Working Paper No. 88/05

Labour Market Adjustment to Economic Downturns in the Catalan Textile Industry, 1880-1910. Did Employers Breach Implicit Contracts?

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February 2005

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Abstract:
This paper studies the way workers and firms behaved in a highly cyclical sector such as the cotton textile industry, which encompassed 1/5 of the Catalan industrial workforce in the early 20th century. Using firm level evidence from the late 19th and early 20th centuries, the paper shows that, in spite of weak unionisation and the lack of regional or local collective bargaining institutions, piece rates in cotton spinning and weaving were not subject to competitive rate cuts and remained fixed over the cycle. When facing a negative demand shock, firms adjusted by reducing output, hours of work, labour productivity and employment. I argue that in the Catalan case the stability of piece rate lists depended on a highly flexible labour market for female workers, limiting the pressure of unemployed workers on prevailing wages.

1 Piece rate and working conditions in the Catalan cotton textile industry, 1880-1910

Since the publication of an article by Albert Balcells in 1974, Spanish labour historians have been documenting the erosion of the terms of employment in the Catalan cotton textile industry following the recession of 1885-1890.[1] For example, Balcells remarked the declining trend in real wages between 1895 and 1915 in the industry caused by nominal wage cuts and increases in the cost of living.[2] A recent contribution by Carles Enrech has focused on the destruction of a previously existing "craft culture" caused by the expansion of the town mill system since the 1870s, de-skilling technical change and the associated

[1] Balcells, "La mujer obrera."
[2] Ibid., p. 35.

increase in female employment, and periodical overproduction crises.[3] Angel Smith, who has carefully studied conflicts in the textile industry in the early twentieth century, also suggests that excess capacity and technical change led to irreversible shifts in labour demand. Employers "anxious to cut labour costs and unwilling to negotiate with trade unions" altered the traditional terms of employment in the cotton textile industry, which finally led to a decrease in cotton workers' living standards.[4]

Implicit in these views, it is accepted that the labour market became more competitive eroding customary practices prevalent in the factories since the mechanisation of artisan work. This line of reasoning holds that workers' bargaining power weakened as a consequence of unemployment caused by economic decline and periodic industrial downturns and the competition of women in skilled or semi-skilled jobs such as weaving or spinning. Competitive forces were especially strong in recessions, when employers reduced wages, intensified work, fired male workers and curtailed the power of unions by sacking union workers.[5] Similar views also appeared among contemporaries. In the early 1890s, a popular song written by the textile workers of the so-called Mountain (*Muntanya*), employed in the water-powered factories of inner Catalonia, stated that unremunerated increases in the length of pieces of woven cloth were common:

> *"los teixidors mechanics com ja se sap per tots,*
> *'ls allargan los trossos y'ls pagan mes poch .*
> *Es molt clara la cosa com ja poden pensà,*
> *Que del guany y de la feina ja no podém menjà."*[6]
>
> (we, mechanised weavers, as everybody knows, / get longer pieces and lower pay / it is all too clear / that from our work and our pay we can only starve)

[3] Enrech, "L'ofensiva patronal", p. III.
[4] Smith, "Social conflict," p. 331.
[5] Ibid., p. 336.
[6] Serra and Viladès, *La colònia Pons*, p. 138.

To take another example, in 1913 Juan Martí, a weaver leader of the textile union *La Constancia* offered a testimony of how piece rates were managed in the weaving rooms since 1890:

> (…) Years ago, work was paid according to count and type of warp, but today we are paid [strictly] by the piece. As each year there are changes in the type of yarn, pay varies accordingly without taking into consideration these changes. Even if the type of yarn does not change, the number of picks increases by one or two per piece, and each additional pick meaning three additional, unremunerated metres per piece. This means the worker is paid less for his effort (…).[7]

However, these contributions rely on scattered (but eloquent) evidence provided by the union press, which can be biased or is not straightforward to interpret. Smith focuses on the conflict of spinners in the Ter Valley and especially in Manlleu, a small textile town in the north of the province of Barcelona, where the presence of men in spinning rooms was abnormally compared with other areas where female work was more common. The contention by Balcells that the cost of living was increasing in Barcelona is mainly based on the working class press (*La Nació*) and this evidence is not supported by the available cost-of-living indices.[8]

The emphasis on the erosion of working conditions contrasts sharply with other studies pointing to nominal wage stability between 1890 and 1910 in a period of very low inflation and even deflation.[9] Moreover, authors like Enriqueta Camps have drawn attention to the existence of internal labour markets and implicit contracts in the Catalan

[7] Instituto de Reformas Sociales (IRS), *La jornada*, pp. 59-60.
[8] Maluquer de Motes, "Los salarios;" Ballesteros, "Una estimación."
[9] Camps, *La formación,* pp. 214-215; Maluquer de Motes, "Los salarios;" Soler, "La evolución del salario;" Dorel-Ferré, *Les colònies industrials,* p. 302.

cotton textile firms.[10] This implies that, especially in the case of men, well defined career paths existed based on promotion from one job title to the other, from unskilled work up to supervisory tasks.[11] This, in turn, suggests the existence of customary rules of promotion and the preservation of lengthy attachments between firms and workers. The survival of these rules depended on the fact that firms did not renege on their side of the implicit agreement.

Finally, there is also evidence that firms worked short-time during recessions. The earliest quantitative evidence on short time among Catalan textile firms is from 1848, but there is some qualitative evidence firms also worked short time in recessions in the late 19th century.[12] This shows that labour-hoarding might have been an extensive practice during the period used by employers to preserve lengthy attachments within the same firm. However, short-time working is not a straightforward response to a decline in sales. Among other things, it requires collusive behaviour among many firms and some firms might have the incentive to work full time to capture a greater portion of a contracting market.

Since available evidence is scattered and sometimes contradictory, what could be labelled as the "increasing competition" as opposed to the "stability of norms and customs" hypotheses need to be tested against available data on wages and piece rates paid in the cotton textile industry. In order to do that, I use insights from models of employment and wage setting which derive predictions on the behaviour of wages and employment over the business cycle and which depart from the traditional spot market adjustment to recessions in which prices are totally flexible.[13] Moreover, I also use the empirical applications of these models, which

[10] Camps, "La teoría del capital humano."
[11] Ibid., p. 320.
[12] For example, noted in "La crisis industrial," *El Trabajo Nacional,* 30th September 1900, number 225.
[13] Solow, *The labor market*, chapter 2.

are based on the comparison of wage, employment and output movements over the business cycle, to characterise the behaviour of the labour market in the Catalan cotton textile industry. [14] In table 1, I present the main labour market characterisations following each of the hypotheses.

Table 1. Behaviour of firms during economic downturns (hypotheses).

Increasing competition	Norms and customs
Competitive piece rate cuts	Piece rates are stable
Intensification of labour effort	Labour hoarding
Increasing hours of work	Hours of work fall
Lay-offs	Lay-offs

Given the paucity of data before 1890, a comparison of labour market performance in cotton textile before and after the 1885-1890 crisis cannot be done. I can only test for the existence of competitive forces causing cuts in piece rates and declining wages in the period after 1885. I analyse the trends in piece rates and output in the main processes of cotton manufacturing, namely spinning and weaving, using data collected from corporate records of several textile firms for the period 1885 to 1910. I focus here on *nominal* adjustment, because the period on the whole was *deflationary* (available cost of living indices are shown in table A.1 in the appendix). Contrary to the views emphasising growing competitive pressures, I show how piece rates remained fixed in spite of the absence of local and regional piece rate lists. Analysis of employers' decisions in economic downturns shows how firms adjusted the amount of labour

[14] Hanes, "The development of nominal wage rigidity," Carter and Sutch, "The labor market a hundred years ago;" Sundstrom, "Was there a golden age of flexible wages?"

input, through short-time (the working of fewer days in a given week) and layoffs, rather than adjusting wages. The pattern of wage adjustment in recessions in the period conforms to a labour market model in which *custom* still plays an important role and "insiders" enjoy considerable labour market power. To a great extent, this means "insiders" were relatively isolated from the vagaries of the firms' product market.

The remainder of the paper is organised as follows. Section 2 describes the sources being used in this study. Section 3 describes institutions governing pay and their stability over time. Section 4 discusses the evolution of labour productivity focusing on effort norms. Section 5 studies short time and employment fluctuations. Section 6 discusses what explains the stability of implicit rules and section 7 concludes.

