The Determination of Workers' Remuneration in a Cotton-Spinning Factory. A (Re)Reading of the Payrolls of the Voortmann Spinning Mill in Ghent, 1850–1890

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ABSTRACTS

In der Spinnerei Voortman in Gent (Belgien) lässt sich herausfinden, wie die einzelnen Arbeiter bezahlt wurden. Im Erdgeschoss wurden die ungelernten Arbeiter – die Männer – auf Zeitbasis beschäftigt; die Frauen wurden auf dieselbe Weise bezahlt, später wurden sie auf Leistungsbasis bezahlt. In den oberen Stockwerken befanden sich die Spinnmaschinen. Die Maschine wurde immer schneller. Aber die Spinner wurden immer noch nach Leistung bezahlt. Im Laufe der Zeit gewann die Akkordarbeit zunehmend an Bedeutung: Sie breitete sich von den oberen Stockwerken auf das Erdgeschoss aus. Aber je schneller die Maschine wurde, desto weniger fielen die Unterschiede auf, weil das Tempo der Maschine mehr zählte als alles andere.

At Voortman in Ghent (Belgium), it is possible to find out how each worker was paid. On the ground floor, the unskilled workers – the men – were employed on a time basis; paid in the same way, the women were later paid on an output basis. On the upper floors were the spinning machines. The machine is getting faster and faster. But the spinners are still paid by output. As the period progresses, piecework becomes more and more important: from the upper floors it spreads to the ground floor. But as the machine's pace increases, the differences become less noticeable, because the machine's pace counts more than anything else.

While innovation by manufacturers was a feature long before the advent of mass industrialization, cotton-spinning mills in the nineteenth century did indeed turn into hotbeds of technical developments accelerating this constant search for maximum pro-

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ductivity. It is hardly surprising, therefore, to find economists relying frequently over this same century on this particular industrial branch when trying to conceptualize the first principles according to which pay should be determined in a large-scale concern. When Jean-Gustave Courcelle-Seneuil explored the way wages should be computed in his *Manuel de gestion* [*Handbook of Management*], published in 1855 and constantly reissued thereafter, he was referring to cotton-spinning mills first and foremost, even though he did want his analysis to cover the whole gamut of the productive branches of his era.[1] Nonetheless, having carefully examined the comparative advantages and drawbacks of incentive wage and time wage, he stops dead in his tracks, as if he had to stick with generalizations, and does not raise the issue of rates even though the question cannot possibly be avoided if one chooses the first mode of remuneration. Almost forty years later, in 1891, David Schloss took up and extended the exploration of this particular topic in his pioneering study on *Methods of Industrial Remuneration*, singling out for praise the processes "remarkable by [their] perfect manner" developed to deal with the rates underpinning the computation of wages in the textile industry. However, and paradoxically, Schloss too gives up trying to describe them, since according to him they are "of a highly complicated nature".[2]

This form of avoidance perpetuated itself well into the twentieth century. It would be overly fastidious to list all the works in which researchers doggedly tried to measure the movement of both nominal and real wages throughout Western Europe, without ever wondering how the figures they used had been constructed in the first place.[3] Only in 1999, a symposium was organized at long last around a "simple and naive, albeit formidable, interrogation": how were the rewards of the people's labour calculated exactly?[4] Yet once again, while the ensuing publication did improve our knowledge of how a wage was set, the process whereby a specific remuneration was calculated was once again glossed over and left for further study, by the very admission of the symposium organizers.[5] Indeed, this was a deliberate and explicitly self-confessed choice of Peter Scholliers and Léonard Schwartz, who were coordinating the publication. This was hardly a product of lack of knowledge of the issue on their part, since Scholliers himself had just published a research work in which he had relied on the remarkably rich contents of the payrolls of the Voortman textile mill in Ghent to analyze in minute details the complex set of ele-

1 J.-G. Courcelle Seneuil, Manuel des affaires. Ou traité théorique et pratique des entreprises industrielles, commerciales et agricoles [1855], Paris 2013, 388 pp.

2 D. F. Schloss, Methods of Industrial Remuneration, London [1892] 1898, p. 35, 33 (3rd edn).

3 The payroll records of the Voortman company have already been used by Peter Scholliers in his book Wages, Manufacturers and Workers in the Nineteenth-Century Factory : The Voortman Cotton Mill in Ghent, Oxford, Berg Publishers, 1996. Needless to say, we refer to this book for information on the organisation of this cotton mill (which also had a weaving mill and an Indian mill), the characteristics of the workforce and the development of real wages.

