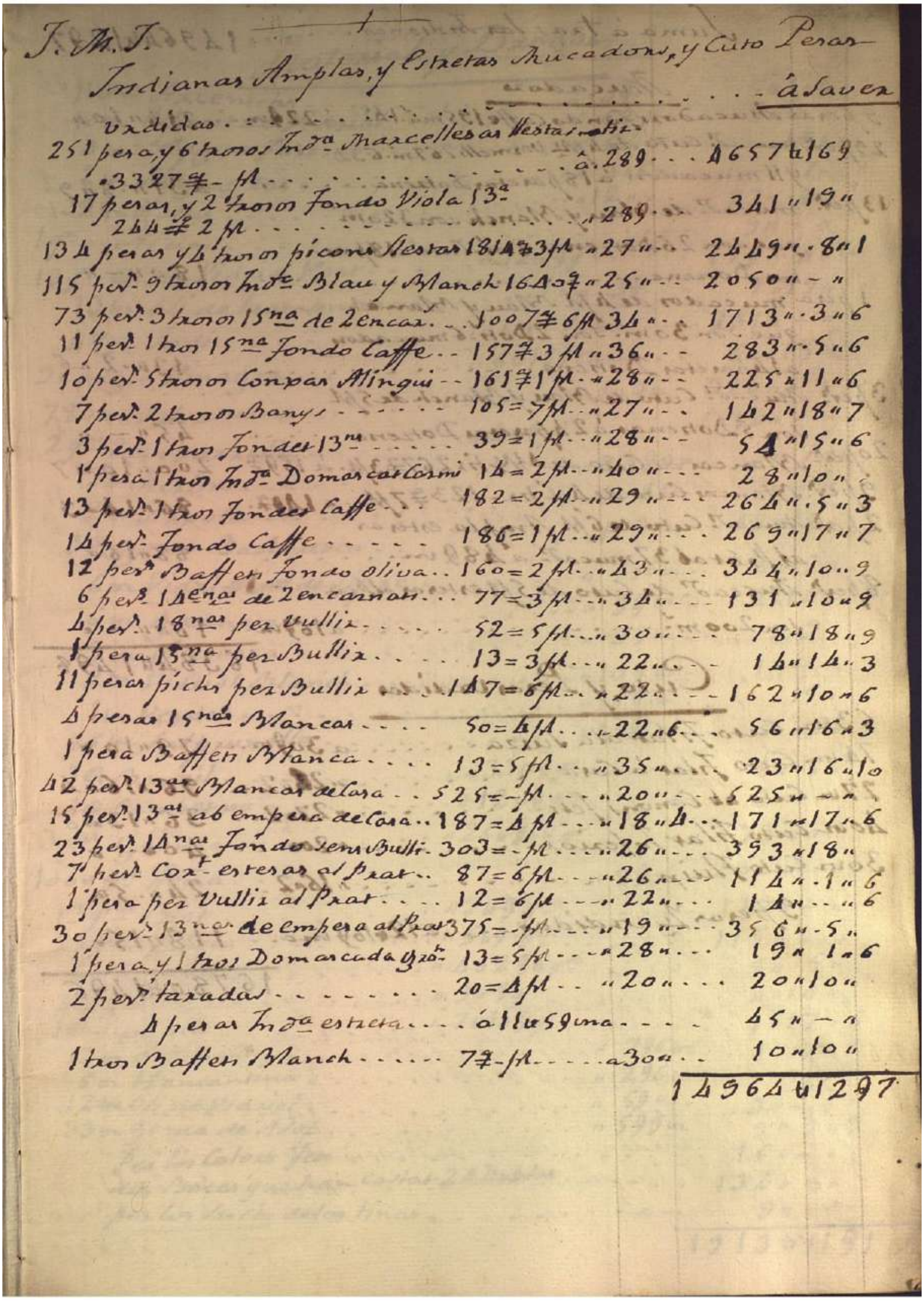
Worker's name	**Week salary**		
Lluis Rosell	3.0.0		
Jaume Torre	2.5.0		
Jaume Grau	2.5.0		
Jaume Buell	2.5.0		
Valentì Valenti	2.5.0		