2 Data

Data for this study were drawn up from available records of Catalan textile firms –*La España Industrial, Manufacturas Sedó* and *Almeda, Alemany y Cía.*- located at the National Archive of Catalonia (ANC). There are obvious potential biases in the use of these sources to describe labour market conditions. The records of these firms might not be representative if they were exceptionally successful in dealing with the problems of their product and labour market. However, these firms were selected because they represented very different labour market conditions. Contemporaries divided the sector into two different areas: the Lowlands (*Pla*) –which included the steam powered factories of the area of Barcelona and coastal towns like Mataró and Vilanova i la Geltrú- and the Mountain (*Muntanya*), containing traditional textile towns like Manlleu

or Manresa and the town mills located on the banks of the rivers Llobregat, Cardener, Ter, and Fresser.[15]

Some of the steam-powered factories (*vapors*) in the Lowlands were among the largest establishments in the sector. Next to Barcelona, in Les Corts, *can Batlló* concentrated some 2,500 workers circa 1880. Nearby, in Sants, *La España Industrial* employed more than 1,500 workers and *Vapor Güell* about 1,000. In the Mountain, because water power did not allow large establishment sizes,[16] firms employed between 150 to 300 workers, with the only exception of *Sedó*, employing 2,500 workers in 1900.[17] The largest concern in Manresa in the late 1880s did not employ more than 300 workers. In Manlleu, a spinning centre in the Ter Valley, average establishment size in 1892 was 187 workers.[18]

In order to analyse the behaviour of piece rates, I have taken data on earnings in the weaving and spinning sections of *La España Industrial*, *Manufacturas Sedó* and *Almeda, Alamany y Cía*. In all these firms, weavers and spinners were paid by the piece, except ring spinners at *La España Industrial* after 1887. In both processes, it is necessary to take into account technical change and different skill requirements. Cotton spinning in the big factories around Barcelona initially employed female spinners on mules to break out resistance of male spinners employed in mule-jennies.[19] However, the employment of women limited the ability of employers to extend the number of spindles per mule because longer mules required more physical exertion.[20] As a result, men were hired to tend the longest mules. A similar process happened in the power looms, where men were employed to operate the largest power looms. In fact,

[15] IRS, *La jornada.*
[16] Valls Casas, *De colònies tèxtils a parc fluvia*, p. 90.
[17] Dorel-Ferré, *Les colònies industrials,* p. 301.
[18] Sallarés y Pla, *El trabajo de las mujeres y los niños*, p. 130.
[19] Benet and Martí, *Barcelona a mitjan segle XIX,* vol. I, p. 366.
[20] On the strength requirements of self-acting mules, see Lazonick, "Industrial relations," p. 235.

between 1840 and 1861 (the two available benchmark years), the proportion of adult men increased from 5.4 per cent to 29 per cent in cotton spinning and from 61.8 to 76.9 per cent in cotton weaving.[21]

In cotton spinning, from the 1880s another technology, ring spinning, was available which substantially reduced skill and strength requirements and had a significant productivity advantage in coarse and medium yarns.[22] Except in Manlleu, where male spinners resisted the hiring of women to replace them,[23] ring spinners were women assisted by a piecer and occasionally a helper, in both cases generally young girls.

La España Industrial, created in 1847, is representative of the experience of a large steam-powered factory of the lowlands. In the 1880s, the firm used 27,332 mule spindles and 3,250 throstle spindles and some 900 power looms.[24] After a strike lasting three and a half months, new machinery in 1887 brought about the substitution of rings for mules and throstles. In 1891, 21,288 ring spindles were in place, while the number of looms was reduced to 700.[25] Both self-acting mule and ring spinners were women, assisted by a piecer and one or two helpers, with each team tending frames of 400 spindles on average.[26] In the weaving rooms, women tended 2 small looms while men tended 2 large ones. After 1887, ring spinners in *La España Industrial* were paid time rather than piece rates.

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[21] Izard, *Revolució industrial,* p. 43.
[22] Saxonhouse and Wright, "Technological evolution," p. 3.
[23] Smith, "Social conflict," p. 339.
[24] Enrech, "L'ofensiva patronal," p. 275.
[25] Arxiu Nacional de Catalunya (ANC), fons La España Industrial, "Reforma total de la maquinaria en las secciones de preparación de hilados é hilados" (1887); Enrech, "L'ofensiva patronal," p. 275.
[26] Reforma (1887) gives productivity calculations for rings of 672 and 700 spindles for warp and weft yarn respectively. However, in the visit of the officials of the US department of Commerce and Labor in 1910, frames of 400 spindles on average were reported, much in line with the observed ring sizes in Catalonia. Odell, *Cotton goods*, p. 30.

Sedó was unusually large for a town mill of the Llobregat Valley. The firm was created in the mid 19th century when the owner, Miquel Puig, bought the right to use water power from the Llobregat river. By 1875, the firm had already installed 25 000 spinning spindles and 500 power looms and employed 1,300 workers.[27] A new town mill was built in 1895 with 1,328 inhabitants, the main group being families of four to five members, most of them employed in the factory.[28] These figures suggest that about half of the labour force (of 1,700 to 2,000 workers in the early 20th century) lived in the town mill and the rest walked to the factory from the neighbouring towns of Olesa and Esparraguera.

In our period, the firm experienced five strikes. In 1882, the employers locked-out the entire labour force to layoff union workers.[29] In 1885, workers staged a 6 months-long strike (from September 1885 to the 10th March 1886) to prevent employers from increasing the number of looms and mules tended by workers.[30] In 1890, workers went on strike in solidarity with the textile workers of Manresa. In 1899, a strike lasting five weeks was staged to demand an increase of pay of 25 per cent for weavers. In November 1900, a strike took place after employers tried to reduce wages by between 5 to 8 per cent. The strike ended on February 1901 when the pay cut was withdrawn.[31]

At *Sedó*, loom sizes ranged between 1 and 2.70 metres. Men generally tended two large looms, while women tended two small ones.[32] Before 1903, most spinners were men. Men tended one mule with the help of one assistant, while both men and women tended one ring with the help of a piecer and a helper.[33] For example, in 1901, the firm

[27] Dorel-Ferré, *Les colònies industrials,* p. 268.
[28] Ibid., p. 358.
[29] Ibid., p. 382.
[30] Ibid., p. 385.
[31] Ibid., p. 392.
[32] Ibid., p. 404.
[33] Enrech, “L’ofensiva patronal,” p. 255.

employed 201 men and 89 women in its spinning room. However, in 1903, a fire destroyed the spinning section (according to workers, it was deliberately started by employers) and the firm replaced all male spinners with women.[34] Warp spinners tended one ring assisted by a helper, while weft spinners with a helper operated two rings. Weft spinning additionally used a group of ancillary workers.[35] *Sedó* installed relatively small rings bought to the British manufacturers Howard & Bulloughs of 280 and 256 spindles respectively.[36]

Almeda, Alamany and Cía was a river factory located in Manlleu employing 197 workers in 1903.[37] As most firms in Manlleu, the firm specialised in cotton spinning and employed exclusively male spinners throughout the period. The firm started to produce in 1882 with eight mules of 312 to 404 spindles and 2,626 spindles in total. From 1885 onwards, *Almeda* only bought rings of about 350 spindles, using 3,772 ring spindles in 1900.[38]

In all three cases, data are available on pay and output in the spinning and weaving rooms from payroll ledgers (*llibres de salaris*). Since wages were earned on a weekly basis, I sampled the ledgers by choosing only weeks corresponding to early March, early June, mid September, and late November. In the case of *Sedó*, because only ledgers from week 13, 26, 39, and 52 have survived and the series only covers 1900 to 1912, with two additional wage books from 1895, all available ledgers were selected to maximise the number of observations.

[34] Dorel-Ferré, *Les colònies industrials,* p. 393.
[35] Ibid., p. 255.
[36] ANC, fons Manufactures Sedó, "Maquinaria existente."
[37] Enrech, "L'ofensiva patronal," p. 262.
[38] Ibid., p. 452.

3 Institutions governing pay: the stability of piece rate lists.

Pay in the Catalan cotton textile industry was governed by piece rate or price lists (*listas de precios*), which on a few occasions covered whole towns or regions (public lists) but were generally bargained at the firm level (private lists). The evidence on both public and private lists is scarce but in this section I present new evidence on piece rates collected from firms' payroll records.