4 P. Scholliers/L. Schwarz (eds.), Experiencing wages. Social and Cultural Aspects of Wages Forms in Europe since 1500, New York/Oxford 1999, p. 7.

5 Ibid., p. 9.

ments which were combined to determine for each job description what the firm would end up paying.[6]

As a continuation of Scholliers' work, we in turn asked ourselves two questions, no less formidable: how would one's wages be calculated once time wage had displaced incentive wage for most of the workforce in a spinning mill? And, taking into account the various job positions, what kind of policy would be developed regarding the rates which determined each person's wages, given the technical improvements which were generating constantly increasing productivity? To recapture the internal logic of the compensation policy of the managers of the firm, we chose to study three key moments of the technical development of the spinning process in this integrated factory, which also included a weaving and a printing department: 1851, when spun yarn was produced using spinning mules; 1871, when despite the recent acquisition of two self-actors by the firm, semi-powered mules were still producing most spun yarn; and 1891, at which point spinners were working exclusively on self-actors. Obviously, the machinery improvement and productivity gains were not the only elements to be taken into account, whether one was setting up a system of remuneration, or modifying and adapting it. The economic environment, the labour market, the social climate, the make-up of the workforce within the firm, or even the influence of dominant wage policies in the industry at large also had to be taken into account. Each of these criteria, the list of which is far from complete indeed, also contributed to the compelling need to conform to "a common rule: gaining from the capital spent the highest possible total volume of labour".[7] Focusing the approach on the tool of production every time a new machine was introduced in the factory allows us to remain as close as possible to the gestures, the postures, and the pace workers were forced into, while taking into account technical change. On this basis, we tried to stay at ground level, and to think not only in terms of the job description, but also in terms of each individual occupying it. Each person was paid weekly, according to the amount of labour done, computed in days, then hours, or by the piece, and in both cases according to a very specific rate which could be different from the one applied to other operatives within the same job description. It seemed better to us to try and embrace all the workers at first, before digging further in a second part into the issues concerning more specifically the spinners, who constituted the most highly qualified group among operatives.

1. Determining Wages: A Highly Sophisticated Process

Few of the works published after 1850 distinguished the managerial function from the purely technical dimensions of operating a cotton spinning factory, and even the ones which did, failed to link the type of work required in the various work stations and the

6 P. Scholliers, Wages, Manufacturers and Workers in Nineteenth-Century Factury. The Voortman Cotton Mill in Ghent, New York/Oxford 1996.

7 "une règle commune: obtenir du capital dépensé la plus forte somme de travail possible". Jean-Gustave Courcelle Seneuil, p. 63.

way in which one should set the remuneration of each worker who occupied them. Separating the two issues was nonetheless impossible, since "the major issue for the labour force is not merely to know how much operatives earn, but also to know what they do, and eventually what is the overall cost of a kilogramme of spun yard".[8] Computing any remuneration was thus a process highly dependent on the way in which each operative had to deal with the machine and service it in such a way as to come, by the end of the manufacturing process, as close as possible to the theoretical optimal performance expected in terms of volume and quality of production, at the lowest possible cost. Setting accordingly each wage level in as rigorous a way as possible was thus extremely important, since what was at stake was the cost price of the spun yard, approximately half of which was the wage bill, and also the acceptance by male and female operatives of modes and levels of remuneration which would compare favourably with existing ones in other spinning factories in the region.

Two modes of remuneration

The recourse to machines cannot be implemented without a technical cooperation which implies more or less compelling forms of coordination between workers and between work stations, with the timing and throughput in any one place unavoidably conforming to that of the other stations. Thus, tasks must be paced and synchronized so as to ensure a fluid manufacturing process. Regulations published in 1849 by the "Committee of cotton spinners of Lille and its suburbs"[9] and similarly applicable to the Ghent factories started with the following preliminary clarification:

> *The spinning industry, as all other industries, can be assimilated to a machine which works with gearings. A single gear tooth breaking or missing in one of these gearings is enough to prevent all the others from operating properly, enough indeed to stop everything. Thus, in large industrial concerns, the labour and earnings of each category of operatives are always dependent on the good or bad implementation by the category preceding them in the whole labour process. Therefore, bad implementation must be sanctioned by some punishment or other, and most particularly in the interest of the operatives.*[10]

In Ghent as in the Lille-Roubaix-Tourcoing area, time work and piece work coexisted throughout the nineteenth century. Understanding the way in which these two modes of