Angel Casanovas	2.5.0		
Joseph Barart	2.5.0		
Francisco Axissò	2.5.0		
Pau Perera	1.18.7		
Joseph Ramoneda	2.5.0		
Pau Gulubandos	2.0.2		
Anton Boix	1.18.7		
Anton Lluis	1.6.3		
Joseph Monne	1.2.6		
Jacinto Cardira	0.18.9		
March Mirallas	1.2.6		
Ventura Benavent	0.18.9		
Luis Recto	0.7.5		
Joseph Benavent	1.6.3		
Sebastià Comas	0.12.5		
Pheliph Montellas	2.5.0		
Gratificaciò	0.5.0		
		Department's amount	40.10.8
Bleaching and dyeing in Besos site			
Worker's name	**Week salary**		
Joseph Jove	3.9		
Juan Jove	1.1.9		
Isidro Extaray	2.12.6		
Jaume Buada	2.12.6		
Mannera	2.12.6		
Juan Valencia	2.12.6		
		Department's amount	15.0.0
		Total costs	**276.3.7**

Illustration 2. Libreta de semanadas (excerpt) 1st week 3 to 10 January 1784, expenses paid by J.B. Sires factory (AHCB, Fons Comercial, B 246)

Illustration 3. J.B. Sires & Co. Annual Balance 1806 (BC, Barò de Castellet, legajo 199/2)


Balans dela Fabrica de Indianas
que Joan Bap.ta Sirés, y Companyia â
Administrada en lo any ~ ~ ~ ~ ~ ~ ~ ~
1806.