Piece rates in cotton weaving depended on the number of picks (*pasadas*) per inch (*pulgada española*) –the pick referring to the number of times weft yarn is passed through warp yarn to produce cloth- as well as the size of pieces, and yarn characteristics. In spinning, the standard unit was the weight of output, with the payment per Catalan pound or kilogram increasing with the fineness of yarn. Yarn fineness was measured by the count, defined as the number of Catalan hanks (*madejas*) of yarn –the standard unit of length corresponding to 500 *canas*, or 777.5 metres- weighing 1.1 Catalan pounds or 440 grams.[39] Therefore, one hank or 777.5 metres of count number 1 weighs 440 grams, one hank of count number 10 weighs 44 grams. Since it took longer to spin one kilogram of yarn at higher counts, pay increased with the count of yarn.

The first public local lists in cotton processing appeared in the early 1840s for hand-loom weavers, associated with a short period of formal collective bargaining.[40] During the "self-actings conflict" (*conflicto de las selfactinas*) in 1854, there is evidence of the first local lists for power-loom weavers (mechanised looms).[41] A similar list was agreed upon in Sallent –a traditional textile town in the Llobregat valley- in March 1855.[42] With

[39] Ferrer Vidal, *Conferencias sobre el arte de hilar y tejer*, p. 70; Rabasa, *Tratado teórico-práctico,* p. 3.
[40] Ollé, *El moviment obrer*, p. 109; Barnosell, *Els orígens*, p. 130.
[41] Benet and Martí, *Barcelona a mitjan segle XIX*, vol. I, pp. 570-572.
[42] Ibid., p. 627.

formal collective bargaining, other public lists also appeared in textile towns like Manresa, Vilanova i la Geltrú or Manlleu.

In the case of lists for weaving, the payment associated with each piece of cloth depended on the size of the piece and the number of picks. In the 1854 list, the number of 'picks' for each type of piece could vary from 14 to 20. For instance, a piece of size 4/4[43] with 14 to 16 picks was paid 11 *reales,* with every additional two picks being paid an additional *real*. Similarly, a piece of size 6/4 was paid 15 *reales* for a piece of 14 to 16 picks and 17 *reales* for a piece of 18 to 20 picks.

Evidence on cotton spinning local lists is relatively scarce. Manlleu spinners drew up a local list in 1855, but it is not known exactly how it worked.[44] In Barcelona, a mixed commission of employers and spinners negotiated a spinning list for Barcelona, but conflict over the introduction of self-acting mules postponed every agreement on the list.

In the 1st Republic (1872-1873), with another period of formal collective bargaining, a regional textile union belonging to the 1st International –the *Unión Manufacturera*- tried to enforce a regional list which included a 7.5 per cent rise in pay. In this case, the regional list contemplated discounts in rates proportional to the distance from each town to Barcelona –Barcelona being considered to have the highest cost-of-living and thus having higher wages.[45] However, evidence on the particular form of this list is not available.

In the 1880s, thanks to the union press, especially the newspaper of the leading cotton textile union, the *Tres Clases de Vapor* (three steam sections),[46] there is some scattered evidence on the nature of lists. As in 1873, the textile unions also tried to enforce a regional list, but these

[43] Units are not defined. The two units of length used in the period were *canas* and metres (1 *cana* being equal to 1.56 metres).
[44] *La Publicidad,* morning edition, 17th February 1899.
[45] Izard, *Industrialització i obrerismo*, p. 171.
[46] Refers to the 3 processes of cotton processing: spinning, weaving, finishing.

efforts failed after the defeat in the general strike of 1890.[47] Contrary to the previous examples, in the general strike bargaining was over nominal wages, a standard weekly wage, rather than piece rates. In mechanical weaving, nominal earnings for weavers increased with the size of looms, the number of shuttles per loom and the type of cloth being produced. For example, the standard wages drawn up by the *3 Classes* for Manresa (province of Barcelona) stipulated that weavers of white fabrics on two looms were to earn from 17 to 18 *pesetas* per week, those tending looms with only one shuttle weaving coloured fabrics from 20 to 21 *pesetas* and weavers tending looms with more than one shuttle from 24 to 25 *pesetas.*[48] In Sant Andreu del Palomar (next to Barcelona), target earnings varied with the size of looms, with 19, 21 and 23 *pesetas* week being paid to weavers tending looms of 5, 8 and 10 hand spans.

Similarly, in cotton spinning target earnings depended on the size of self-acting mules. In Manresa in 1890, nominal weekly wages increased with the number of spindles. In self-acting mules of 400 to 500 spindles, spinners were entitled to 19-20 *pesetas* week, with pay increasing to 22 to 24 *pesetas* for spinners tending 600 to 700 spindles and to 25 to 28 *pesetas* for those tending 800 to 1000 spindles.[49] No premium was given for faster machine speeds (self-acting mules could be driven at different revolutions per minute). Once workers and managers had agreed upon standard wages, each firm adjusted piece rates according to its particular labour productivity, with less productive firms paying higher piece rates to meet the required standard.

In the 1890s, with the main textile union weakened, workers and firms bargained over lists in absence of formal bargaining procedures and, in most cases, in absence of a union. However, the evidence

[47] Dalmases, *El socialismo en Barcelona*, p. 15.
[48] Enrech, "L'ofensiva patronal," p. 448.
[49] Ibid., p. 285.

collected here shows piece rates remained fixed in a period of frequent economic downturns, leading to the existence of piece rate stickiness. In fact, there is some evidence piece rates were adjusted upwards, but only exceptionally downwards. Changes in piece rates did not correspond to cyclical downturns or upturns.

This view is corroborated by evidence on piece rates for particular types of count over 1890 to 1910. Piece rate changes are found in table 2, figures from *Sedó* and *La España Industrial* correspond to female spinners while *Almeda* only employed male spinners (piece rates were substantially higher, about double the piece rates of women). In table 2a, I show piece rates were fixed for the most common yarns in the mule spinning section of *La España Industrial* between 1880 and 1886, which includes the bad business years of 1885 and 1886. In *Sedó* (table 2b), nominal piece rates increased by 3 to 20 per cent between 1901 and 1910 and do not show downward adjustments. At *Almeda*, between 1890 and 1910, piece rates remained stable across most count types. In the period 1886-1890, piece rates in ring spinning were cut by 10 to 20 per cent, but this could well correspond to a period of experimentation after the rings were first introduced in 1886 (in fact, in self-acting spinning, rates were not cut). This cut does not correspond with an economic downturn; rather, the firm's output was increasing very fast. Afterwards, piece rates remained fixed during the whole period. Rates corresponding to the common twist yarn count 24 in the self-acting mules kept constant during the whole period.

Table 2. Piece rate changes, ring and self-acting mule spinning.

a) La España Industrial, self-acting spinning 1880-1886.

	1880-1884	1885-1886
Warp yarn, count 22	0.593 *reales*/kg	0.593 *reales*/kg
Warp yarn, count 32	0.985 *reales*/kg	0.985 *reales*/kg

b) Sedó, 1901-1910. *Pesetas* per kilogram.

	14 warp	20 warp	26 warp	55 warp
March 1901	0.029	0.046	0.0742	0.18
December 1901	0.0307	0.0487	0.0742	0.1908
March 1904	0.0350	0.0501	0.0764	0.1908

c) Almeda, 1886-1910. *Pesetas* per kilogram

	1886	1890	1895	1900	1905	1910
Self-acting mules, twist yarn, number 24.	0.165	0.165	0.165	0.165	0.165	0.165
Rings, warp 14	na	Na	0.074	0.074	0.075	Na
Rings, warp 16	0.096	0.085	0.086	0.086	0.086	0.086
Ring,s warp 18	0.1103	0.098	0.098	0.098	0.097	0.098
Rings, warp 20	0.1103	0.127	0.101	0.112	0.104	0.104

Sources: Arxiu Nacional de Catalunya (ANC), fons la Espanya Industrial, “Llibres de salaris”. ANC, Fons Manufacturas Sedó, “Llibres de salaris”. ANC, fons Almeda, “Llibres de salaris.”

A similar case can be made for weaving. In spite of the existence of many different types of woven cloth, detailed examination of piece rates at *La España Industrial* of the most common types of cloth suggests piece rates were also sticky in the weaving rooms of Catalan factories. For example, between 1880 and 1886, piece rates did not change even in the bad business years of 1885 and 1886 (table 3a). However, in 1887, there was a piece rate cut of about 30 per cent when the firm laid off most of its male weavers and hired women (piece rates varied between men and

women).[50] The cut took place under very exceptional circumstances when the firm re-organised its spinning section and activity was stopped or slowed for almost one year and a half. After 1888, piece rates remained fixed or with little adjustments up to 1910. During the period there was a shift towards the production of more expensive pieces of the type *liso* or *bordón.* As a result, average nominal piece rates increased from 1.94 *pesetas* per piece to 2.92 in 1905 and further to 5.38 in 1910, with an increase between 1890 and 1910 of 177 per cent.

