

A family business between
proto-industrialization and capitalist
development:
the indianas manufacture
J.B. Sires y Cia
in 18th Century Barcelona

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Introduction

In the first half of the Seventeenth Century woolen fabrics began to be gradually supplanted by colorful cotton fabrics from India, Egypt (imported by British merchants) and Malta. Cotton fabrics - already known by European consumers, although less widespread - responding better to new fashion and, from an hygienic point of view, allowed to be washed more frequently, as well as offering greater strength and greater resilience of color. The success of cotton textiles in the European market was supported by the role played by domestic demand, which steadied on a growth trend, pushed by the good results of the primary sector. In fact, fashion and consumer tastes become - at a time of increased purchasing power - conditioning elements of the demand.

The widespread use of cotton accelerated at the beginning of the XVIII Century when increased the availability of raw material, due to the cultivation of new plantations in the American colonies (by the English and Spanish rulers) and in India and China (D.A. Farnie, 2004); this prompted on European markets a substantial amount of raw cotton fabric 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 fiber grew enormously, finally supplanting the use of wool in the mass textile production (D.A Farnie, cit.).

Cotton, on the other hand, allows for easy adaptability to machining and proved to be an extremely versatile fiber. In addition, the plant lends itself to an easy cultivation both by small farmers and large planters (mainly based on extensive cultivation) (I. Turnau, 1988). Cotton finally assured a crop quickly converted into cash and less perishable. Thanks to its characteristics and features, the cotton became the most successful product. This result was due to the cost/opportunity ratio, which allowed the cotton to overcome linen in terms of quantity produced.

The first phase of Indianas manufacture

The printing of cotton fabrics 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 (J.K.J. Thomson, 2003). Technical knowledge had spread quickly establishing, during a decade, a significant manufacturing framework, especially characterized by the presence of Huguenots technicians. Only in the following decades the technique of cotton fabric dyeing widespread in England and the Netherlands, stimulating the creation of productive centers. The printing technology then passed from France to neighboring Catalonia, especially after the revocation of the Edict of Nantes in 1685 and the consequent abolition of religious freedom. Many technicians left the motherland to move to countries where there was more religious tolerance. The revocation of the Edict of Nantes was accompanied by a

series of policy measures for the protection of national traditional French textile manufacturers such as wool and silk, penalizing the printing of cotton.

In Catalonia, printing and coloring of *indianas* and *calicos* spread belatedly in the Eighteenth Century, while in other parts of central Europe this occurred already in the last decades of the previous century. The delay in the transfer of technical knowledge in Catalonia is also justified by the state of war between Spain and France in the period 1672-1678 that made Catalonia the main battlefield, with significant implications for the production and the economy of the area. The introduction of *indianine* and *calicos* manufacture in Catalonia was further delayed by the considerable resistance from traditional textiles manufacturers such as silk and wool, who saw in cotton fabrics dangerous competitors to a consolidated market segmentation between the two fibers. 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 fabrics "a la chinesca" (chinese style) (P. Romeva Ferrer, 1952). The War for Spanish Succession aggravated the situation causing an abrupt interruption of the economic recovery experienced by Catalonia in the last two decades of the Seventeenth Century. This combination of events can be considered the origin of the delay in the spread of printing of cotton textiles in Catalonia until the 30's of the Eighteenth Century, when *indianas* and *calicos* were still an imported product.

However, the change of Spanish consumers tastes respect of cotton fabrics and the increase in purchasing power, made the internal market particularly attractive for domestic producers. At the mid of 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. The Catalan bourgeoisie saw the opportunity to increase its business and to achieve profit (on average superior to other productive activities) giving rise to a new manufacturing sector thanks to a mechanism of import-substitution (C. 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). Secondly, there weren't specialists in printing and coloring of cotton cloths, and even less, there were no chemical experts for the preparation of the same colors. Finally, it was necessary to identify a primary source for the supply of the necessary raw material. In this framework, the weakening of the Catalan textile corporations, together with the absence of a specific cotton corporation was the context in which the new cotton manufacture found the space to develop (F. Torrella Niubó, 1961). The inflow of skilled workers from nearby France allowed early Catalan pioneers to overcome the lack of specific technical skills.