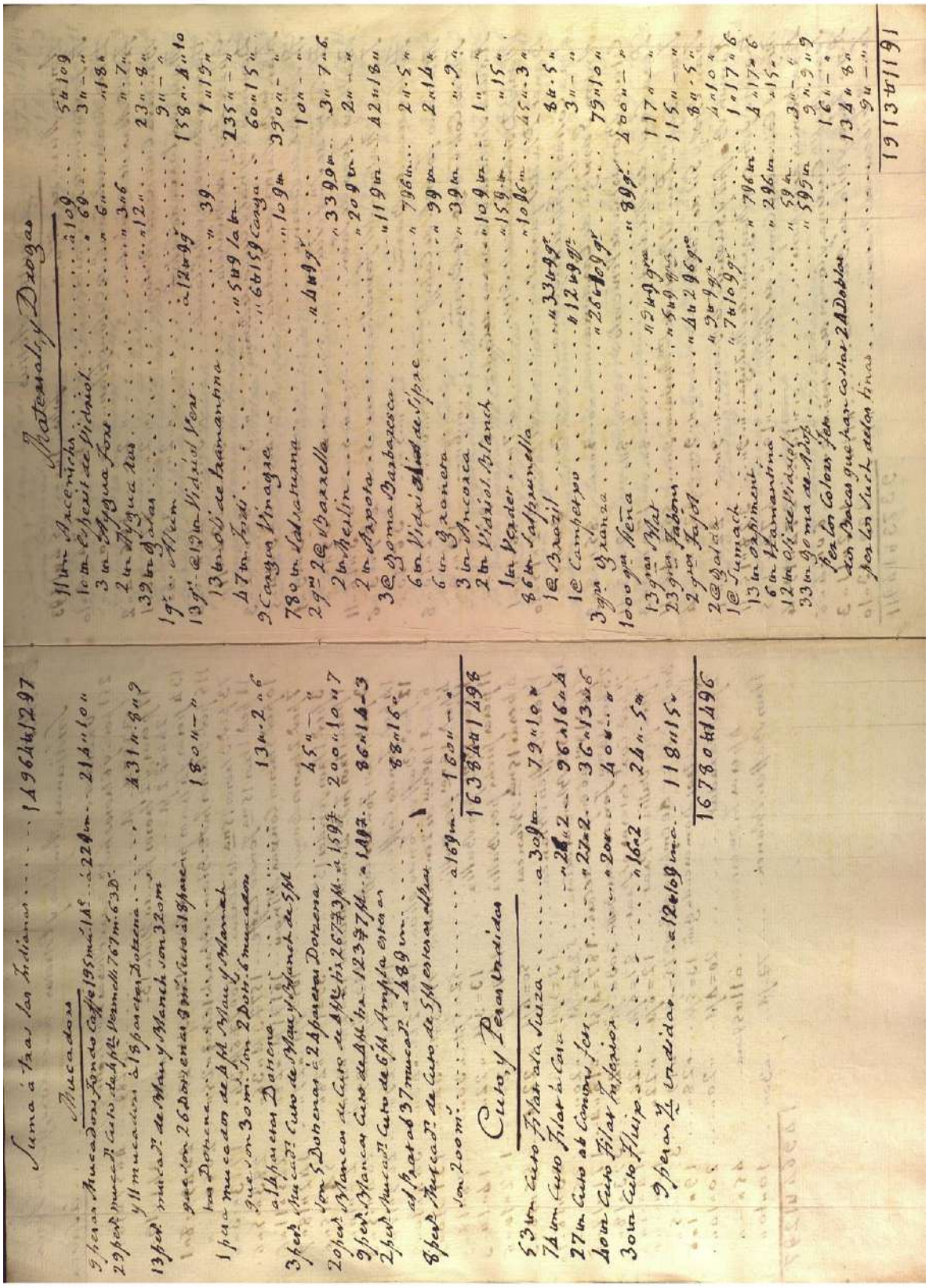


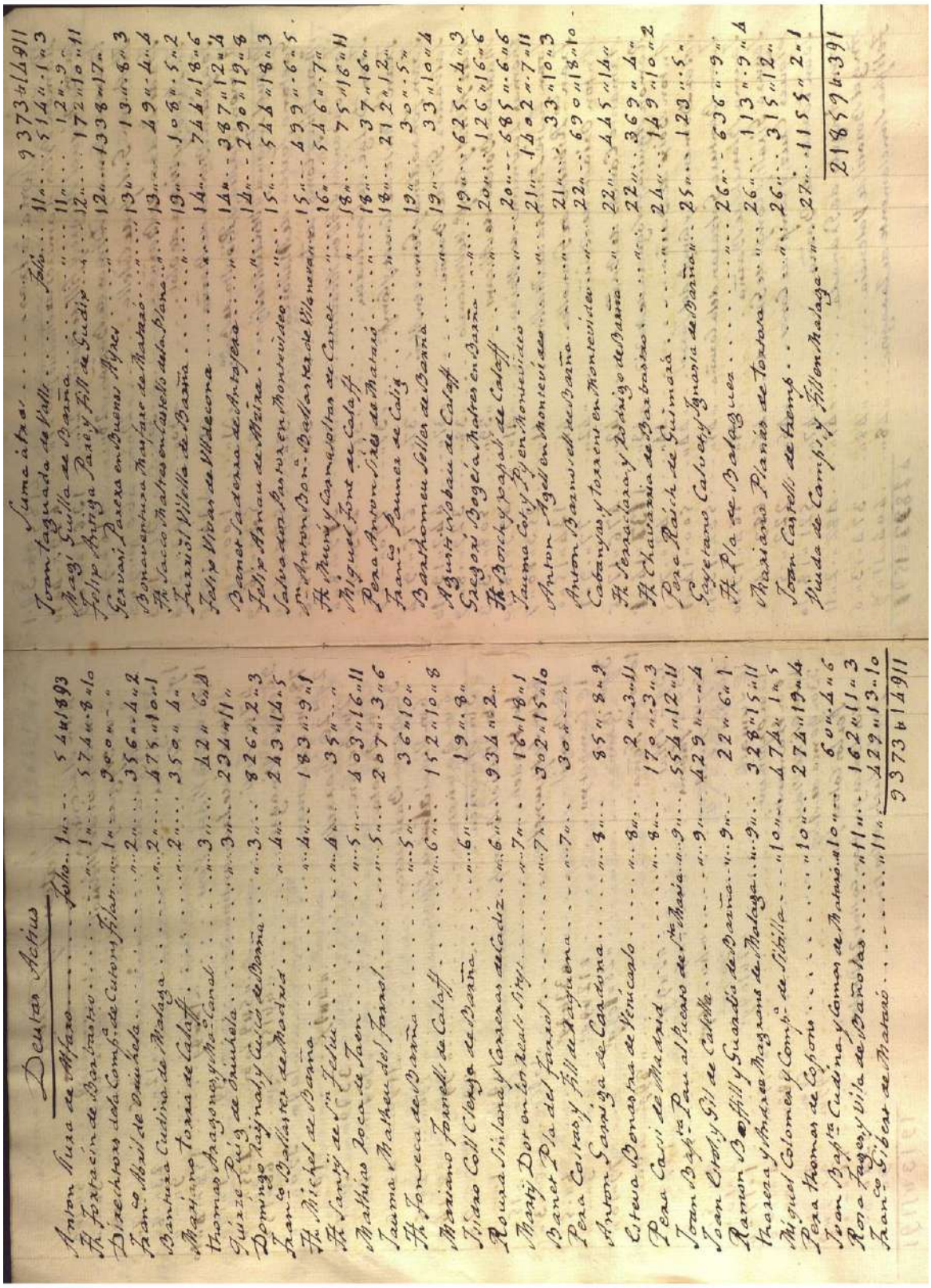
J. M. J.