Evidence from *Sedó* suggests that the rising rates per piece of cloth depended on the pieces getting heavier. In the case of *Sedó,* calculating average rates per piece showed an increase of 119 per cent between 1895 and 1910 (table 3c). Increases in the rate paid per metre of cloth are of the same order of magnitude, with an increase of 61 per cent in the rate per metre paid between 1900 and 1910 (between 1900 and 1910 the average piece rate increased by 69 per cent). The average length of pieces grew from 82 metres per piece in 1901 to 86 in 1910, an increase of 4.9 per cent over the period. The explanation for the rise in the average piece rate is provided by the evolution of the weight of pieces. At *Sedó,* between 1895 and 1910 the average weight of pieces increased from 12.88 kilograms per piece to 22.49 kilograms, i.e. an increase of 74.6 per cent.[51] At the same time, the rate per kilogram of cloth grew by 30.8 per cent. These two changes together bring about an increase in the rate per piece of 129 per cent (1.75*1.31), explaining the 119 per cent rise in the price of pieces observed between 1895 and 1910. Therefore, the decline in rates due to pieces getting longer is indeed small.

[50] Pay did not necessarily fall, the average number of pieces produced in a given week increased by 35 per cent while average piece rates fell only by 30 per cent (values of 1880-1885 compared with those of 1890-1900).

[51] The increase was continuous through time. In 1895, the average weight of pieces was 12.88 kilograms, in 1900, it was 14.78, in 1905 it was 19.072, and in 1910, 22.49 kilograms per piece.

Average piece rates at *Sedó* also show that piece rates were sticky (table 3d). Average rates per metre increased continuously from 1901 to 1911. Over the period from 1895 to 1910, the rate per kilogram grew by 31 per cent. There was a temporary 5 per cent fall of the average rate per kilogram, which proxies the rate per pick, between 1900 and 1905. However, the upward trend in the rate per metre and the increase of the average weight of pieces more than compensated for the fall in the rate per kilogram.

Table 3. Piece rate changes, cotton weaving.

a) *La España Industrial,* 1880-1886. *Reales* per piece.

Type	1880-84	1885-1886
4/4 3ª	11.82	11.82
4/4 2ª	12.63	12.63
4/4 Madras	10	10
6/4 Madras	18	18
Entrefino primera	8.80	8.80
Entrefino segunda	8.80	8.80
Molesquin 4/4	39	39

b) *La España Industrial,* 1890-1910. *Reales* per piece.

Type	1890	1895	1900	1905	1910
4/4 3ª	8	na	na	Na	na
4/4 18	7	7	7	Na	na
4/4 Madras ½	8.50	8.50	8.50	Na	na
4/4 Molesquin 3ª	18	18	18	19	19
4/4 Molesquin 4ª	na	24	24	25.50	na
4/4 Franela	na	6.20	6.50	7	na
4/4 setina 1ª	na	13	na	15	na
4/4 Bordon	na	na	34	37	37
4/4 Liso D	na	na	Na	42	42
5/4 Franela 1ª	na	na	6.50	6.90	6.80
5/4 chagrin	8	8	8	na	na
6/4 Encuad	na	na	13	13	13
6/4 Madras 2ª	10	10	10	na	na

c) *La España Industrial*, 1890-1910.

Year	Average piece rate. Ptas piece.	Pieces per worker-week
1880	2.905	5.65
1885	3.139	3.83
1890	1.937	6.73
1895	1.970	6.57
1900	2.423	5.91
1905	2.916	6.06
1910	5.377	3.67

d) *Sedó,* 1895-1910

Year	Average rate per piece of cloth	Average rate per kg	Average rate per metre
1895	2.76	0.214	n. a.
1901	3.59	0.252	0.044
1905	4.59	0.241	0.051
1910	6.07	0.280	0.071

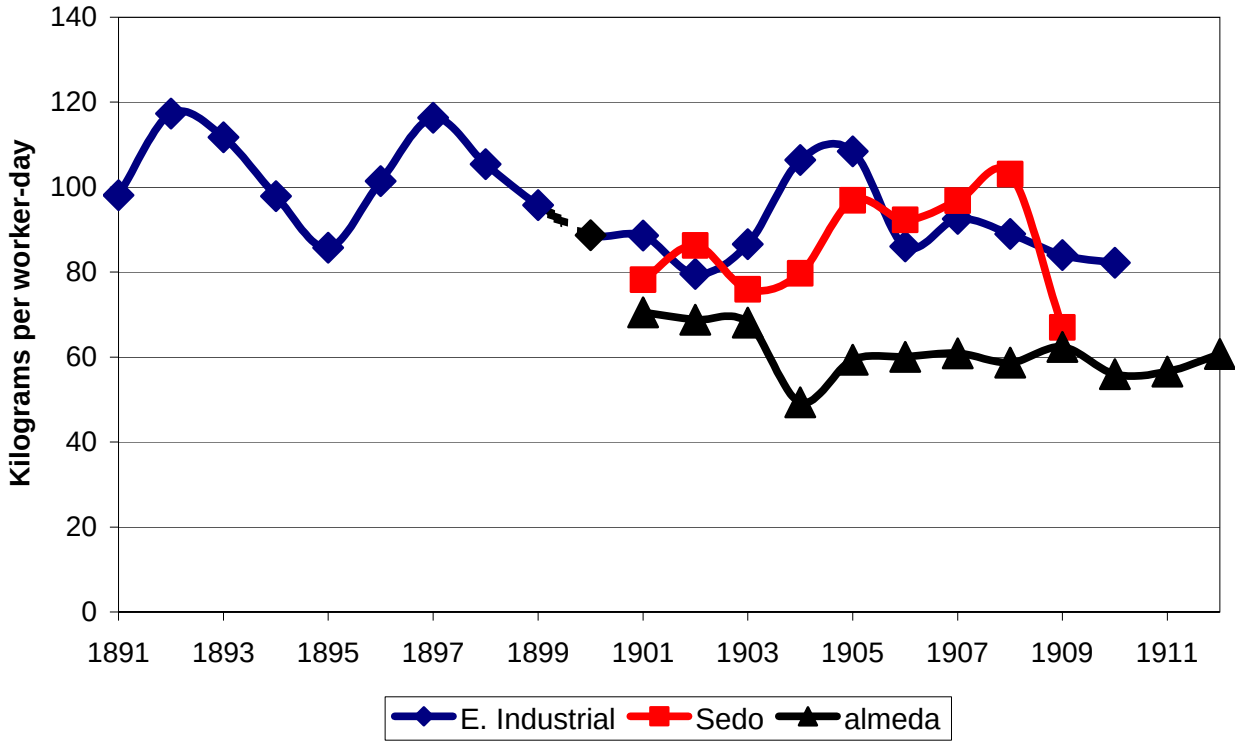
Sources: Arxiu Nacional de Catalunya (ANC), fons la Espanya Industrial, "Llibres de salaris". ANC, Fons Manufacturas Sedó, "Llibres de salaris". ANC, fons Almeda, "Llibres de salaris."
Averages are own calculations.