The measure of prohibition on imports of foreign cotton items adopted by Spanish Crown

create a favorable 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 (C. Martinez Shaw, cit.). There was a new phase of manufacture settlements, since the 50s of the century. During this decade, appeared, in the manufacturing landscape of Barcelona, the company of Joan Ayguasanosa, of Josep Sala i Viber and that of Mateu Farrà and Augusti Sala. In the years 1756 - 1757 are operating the manufactures of Joan Francesc Seguí y Feliu and that of Francesc Magarola.

J.B. Sires y Cia. The Factory

The first information we have about the manufacture Juan Baptista Sires date back to 1769, the date of the first book that report accounts of several individuals for the supply of *indianas* and *pezze* (bolts) (AHCB, Fons Comercial, B 228). Arguably, the company Sires had existed for some years, founded by Juan Baptista, probably in the early 60's of the XVIII Century, thanks to the experience acquired in coloration from Sires who was the son of a Barcelona's *droguero* (a trader of products for the coloring of textiles). In fact, a much more comprehensive document dates from the following year, when the company made between Sires, the manufacturer of silk veils Joseph Aymar and Francesc Friginals, was officially founded with name Juan Baptista Sires y Cia. based in the *carrer* (road) Trentaclus, in the Raval district of Barcelona (M. Vicente, 2000). In 1772, the three partners expanded the base of the company, admitting into the social structure Alegre y Gibert, a big 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 (M. Vicente, 2006).

In the division of roles between the members of the JB Sires y Cia., Joseph Aymar took the office of *fabricante* (manufacturer), with responsibility for overseeing the preparation of colors and stains and the application process on raw canvas, in this task, Aymar was also in charge of selecting the staff and allocate it to different productive phases (P. Molas Ribalta, 1985). Francesc Friginals would take care of the commercial side, dispatching the finished *indianas* to customers. As can be seen from the inventory drawn up on the merger of manufactures, the joint stock (current assets) amounted to 26,543 catalan lliures of which 21,015 catalan lliures by Alegre and 5,528 by J. B. Sires y Cia (AHCB, Fons Comercial, B 228).

Technology and production

The real peculiarity of the production of *indianine* did not reside in the weaving process itself - as it is known, based on the widespread use of mechanical loom - as in the process of coloring and printing the raw canvas. Although it is obvious that the quality of the semifinished 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* (field) which had to have very specific characteristics. The *prat* must be near fresh and clean water, should be sloping in order to facilitate water flow and finally should be wide enough to permit the settlement of machinery.(C. Ardit, 1819).

In the *prat* raw canvases were wash and let dry in the sun to allow weathering to facilitate bleaching, then 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 (C. Ardit, cit.). After the washing the raw canvas passed to the real bleaching process. This operation could be done by means of steam with a *caldera* (a metallic vat), or by chemical agents such as potash or muriatic acid. The steam system was the cheapest - it was the one used by JB Sires y Cia - and was based on a copper vat large enough to contain the canvases (about 5-8 feet deep and 5 in diameter). The vat was provided with a sealing cover, with a central hole from which branched off a short metal tube that ended in a safety valve which let the steam escape gradually and that would open completely in case of excessive internal pressure. This process allowed the bleaching of about 30 - 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 (C. Ardit, cit.).