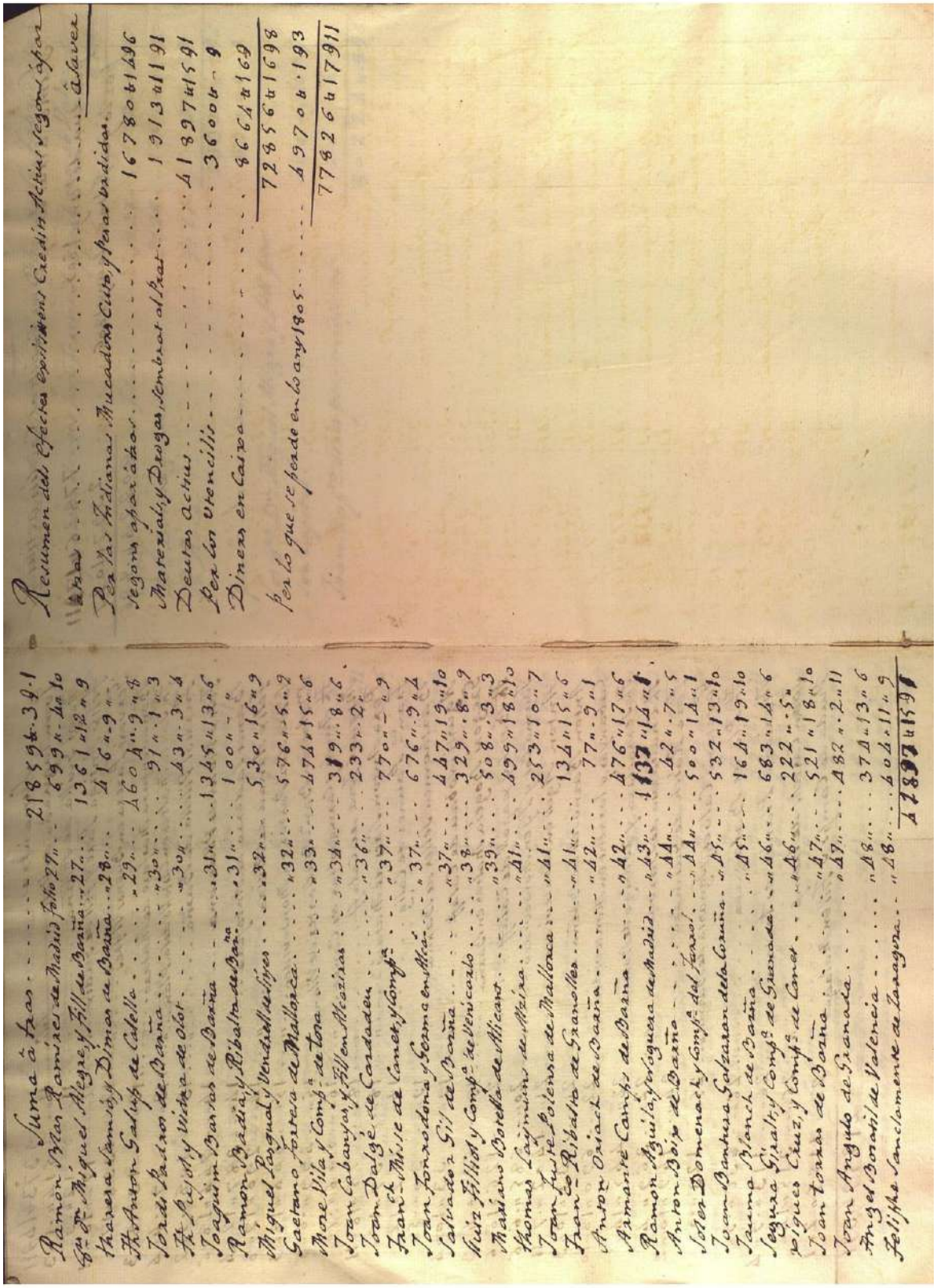
Indianas Amplas, y Estretas Mucadors, y Cuto Pesas ... â Saver