4 Intensification of labour utilization.

Another crucial tenet of the "increasing competition" hypothesis is that work intensified over the period, further reducing the demand for labour. In order to study if this was the case, evidence on labour productivity levels and their evolution over the period is necessary. This is especially straightforward for spinning since it is relatively easy to control for varying qualities of output. In this case, ten rings were randomly selected and the labour productivity of the teams that tended them monitored over time. The size of teams did not vary over time. *La España*

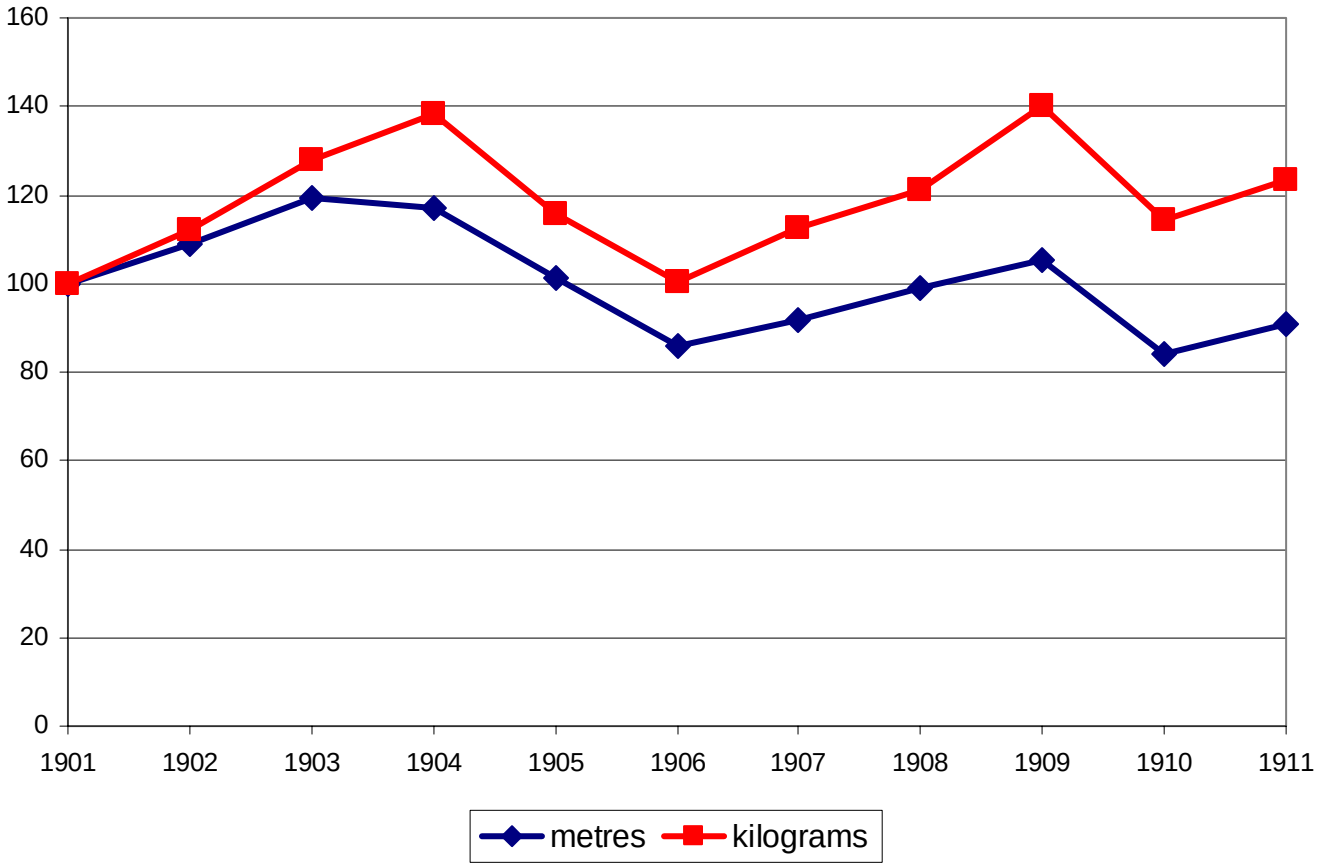
Industrial had teams of three spinners. *Sedó* only used two in their smaller rings. Therefore, we need only focus on the daily output produced in each machine. To do so, I regressed for each firm the daily output of each ring against a constant, the quality variable (the count, the count squared and whether it is weft or warp yarn), a dummy variable controlling for the season in the year in which observations were taken, and dummies for all years. Some observations were missing, so this constitutes an unbalanced panel. All regressions performed well with R-squares of about 0.7. Coefficients in the big firms, *Sedó* and *La España Industrial*, look remarkably similar. *Almeda* has different coefficients. There are two reasons for that. Figures for days of work in a given week are less reliable in this firm. Also, productivity might have been lower in a small firm with older machinery bought in the early 1880s. Using the coefficients of these regressions, I then constructed yearly values of labour productivity for a constant count number, also taking into account the seasonal variation in output. These values are plotted in graph 1. With the possible exception of *Sedó*, the picture does not suggest any intensification of effort in the cotton spinning rooms.

Graph 1. Labour productivity in cotton spinning, 1891-1912. Kilograms day of count 20.



Similarly, we can analyse the evolution of labour productivity in cotton weaving in the firms with a weaving section. Weaving data from *España Industrial* are inadequate because they only give information on pieces produced in a given week, without information on the characteristics (size, length, weight) of these pieces. Evidence from *Sedó,* where weekly output is given in pieces, kilograms and metres, gives more detailed information (but data on employment levels are only given from 1901 onwards). The average length of pieces produced by a worker in a given day is falling, whereas the trend in kilograms per weaver-day has a positive but statistically insignificant trend. In fact, average daily labour productivity expressed in kilograms was about 119 kilograms in both 1901-5 and 1906-11. Again, there is very little evidence of an intensification of effort.

Graph 2. Labour productivity in cotton weaving, 1901-1911 (1901=100).



5 Short time and employment fluctuations.

In this section, I will analyse employers' responses to economic downturns addressing explicitly the pattern of adjustment in the sector to gain insights on how the cotton textile labour market operated. By doing this, I follow other historical studies that compare the output, nominal wage and labour input changes over the business cycle to characterise historical labour markets that did not have institutional impediments to nominal adjustment like minimum wages or state-enforced collective

bargaining.[52] As I will show, since piece rates were rigid, price rigidity produced quantity adjustments. Firms responded to declines in economic activity by adjusting output, hours of work (short-time), and employment. Labour productivity was pro-cyclical.

In this period, there were three identifiable economic downturns producing a decline in sales and excess capacity: 1898, 1900 and 1904. The first two crises are related to the Cuban war of 1898 because Cuba was the main export market of the Catalan textile industry.[53] The crisis of 1904 according to the employers' press was one of overproduction caused in part by a rise in raw material prices.[54] In order to identify declines in sales, I regressed the logarithm of weekly output against a constant and a time trend. Economic crises were identified when there were more than three observations below trend (9 months below trend). Then I compared the values of the relevant variables with values corresponding to good years (above trend). In table 4, I present results from this exercise carried out with data from the spinning and weaving rooms at *Sedó* and *La España Industrial*.

[52] Huberman, "Invisible handshakes;" Sundstrom, "Was there a golden age;" Sundstrom, "Rigid wages;" Carter and Sutch, "The labor market."
[53] Nadal, "La indústria cotonera," p. 64.
[54] *El Trabajo Nacional,* numbers 312 and 313, first page, July and August 1904.

Table 4: Labour input and wage adjustments to output fluctuations.

Sedó, spinning	Sep 1903-Dec 1904	June 1909-March 1910	
Output (kgs)	-54.54	-14.38	
Employment	-41.13	-11.85	
Labour productivity-week	-23.19	-2.01	
Average rate per kilogram	13.89	10.53	
Nominal weekly wage	-12.36	8.78	
La España Industrial, spinning	Sep 1900-June 1901	Nov 1902-March 1904	March 1910 – Nov 1911
Output (kgs)	-23.67	-29.81	-25.54
Employment	-24.32	-25.5	-10.08
Labour productivity – week (Y/L)	1.56	-3.17	-17.44
Average rate per kg	2.82	10	7.95
Nominal weekly wage	4.24	12.03	-11.29
Sedó, weaving	Dec 1903-June 1904	March 1910-Sep 1911	
Output (kgs)	-38.73	-18.01	
Employment	-37.58	-14.17	
Labour productivity –week (Y/L)	7.11	-14.72	
Average rate per kg	-7.06	13.99	
Nominal weekly wage	-0.77	-1.62	
La España Industrial, weaving	Nov 1898-June 1899	March 1903-March 1904	March 1910-March 1911
Output (pieces)	-26.02	-38.52	-44.05
Employment	4.1	-21.48	-15.49
Labour productivity – week (Y/L)	-28.74	-15.76	-34.98
Average rate per kg	17.07	33.36	62.14
Nominal weekly wage	-15.09	2.19	1.68

Sources: Arxiu Nacional de Catalunya (ANC), fons la Espanya Industrial, "Llibres de salaries," ANC, Fons Manufacturas Sedó, "Llibres de salaris". ANC, fons Almeda, "Llibres de salaris."