The printing process of the paintings began with the creation of the mold that was engraved directly on a wood support, or on wooden support coated with a copper foil, and finally, made directly in brass. In general, it is preferred to carry out the wooden molds when it came to simple designs with larger and less precise contours; conversely, the use of metal molds answered the need to prevent mixing of the wood grain with the contours of incision. The model was made by a designer, generally on the instructions of the manufacturer, according to those who were the tastes of the moment. The incision was made possible thanks to the help of chisels and punches, then the mold was finished and polished with oil in order to make it more polished. According to documentation of J.B. Sires y Cia. the mold pressed procedure was used until the end of the 80's, only to be replaced by the press cylinder in the new Century. The operation was performed 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 color. As is easily understandable, this was the most delicate stage of the production process of *indianas*, an error or a fickleness at this stage would

compromise all the work already done (C. Ardit, cit.). For this reason, on Saturday, at the end of week operations, the *niños* (children) used for auxiliary tasks and support to *pintadores* (dye technicians) and *gravadores* (molds technicians) had the task of thoroughly clean the molds and benches for the molding of the canvas, in order to avoid that any, even small, residual color or stain could ruin the process. In case of more complex or smaller printed designs, it was used the press on which was mounted the mold. 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 printing system by means of wood models was replaced, already in the last two decades of the Eighteenth Century, by the cylinder system, in which the canvas passed through two opposed cylinders, one smooth wooden or metal coated cardboard and the other built in hardwood or metal (typically bronze) on which the foil was applied for printing. As it is easy to understand, the cylinder system allowed a net decrease of printing times, increasing the productivity of the factory.

The printing process was completed by the mordanting, this could occur during the printing process of the most delicate decorations, or by a successive bath to fix the colors. Specifically, the bath was necessary to fix colors such as flesh-coloured, coffee, red, yellow and olive green. To carry out the bath, the stainer used a kneading trough, which 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 colors and designs (C. Ardit, cit.).

The work

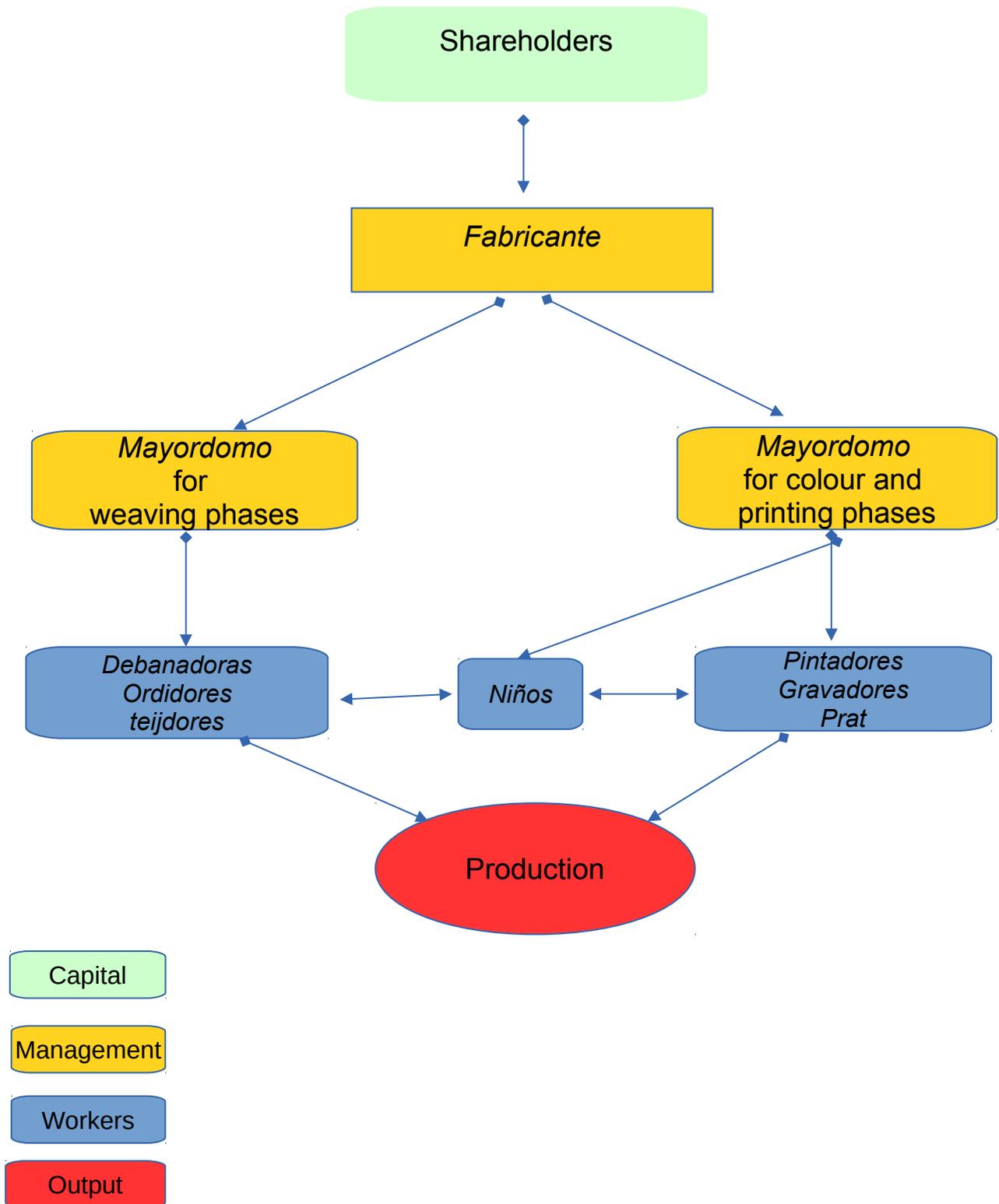
Despite the discussion on the fulfillment of the capitalist process in the Barcelona cotton manufacture is still incomplete, it is possible to say that the development of *indianas* factories in the mid-eighteenth century, is fully part of a process of industrialization. The typical elements of this process are the free action of the two main factors of production such as capital on the one hand, and wage labor on the other. In fact, the case of the manufacture J.B. Sires shows perfectly the coexistence of capital working alongside with waged work. This seems to be the first element of detachment of *indianas* manufacture from the traditional textile manufacturing craftsmanship.