venditas

251 pesa, y 6 trosos Indª Marcellesas Vestas ... 3327 ≠ - pl	â 289		4657 " 16 9
17 pesas, y 2 trosos Fondo Viola 13ª 244 ≠ 2 pl	" 289		341 " 19 "
134 pesas y 4 trosos picons Restas 181473 pl	" 27 "		2449 " 8 " 1
115 pes. 9 trosos Indª Blau y Blanch 16407	" 25 "		2050 " - "
73 pes. 3 trosos 15na de 2encas	1007 ≠ 6 pl	34 "	1713 " 3 " 6
11 pes. 1 tros 15na Fondo Caffe	1577 ≠ 3 pl	" 36 "	283 " 5 " 6
10 pes. 5 trosos Conpas Mingui	161 ≠ 1 pl	" 28 "	225 " 11 " 6
7 pes. 2 trosos Banys	105 = 7 pl	" 27 "	142 " 18 " 7
3 pes. 1 tros Fondet 13na	39 = 1 pl	" 28 "	54 " 15 " 6
1 pesa 1 tros Indª Domascat Cosmi	14 = 2 pl	" 40 "	28 " 10 "
13 pes. 1 tros Fondet Caffe	182 = 2 pl	" 29 "	264 " 5 " 3
14 pes. Fondo Caffe	186 = 1 pl	" 29 "	269 " 17 " 7
12 pes. Baffen Fondo Oliva	160 = 2 pl	" 43 "	344 " 10 " 9
6 pes. 14enas de 2encarnan	77 = 3 pl	" 34 "	131 " 10 " 9
4 pes. 18nas per Bullir	52 = 5 pl	" 30 "	78 " 18 " 9
1 pesa 13na per Bullir	13 = 3 pl	" 22 "	14 " 14 " 3
11 pesas pichs per Bullir	147 = 8 pl	" 22 "	162 " 10 " 6
4 pesas 15nas Blancas	50 = 4 pl	" 22 " 6	56 " 16 " 3
1 pesa Baffen Blanca	13 = 5 pl	" 35 "	23 " 16 " 10
42 pes. 13as Blancas de Casa	525 = - pl	" 20 "	625 " - "
15 pes. 13as ab empesa de Casa	187 = 4 pl	" 18 " 4	171 " 17 " 6
23 pes. 14nas Fondo sens Bullir	303 = - pl	" 26 "	393 " 18 "
7 pes. Coxt. estesas al Prat	87 = 6 pl	" 26 "	114 " 1 " 6
1 pesa per Bullir al Prat	12 = 6 pl	" 22 "	14 " - " 6
30 pes. 13nas de empesa al Prat	375 = - pl	" 19 "	356 " 5 "
1 pesa y 1 tros Domascada 420	13 = 5 pl	" 28 "	19 " 1 " 6
2 pes. taxadas	20 = 4 pl	" 20 "	20 " 10 "
4 pesas Indª estreta	â 11 " 5 9 una		45 " - "
1 tros Baffen Blanch	7 ≠ - pl	â 30 "	10 " 10 "
			14964 " 12 9 7







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