The magnitude of the fall in output in the cases analysed here was indeed large. For example, output in the spinning rooms of *Sedó* fell by 54 per cent in late 1903 and early 1904 compared with average output in the previous two years. The company reacted by cutting employment by 41 per cent and by working short-time. The magnitude of the negative adjustment in the number of hours worked is proxied by the average weekly labour productivity (weekly output divided by the number of workers on payroll). The difference between the two periods was 23 per cent, which would mean that, if the levels of daily productivity were kept constant, the firm worked on average 4.62 days instead of 6. On the other hand, the average rate per kilogram of spun yarn showed considerable counter-cyclicality, with an increase of 14 per cent. As a result, nominal weekly wages only fell by 12 per cent.

The recession of late 1909 and early 1910 was milder, with output falling only by 14.38 per cent. Layoffs were limited to 5.17 per cent of the workforce while short-time –measured by the fall in weekly labour productivity- was only 2.01 per cent in this case. Because the firm adjusted mainly through layoffs and quality was countercyclical, the nominal weekly wage increased by 8.78 per cent.

Compared to *Sedó*, the elasticity of employment with respect to output was larger in the spinning rooms of *La España Industrial.* In two of the three recessions that I have identified, the fall in employment was of the same magnitude than the fall in output, reducing the need to work short-time. Accordingly, weekly labour productivity increased or fell only slightly in both recessions. Average weekly wages and the average rate per kilogram increased during both downturns. Only in the last economic downturn, March 1910-June 1911, did the firm resort to both lay-offs and short-hour working (minus 10 per cent and minus 17.4 per cent, respectively).

Still in table 4, the same exercise was repeated in the case of the weaving rooms of *Sedó* and *La España Industrial.* Again, the response to large economic downturns was adjustment of labour input rather than prices. In the case of *Sedó*, the firm adjusted to the fall in output (measured by the number of kilograms of woven cloth) through a combination of lay-offs and short-time. In the downturn of early 1904, the firm adjusted only by reducing employment; with output falling by 39 per cent, employment fell by 38 per cent, while weekly labour productivity grew by 7 per cent. During the second economic downturn in 1910-1911, with output falling by 18 per cent, short-time was 14.7 per cent.

Evidence on the weaving rooms of *La España Industrial* is more difficult to interpret given the fact that the output variable is measured in terms of pieces of cloth, which varied in their characteristics over the cycle. From December 1898 to June 1899, output fell by 26 per cent but the firm did not reduce employment. Instead, it reduced weekly labour productivity by 28.74 per cent to accommodate the reduction in sales. Average weekly wages only fell by 15.09 per cent because at the same time the average piece rate was increasing by 17.07 per cent because pieces of cloth of higher quality were being produced. In the other two economic downturns, in early 1904 and 1910, the company resorted to a combination of lay-offs and short-hour working. As a consequence of the employment adjustment and the increase in average piece rates, nominal weekly wages increased in both recessions.

The results in the previous table can be improved in three directions. First of all, I wish to construct an the aggregate picture of movements in output, short-time and employment rather than one that is focused on particular downturns. In this regard, it is useful to aggregate all output, short-time and employment changes. Second, due to my sampling method which takes three or four weekly observations per year, some fluctuations may simply be seasonal. Thus a method to correct for

purely seasonal variation is needed. Finally, upward movements in average piece rates during economic downturns suggest it is worthwhile to control for quality movements over the cycle. Since downturns are associated with higher piece rates, there is a concern that declines in total product might be confused with simple increases in average quality reducing the physical quantity of output being produced. This is simple to control for in the case of spinning where I could collect at a reasonable cost the average count for the different types of yarn (warp and weft).

In order to incorporate these improvements, I have regressed the logarithm of the weekly amount of spun yarn against a constant, a time trend, and dummies for each of the weeks selected in the study.[55] In two firms, I also included a yarn quality control. In the case of *Almeda*, I used the average count of warp yarn, and I calculated for *La España Industrial* a composite index of average warp and weft yarn count multiplied by the shares of warp and weft yarn in the total weight of yarn produced in a given week. I did the same exercise with the logarithm of weekly labour productivity, also including a quality control, and employment levels. *Almeda* did not report employment figures, so I used output per spindle to proxy labour productivity given that capital-labour ratios did not vary in the period. Then, negative deviations of output with respect to trend were added up and compared with the adjustments about trend of employment levels and of weekly labour productivity.[56] All differences with respect to trend are expressed in percentages.

Some caveats however are necessary which prevent a straightforward interpretation of the pattern of employment and hours adjustment. Given my sampling procedure, I capture more precisely

[55] I tried different trends: linear, quadratic and experimented with trends including lagged values of the dependent variable as independent variables. Including lagged values obviously diminished the size of fluctuations about trend, but results did not vary substantially. Results presented here use linear trends only.
[56] This follows Huberman, Michael, "How did labor markets work?" As well, Huberman, "The economic origins of paternalism."

short-run adjustments than adjustments that are lagged in time. Since employment cuts meant the loss of trained workers and firm-specific human capital, employers might have delayed cuts until the trough of the recession was reached. If this were the case, then my procedure would underestimate the magnitude of the adjustment. In order to avoid the problem of lagged adjustment, I have calculated the sum of the absolute values of positive and negative deviations with respect to trend. Employment and labour productivity adjustments to negative output deviations capture the (short-run) "sensitivity" of these variables to changes in output, whereas adding up all deviations about trend captures the size of cyclical adjustment in each of the variables.

Table 5. Adjustment to output declines, cotton spinning, 1880-1910.

a) *La España Industrial*, 1880-1886. Mule spinning.

	Output (kilograms)	Employment	Weekly labour productivity
Negative deviations with respect to trend	-31.7	-11.5	-59.2
Negative deviations, quality adjusted	-30.0	-10.0	-54
All deviations with respect to trend (quality adjusted)	60.0	36.7	116.2

b) *La España Industrial*, 1891-1910. Ring spinning.

	Output (kilograms)	Employment	Weekly labour productivity
Negative deviations with respect to trend	-74.7	-39.5	-108.9
Negative deviations, quality adjusted	-65.5	-39.7	-91.7
All deviations with respect to trend (quality adjusted)	132.9	127.5	212.5

c) *Almeda, Alamany, y Cía*., 1886-1910. Ring spinning.

	Output (kilograms)	Weekly output per spindle
Negative deviations with respect to trend	-48.6	-343.7
Negative deviations, quality adjusted	-45	-330.7
All deviations, quality adjusted	90	802.2

d) *Sedó*, 1900-1910. Ring spinning.

	Output Kilograms	Employment	Weekly labour productivity
Negative deviations with respect to trend	-41.6	-33.6	-48.2
All deviations	81.14	106.2	112.9

Sources: Arxiu Nacional de Catalunya (ANC), fons la Espanya Industrial, "Llibres de salaris". ANC, Fons Manufacturas Sedó, "Llibres de salaris". ANC, fons Almeda, "Llibres de salaris."

Results in table 5 show that correcting for yarn quality removes some of the variance of both the output and labour productivity variables but that the conclusions drawn from table 4 are still valid. The main adjustment mechanism for firms in the face of negative demand shocks was short-time working, measured by the decline in average weekly labour productivity. This is especially the case in *Almeda* and mule and ring spinners in *La España Industrial,* where short-time was more important than lay-offs. In *Sedó,* the size of the adjustment through employment and labour productivity is of similar magnitude (observed using both only negative and all deviations).

Table 6. Adjustment to output declines, cotton weaving, 1889-1910.

a) *Sedó*, 1900-1910. Weaving.

	Output (kilograms)	Employment	Weekly labour productivity
Negative deviations	-24.19	-3.68	-56.2
All deviations	48.38	54.69	139.27
	Output (metres)	Employment	Weekly labour productivity
Negative deviations	-25.31	-5.48	-65.35
All deviations	50.61	54.69	203.51

b) *La Espanya Industrial*, 1889-1910. Weaving.

	Output (pieces)	Employment	Weekly labour productivity
Negative deviations	-110.9	-20.7	-382.9
All deviations	221.8	100.1	881.6

Sources: Arxiu Nacional de Catalunya (ANC), fons la Espanya Industrial, "Llibres de salaris". ANC, Fons Manufacturas Sedó, "Llibres de salaris". ANC, fons Almeda, "Llibres de salaris."