If we review the structure of work in the textiles workshops (wool, silk and even cotton) that have characterized the European proto-industrial landscape we can see how the organization of work was still deeply tied to a corporate model based on the binomial: shopkeeper - shop boy, with the presence of workers specialized in subcontracting of semi-manufactured or in lesser value transactions. The "fabrica de indianas" (manufacture of printed cotton fabric) seems to completely

overcome this presumption by presenting itself as a place of production in which the organization of work is essentially centralized and based on the specialization of production stages and on internal logistics, in a context of a free bargaining of the labor production factor, characterized by a renewed relationship between man and work (R. Grau – M. Lopez, 1974). Although in the mid-eighteenth century, the total of the workers of Barcelona indianas industry was not so high (it is estimated that there were about 10,000 workers) as to talk of a massive expansion of the factory system - whereas in the inland areas of the Principality, the textile manufacturing was still based on a proto-industrial model - it is true that such a transformation, in a few decades, permanently influenced the entire secondary sector (I. Miguel Lopez, 1996).

The structure of labor within the J.B. Sires y Cia's factory, as well as homologous in all factories of Barcelona, was based on an organization headed by manufacturer (*fabricante*). The manufacturer, very frequently coincided with the owner (or one of the owners of the factory) and had its origins in manufacturing craft (M. Vicente, 2000). Juan Baptista Sires, in fact had had significant experience as a manufacturing and trading *droguero*, a seller of dyeing products, experience then poured inside the factory. Another example of this is provided by the manufacture of Llorens & Sevilla (which will flow into the most famous manufacture of Isidre Català), for which the members decided to appoint *fabricante* Bernat Llorens and delimit his powers only to the technical direction of manufacture (ADB, Arxiu S.ta Maria del Mar, Caja 68). In fact, in the records of the firm there are the instructions which must be followed by the *fabricante*: he could not sign contracts or make purchases without the prior consent of the administrator, that consent must be referred to a particular “register of approvals”. Such consent must precede all operations of purchase of material useful to the factory and for the work connected with it. The work of *fabricante* would be rewarded with a monthly salary to be paid on the profits of 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 *indianine* 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 is ahead of that of the owner of the factory, very common in those pre-capitalist models based on small and medium family based industry - there was the *mayordomo* with the task of supervising the proper execution of all phases of production; very frequently was a person of trust, often a family member, with experience in the textile industry (ADB Arxiu S.ta Maria del Mar, Caja 68).

J. B. Sires y Cia.: Company organisational set up diagram



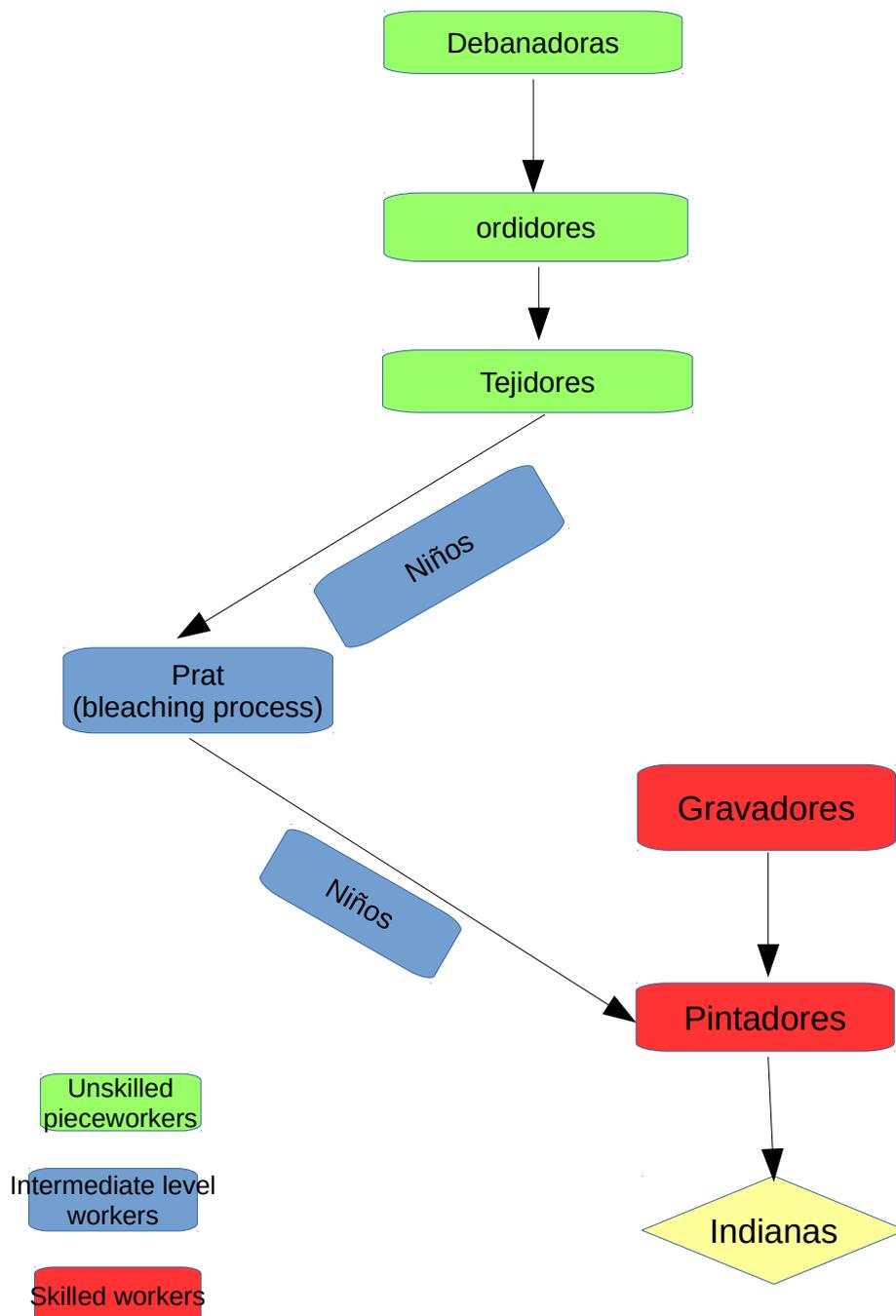
Below, these figures, that we could define managerial, took place the real organization of the work of the factory. First, there were the *debanadoras*, female workers specialized in unraveling spools of yarn and wrap – worked out by rural artisans manufacturers - stored in the warehouses of the factory. It was a job typically assigned to women for two reasons; first of all it can be considered a generic and unskilled job, for this reason, during Eighteenth Century, reserved to 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 (B.L. Ayala, 1987). Another category of workers was constituted by *ordidores* that were occupied with the correct positioning of the wires of cotton on the frame according to the expected number for each type of fabric. The *tejidores* took care of the production of raw canvas, working with the frame. The *peons* were, however, unskilled workers in charge of the transport of heavy operations such as linens washing and mordanting. This first level of workers was completed by *niños*, child labor force, in an intermediate position, to support activities of weave and dye (J. Boy, 1839). Among these little workers were allegedly recruited future *pintadores* and *gravadores*; 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 molds for printing the fabric. The molds were made following drawings of the same *gravadores* or acquired externally. The work was completed by *pintadores* applying the mold to the rough canvas with colors. The last major category of factory workers was formed by the *prat*, skilled workers in the operations of bleaching, drying and preparation of canvases; such workers carrying on their tasks in the *prat* (yard or field for drying and exposure to the sun raw canvas to be whitened), away from the main body of the factory and placed near a watercourse. The labor of the workers of the *prat* was particularly burdensome, as the same were also in charge of the surveillance of canvases let to dry, reason for which they were often housed in buildings located within the same *prat*. The payroll records of J.B. Sires, alongside these types of workers, gives us the presence, albeit limited, of other figures such as *pinsellador*, (workers involved in the "staple" of *indianas* on racks for drying) and *debanadoras ayudandes* (associated with *debanadoras* permanently employed in order to comply with overtime loads). In a primitive phase of work organization, prior to labor regulation, the duration and stability of it only responded to productive reasons. This means that workforce level was a key to regulate productivity and the (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, by the owner of the factory - was continued until sunset. Evidently, the working day was influenced by seasonal conditions and weather, being shorter in the winter months and on very cloudy, conversely resulted longest during the Summer sunny days (J. Boy, cit.). The hours of work underwent a radical change only in 1792 with the introduction of gas lighting in many factories of Barcelona, among them, the weaving department of the factory J.B. Sires y Cia. as it could, therefore, prolong the activity of the frames. The work was distributed from Monday to Saturday, except on Sundays and holidays of religious