Table 6 presents the results of the same exercise in cotton weaving. The results for *Sedó,* calculated for both kilograms and metres, show the same pattern of adjustment through short-time and employment, with short-time being the main form of adjustment. Compared with spinning, employment fluctuations are considerably smaller if only negative deviations are considered. When all deviations are included, differences with respect to trend are similar in output and employment, while deviations of weekly labour productivity are much higher. In part, this was caused by the fact that weavers were more skilled personnel than ring spinners, so that managers might have been

reluctant to lose trained workers. Furthermore, weavers probably enjoyed some additional bargaining power because half were adult men, a group that traditionally formed the backbone of unionism in the sector. In this sense, employment levels fluctuated less around their trend line.

The conclusions from section 5 are clear enough. On the one hand, piece rates were remarkably rigid, not varying or even increasing over time since 1890. I have shown the main pattern of adjustments to economic downturns was based on labour input. Among these, short-time was especially important in cotton weaving, while employment seems to be more elastic in the short-run in cotton spinning.

The pattern of short-weeks or short-time needs some elaboration since working short-time to accommodate reductions in demand is rare in modern times. It is difficult to imagine that all firms would collude to reduce output, so short-time firms might be losing market share to full-time working firms. Second, employers could lose good workers to full-time working firms. However, there are several reasons why employers might be willing to accept these practices. For example, managers might want to hoard labour to avoid losing skilled personnel to competitors and reducing the migration of valuable workers.[57] It could be argued that short time benefited employers because it reduced the total wage bill and the weekly wage paid to an individual worker. But for employers, the relevant unit was not the weekly wage but the labour cost per unit of output -and unitary labour costs were set by fixed rates. On the part of workers, short time could be seen as a way to preserve lengthy attachments with the same firm and as a fair way to spread the costs of unemployment and obtain some earnings in the absence of unemployment insurance.[58] Moreover, short-time working protected rates in economic downturns. For

[57] Kiesling, Lynne L., "Institutional choice matters," p. 70.
[58] Huberman, "Economic origins," p. 14; Huberman, *Escape from the market,* chapter 5.

example, a rule could exist in which firms can cut piece rates in downturns and work full time (for example, under a sliding scale system), with the commitment to raise them again in upturns. However, this was rarely the case because, as some experiences in the 1880s show (discussed below), workers feared firms would renege on their commitments to raise piece rates when the downturn was over.

6 Explanation

Adjustment to economic downturns by working short-time and cutting employment with sticky piece rates raises questions about the origins of nominal rigidity in the Catalan cotton textile sector. Models of piece rate bargaining assume firms need to elicit the co-operation of workers to introduce innovations and increase labour productivity. The theoretical base of these models is the existence of informational asymmetries between workers and managers leading to the payment of an efficiency wage. Informational asymmetries might have been important when new machinery was introduced in Catalonia and adapted to local conditions. Self-acting mules appeared in 1844 and expanded from 83,268 spindles recorded in 1850 to 763,051 in 1861.[59] The number of power looms increased from 210 in 1841, to 4,109 in 1850, 9,652 in 1861 and approximately 29,000 in 1870.[60] However, there are grounds to think that both the self-acting mule and power-loom technologies and later on the ring were quite 'mature' when introduced in Spain. This meant the process of experimentation on the technology was finished and the sources of potential information asymmetries were quite limited. In the case of self-acting mules, physical productivity per spindle changed little

[59] On the arrival of self-actors, Benet and Martí, *Barcelona a mitjan segle XIX,* vol. I, p. 543.
[60] Izard, *Revolució industrial,* p. 21.

between 1860 to 1885, with available estimates clustering around 20 kgs per year and spindle.[61] The rate of technical change seems to have been modest. This is due to the fact that increasing mule sizes was only possible in firms spinning finer counts, which were already experimenting with mules of well over 500 spindles in the 1880s.[62] Coarse yarn producers like *La España Industrial* spun warp yarn in 1887 with 49 mules of 320 spindles and weft yarn with 39 self-acting mules of 343 spindles.[63] Another coarse spinner, *La Rambla,* bought 5 self-acting mules of 410 spindles in 1853, 6 mules of 452 spindles between 1859 and 1869, and 3 mules of 500 spindles in 1867.[64] This means the average number of spindles in mules increased from 410 in 1853 to 447 in 1867, a 9 per cent increase over 14 years or 0.62 per cent per year. *Almeda, Alamany y Cía* used mules of 312 spindles purchased in the early 1880s, later on buying mules of 360 and 404 spindles.[65] By 1913, the most quoted figure for the average number of mule spindles was 500 to 600 spindles.[66] This figure, however, overestimates the pace of technical change; at the time, self-acting mules were only used to spin the finest yarns, for which bigger mules were already used in the 1880s.

In the case of rings, the potential for productivity improvement was exploited from very early on with a spinner and a helper minding rings of 400 to 500 spindles. Here, the information gap on new practices seems to have been small and managers decided in some cases to switch to time rates –as in *La Rambla* or *La España Industrial*. Productivity advances in ring spinning were small. According to the evidence collected from the

[61] Ramoneda, Alfredo, *Introducción al estudio del precio,* p.189. Rosés, *The early phase*, p. 77. *España Industrial* from Arxiu Nacional de Catalunya (ANC), Fons La España Industrial, "Salaris", 1880. Data on spindles from ANC, Fons La España Industrial, "Reforma total de la maquinaria." *Almeda,* ANC, Fons Almeda, Alemany y Cía., "Salaris".
[62] One example is La Bauma, Enrech, "L'ofensiva," p. 332.
[63] ANC, fons la España Industrial, Reforma.
[64] Ibid., p. 89.
[65] ANC, fons Almeda, "Salaris", year 1886.
[66] IRS, *La jornada,* pp. 442-443.

records of British producers Howard & Bulloughs, output per spindle did not increase between 1885 and 1910.[67] Evidence from Spanish ring purchases from British producers shows how, between 1884 and 1914, the average size of new rings increased by only 1.9 per cent (from 417 spindles in the period 1884-1890 to 425.2 in 1907-1914), while machine speeds of new purchases fell from an average 8,500 revolutions per minute in 1884-1890 to 8,400 in 1907-1914.[68] Furthermore, capital to labour ratios did not increase in the period. This suggests managers had a clear idea of how much could be produced with the new rings and this did not require the co-operation of their workforces. This led to a one-off increase in labour productivity for coarse and medium yarns in the late 1880s and early 1890s but minimal further improvements up to 1914-1918.

Informational asymmetries therefore do not take us very far in explaining the factors causing wage rigidity in such a 'mature' industry as the Catalan cotton textile industry. Insider-outsider models of wage and employment setting show that insiders with some degree of job security can resist wage cuts even in the event of an excess supply of labour.[69] The main reason for this is that 'insiders' –the workers with some degree of job security- are not perfectly interchangeable with unemployed or other available workers, either because insiders are more productive or can resist the hiring of outsiders.[70]

For example, in the crisis of the mid 1880s, there is ample evidence of strikes against piece rate cuts even though firms laid off workers or worked short-time. During the 1880s, the periodical of the textile union *Tres Classes de Vapor* reported the existence of various conflicts over

[67] Saxonhouse, "Productivity change," p. 216, footnote 38.
[68] Saxonhouse and Wright, "Technological evolution." In Odell's *Cotton goods* purchases of rings of 400 to 420 spindles are reported in the late 1900s. Odell, *Cotton goods,* p. 30.
[69] Lindbeck and Snower, "An insider-outsider approach."
[70] Solow, *The labor market,* p. 34.

piece rate cuts. For example, in 1888, workers in the *Mas* factory of Vilanova i la Geltrú staged a 600 strong strike against a piece rate cut.[71] In Sant Martí de Provençals (Barcelona) there was a conflict lasting 11 weeks after employers had attempted to introduce a piece rate cut. In Sant Andreu del Palomar (next to Barcelona) and in Manresa (Llobregat valley) in 1890, a strike occurred after a piece rate cut had not been reversed.

More comprehensive evidence on strikes is available after 1905 using the data provided by the *Instituto de Reformas Sociales.*[72] Between 1905 and 1910, a period of low strike activity, there were 29 strikes by cotton textile workers in the province of Barcelona. Of these, 9 were against lay-offs, 9 retaliated against a wage cut, 10 demanded wage increases and one asked for a shortening of the working day. The first group of strikes were generally organised against the dismissal of union or strike leaders. Workers demanded a more continuous activity throughout the year "to guarantee a standard weekly wage" only in one strike. However, this appears to be the case of a river factory in which employers promised their workers that they would buy new machinery to avoid the decline of activity caused by summer droughts.[73] In one third of the recorded strikes of the period, workers protested against a wage cut. They never struck against short-time working or temporary lay-offs.

Moreover, insiders' bargaining power was enhanced by the regional concentration of the textile industry which helped to diffuse information. During the 1880s, *El Obrero* publicised all conflicts over pieces and organised solidarity strikes. The most famous one was the conflict after a piece rate cut in the factory *Els Dolors* in Manresa in 1890. In response, the textile union organised solidarity strikes in Barcelona,

[71] Enrech, "L'ofensiva patronal," p. 448.
[72] The source is IRS, *Estadísitica de huelgas,* years 1905-1910.
[73] Ibid., year 1909.

Vilanova i la Geltrú and the Llobregat valley.[74] Conflicts with blacklegs were legendary, putting severe limits on the substitution of outsiders for insiders. In strikes in Barcelona or Manresa, it was common that women on strike harassed strike-breakers by throwing stones at them or cutting the plaits of female strike-breakers, while shootings and fights were not uncommon among male strikers and blacklegs.[75] This reduced the ability of workers who were available in the labour market to affect working conditions. For example, Angel Smith described conflict lasting 6 months over a new piece rate list in Manlleu in 1909 in which strike-breakers could not be recruited:

> "Conditions in the Rusiñol company town were, it has been noted, among the best on the Ter. Profit margins in the factory had, therefore, no doubt been particularly badly squeezed. This explains why on 15 May 1909 the owner, Albert Rusiñol, closed his factory and dismissed the 365 workers employed therein. The workers would, Rusiñol stated, have to reapply for admission, and accept a new wage list which had been drawn up. Not surprisingly, wages were in the future to be considerably lower. In particular male spinners who worked on the ring-frames would have to accept a cut in wages of 20 per cent. The workforce replied that it would only accept wage cuts in those cases in which wages had actually been higher than in the other factories in the town. Rusiñol refused to compromise, so no solution to the dispute could be found. Thus, when the factory reopened on June 30, the only people to go in were the managers and foremen. Another long strike ensued. The strikers were strongly supported by the Ter's textile unions. Rusiñol tried to break the strike by sending agents out into the country to look for blacklegs, but he had little success: by November only 40 had been recruited. The result was deadlock, which was only broken in February 1910 when Rusiñol announced that he was to close the factory."[76]

[74] Ferrer, *El primer "Primer de Maig"*, p. 65.
[75] Enrech, "L'ofensiva patronal," p. 252.
[76] Smith, "Social conflict," p. 361.

One possible reason for the apparent power of insiders might have been the particular labour market in which factories operated. The share of women with respect to total workers in the textile establishments was about 60 per cent in the 1910s.[77] We know little about the behaviour of these women in the labour market. How many years did they work on average? At what age did they quit the market? Were they mobile workers? Enriqueta Camps provides data showing that earnings for female textile workers rose with age using cross sectional data for the early 1920s from the textile town of Sabadell. Her results imply that a group of women could stay for a long and continuous period of time in the labour market and enjoy rising earnings. Female spinners or weavers were on average about 26 to 28 years old. Since factory work started when girls were about 12-13 years old, this means a potential continuous labour market experience of more than 10 years. Because new workers were recruited in the family, mobility between firms was small. Internal labour markets and job ladders existed for women as well as men. This is an important result, but the question is if the use of cross sectional data is not masking the existence of several career paths and different labour markets. If a small group of women made it to the top of the job ladder in the factory and most of them did not and left the labour market, we will still observe rising age-earnings profiles in the cross-sectional data.

As a pilot study, I used personnel records from the preparatory spinning and the spinning sections of *La España Industrial* to trace the mobility of urban female workers in these sections (about 200 workers employed on average) between 1899 and 1904.[78] Analysis shows there was considerable mobility in and out of the firm. In 1899, the firm required 88 new workers for 100 employed in the above-mentioned sections. In

[77] IRS, *Memoria general,* various years.
[78] I sampled 4 weeks a year from the weekly personnel ledgers. This means I lose moves in and out of the firm of less than 3 months.

1902, the figure was 75 and in 1904, 83. In two American firms, considered to have high rates of labour turnover, figures for the early twentieth century were 134 and 125.[79] The Quarry Bank Mill in Lancashire, where turnover was very low, required only 22 replacements for 100 workers employed. Mobility in *La España Industrial* seems to lie between these two extreme experiences. Of the women employed in the two sections in 1899, 30 per cent stayed for less than 6 months, 45 per cent less than 9, 51 per cent less than 1 year and 66 per cent less than 2 years.[80] Only a third of employed women enjoyed a stable position in the firm and long tenure. Less than a third of female factory workers were extremely mobile with very short employment spells in the firm, about 40 per cent had a discontinuous but prolonged attachment to the same firm, while the remaining group were the heads of the spinning teams with a high degree of employment continuity. Belonging to one or the other of these groups probably depended on age and years of experience in the same firm.

Some of this mobility was caused by employment fluctuations, with about a third of laid off female workers not coming back to the firm when output grew and the firm started re-hiring workers. My sampling method is quite inadequate to capture unemployment spells, but still we can capture some significant facts. In the 1901 downturn, only 3.5 per cent of workers employed in early 1901 went through an unemployment spell of more than 6 months and then were re-hired by the firm. 28 per cent experienced a permanent separation from the firm. 27 per cent worked continuously during the downturn and the remaining 41.5 per cent were not employed by the firm for a period of up to 6 months.

[79] Leunig, "Piece rates and learning," p. 8. Turnover rates in Spain are not very different from the turnover rates of textile firms in Germany in the late 19th and early 20th century. See Brown and Neumeier, "Job tenure," p. 211.

[80] When calculating these figures, I did not require employment to be continuous. We also need to take into account that we are looking at a truncated sample of employment stories.

Substantial research requiring extremely labour-intensive use of company records needs to be done on the area of labour mobility in the Catalan factories to advance our understanding of the labour market experience of female workers. Results so far are highly tentative, but evidence suggests there were competing forms of labour market experiences, with female factory workers enjoying different levels of employment security and stability. For our purposes, if a significant group of women moved flexibly in and out of the labour market, this reduced the pressure of unemployed workers on working conditions. Some laid-off workers might have known they were going to be re-hired after the downturn. The rest went back to household work or looked for employment somewhere else.

7 Conclusions

Did the difficulties experienced by the textile firms in the late 19th and early 20th centuries cause a substantial erosion of working conditions in the industry? Evidence gathered from the spinning and weaving rooms of three textile firms suggests not. Nominal piece rates remained fixed over the cycle and were never adjusted downwards. Labour productivity was stagnant or slowly declining. The intensification of workers' effort, if desired by the factory owners, did not happen in this period. When facing a decline in demand, firms adjusted by reducing output, working short-time and laying off workers. Labour productivity in this context was pro-cyclical, not countercyclical as the intensification hypothesis maintains. Therefore, there was a system of implicit rules, in which piece rates and effort levels were stable and employers preserved lengthy attachments, that was not attacked by managers and factory owners at this time. The main reason was not a need to incentive workers to exploit new technologies in a period of fast technical change, as most models of

implicit contracts would assume. I argue the stability of rules and customs in the Catalan factories depended on insiders' power and an extremely flexible market for outsiders.

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Appendix.

Table A1. Cost of living indices**.**

Spain, 1880-1910 (base year 1913=100)

Year	Cost of Living	Year	Cost of Living
1880	121.92	1896	102.84
1881	121.10	1897	106.87
1882	118.36	1898	110.14
1883	129.12	1899	112.30
1884	126.50	1900	106.62
1885	118.23	1901	105.51
1886	117.14	1902	105.34
1887	118.13	1903	109.00
1888	117.48	1904	109.60
1889	115.19	1905	113.64
1890	113.24	1906	110.87
1891	106.82	1907	105.71
1892	104.90	1908	104.01
1893	106.84	1909	115.50
1894	107.31	1910	102.64
1895	106.08		

Source: Ballesteros-Doncel, “Una estimación del coste de la vida,” pp. 394-95. Index of food, clothing, fuel. Rent included after 1900.

Cost of living indices, province of Barcelona. Benchmark years. Base Barcelona 1910=100.

	1861	1874	1910	1914	1920
COL Barcelona	104.7	111.6	100	100.1	181.14

Source: Data provided by Joan Ramón Rosés. Index includes food, clothing, fuel and rent. Cost of living index calculated for 48 Spanish provinces.

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