precept, the only consideration for work suspension (B.L. Ayala, cit.). This trend is clear from the records of the weekly payroll of J.B. Sires y Cia. 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 colored 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.

J. B. Sires y Cia.: Workforce diagram



The workforce

The workforce within the factory had 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 (F. Torrella Niubó, cit.).

The J.B. Sires y Cia, from a point of view of the labor employed, is an average big business in the sector, taking into account that in 1739 the Serra y Cia 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 (M. Vicente, 2006). The number of workers employed in the production process, however, is not exclusive index of the size scale of the workshop, because we must first keep in mind that manufacturing process of the semi-finished was, frequently, outsourced. In addition, almost all the manufactures of *indianas* in Barcelona - but the example was common to most of the European countries - was 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 that 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 that could count on 4,000 workers.

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 labor 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 labor market which had all the characteristics of the new system compared to manufacturing handicraft corporative or proto-industrial complex. The cotton manufacture demanded dedication to new production procedures, compliance with work schedules and tasks, close supervision and compliance for equipment that workers do not had the property, unlike what happened in the corporation manufacturing system (D.A Galbi, 1997). Then it was necessary the ability to work together with other people in a closed space and the disappearing of personal and direct bargaining between shopkeeper and worker, definitively the depersonalization of work (D.S. Landes, 1993) .

In the *indianas* production, the labor 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 y Cia, will be outsourced at a time when the company will prefer 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.

J.B. Sires y Cia. Female and child workers (percentage on total) 1779-1798

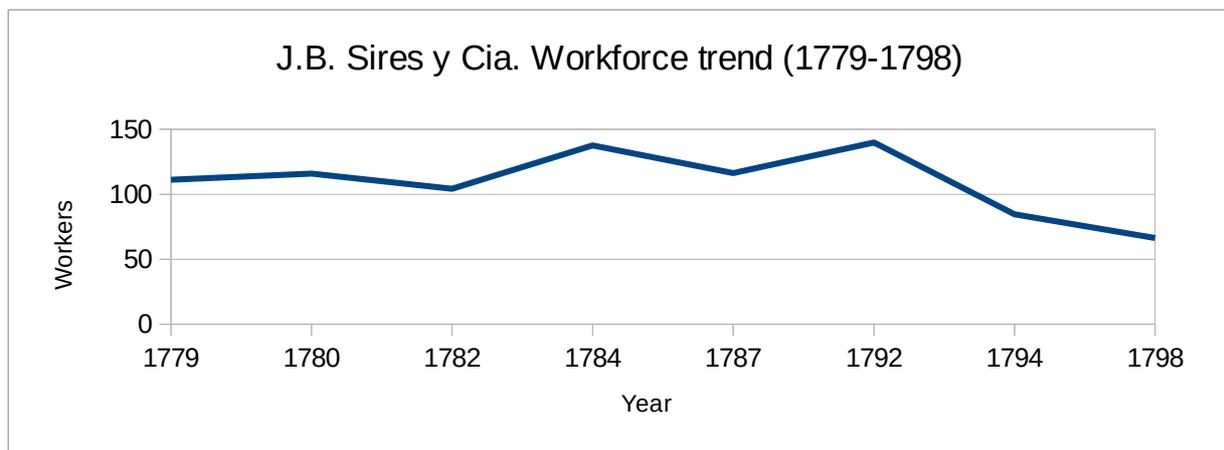
Year	% female workers	% child workers	Total amount of female and child workers	
1779		21,75%	14,92%	36,67%
1780		21,59%	14,79%	36,38%
1782		18,56%	21,45%	40,01%
1784		19,62%	17,75%	37,37%
1787		21,03%	17,66%	38,69%
1792		8,29%	19,74%	28,03%
1794		0,00%	35,67%	35,67%
1798		0,00%	35,78%	35,78%

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 J.K.J. Thomson, employment within the manufacturing of *indianas* was divided between about 55% of 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 y Cia, as can be seen from the table above, corroborate the claim. It is interesting to note that the figures of female labor remained stable for about a decade until the early 90's of the Century, when it is drastically reduced and then disappear as a result of a reorganization of the productive functions (G.L. 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 favor of child workers that were necessary to implement the most added value production phases (coloring and dyeing).

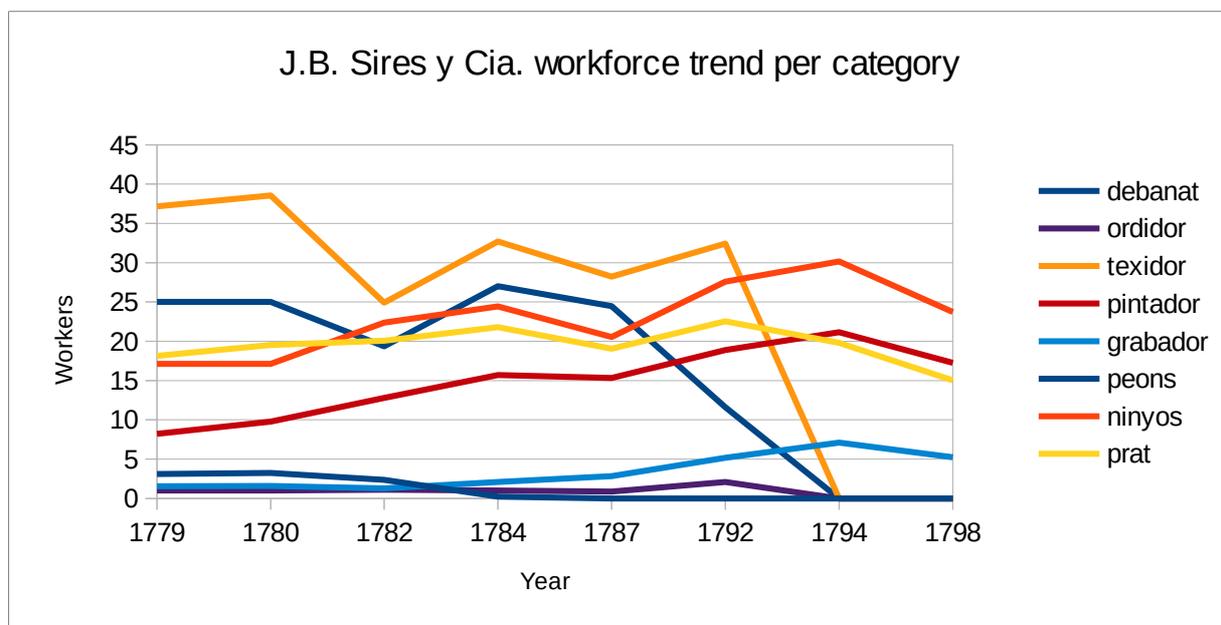
We can verify a wage differentiation applied to female workforce, paid on the basis of the quantity and quality of production, with average wages lower than those of their male colleagues. The fiscal accounts of J.B. Sires y Cia reported that the *debanadoras* are mainly piece-workers, paid on the amount 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.

Otherwise, the child labor presents an upward trend in the period observed, with the exception of two minimum points touched in the years 1784-1787, probably as a corporate response to economic difficulties. The fact that child labor does not suffer a drastic reduction, as was the case for females, - as shown by the presence of a negative correlation between the two variables - makes more explicit the different roles exercised within the factory and, above all, the hierarchy of the same, revealing the difficulties of mobility between different categories of workers. In essence, women in particular responded, from the point of view of the entrepreneur, to job demand with different characteristics. In a model with constant technology rate, operating on the workers number became the principal tool to act on productivity. Finally, keep in mind that child and female labor as well as being the answer to a specific question of cheap labor and extremely flexible in the industrial era, was the indispensable apprenticeship, in the absence of formalized technical education (D.A. Galbi, cit.).



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).

The employment data of J.B. Sires y Cia. shown in the graph above, give us a situation in which we witness an overall growth of the workforce between 1782 and 1784. It then goes on to average 111 employees in 1779 to about 104 in 1782, to reach the largest number of other workers (137) in 1784, before declining in global terms up to about 66 workers employed in 1798. However, the analysis of the graph does not allow to clarify the reason for this phenomenon, which seems apparent in a policy of corporate restructuring, generated by the increase in the average price of *indianas*.



The graph shows in detail the components of the general workforce of J.B. Sires and allows us to highlight that, primarily, we are witnessing a decline in the number of workers employed in certain categories such as *debanadoras*, *tejedores* and *ordidores* - which even disappear in the survey of 1794 - to the benefit of the other categories of workers such as *pintadores*, *prat* and *niños* which instead tend to increase. This trend shows that J.B. Sires began a period of corporate restructuring, outsourcing the production phases with low added value (unwinding, warping and weaving), investing instead on higher value-added production steps such as printing and dyeing/coloring. In this sense it is also explained the stable amount of *prat* workers employed prior to the bleaching of raw canvas, fundamental in the implementation of the printing process.

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