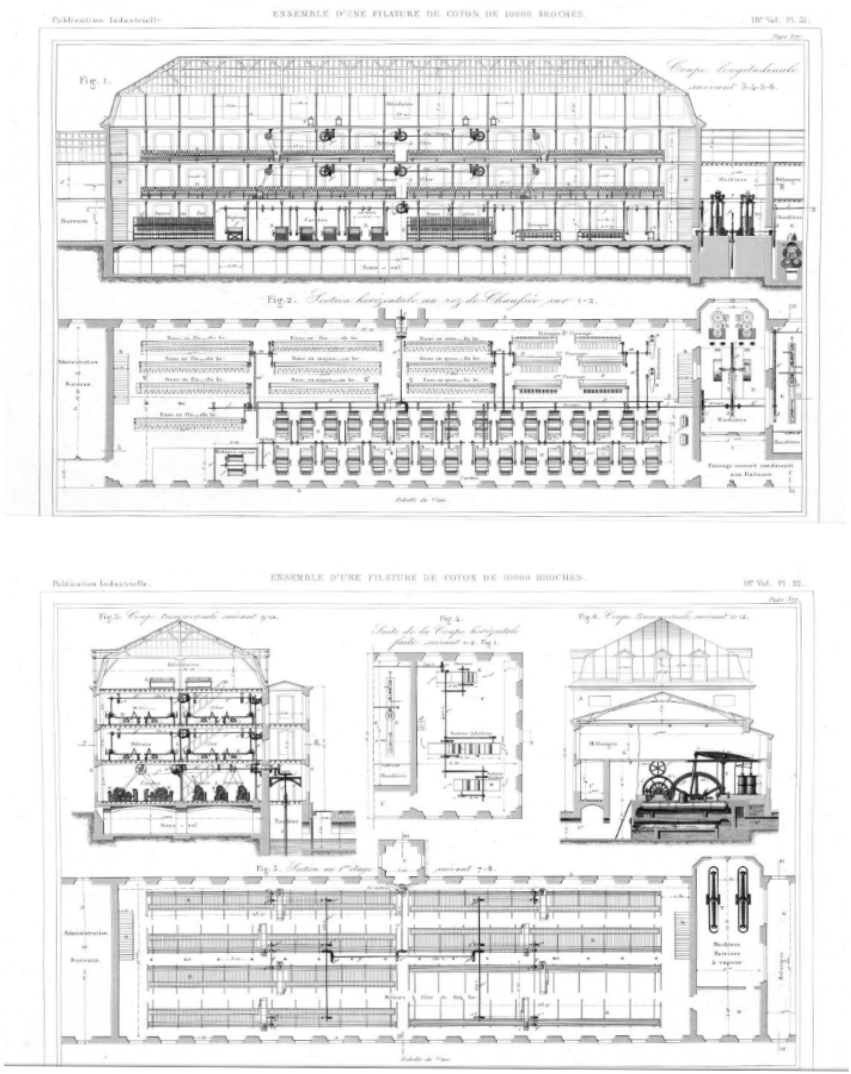
8 "la grande question de la main-d'œuvre n'est pas seulement de savoir ce que gagnent les ouvriers mais de savoir ce qu'ils font et combien, en définitive, coûte un kg de filés". Enquête. 1861. Traité de commerce avec l'Angleterre. Textile. Coton, vol. 4, p. 249.

9 "Comité des filateurs de coton de Lille et de la banlieue", note du traducteur.

10 "La filature, de même que toutes les autres industries, peut être comparée à une machine fonctionnant par engrenages. Si une dent casse ou manque dans l'un de ces engrenages, cela suffit pour empêcher les autres de bien fonctionner, et même pour tout arrêter. Dans les grandes industries, le travail et le gain de chaque catégorie d'ouvriers sont donc toujours subordonnés à la bonne ou mauvaise exécution dans la catégorie qui a précédé dans l'ensemble du travail. La mauvaise exécution doit donc être punie par une peine quelconque, et particulièrement dans l'intérêt des ouvriers". Archives Départementales du Nord, 170 J, 63.

remuneration were distributed requires one to follow the raw material from the opening of the cotton bales through to the production of spun yarn placed on the reelers.

Fig. 1: J. E. Armengaud, Publication industrielle des machines, vol. 18, 1869, pp. 575– 576.



Almost all the spinning mills built in an urban environment had several floors, as shown in the above blueprint describing a typical spinning factory, and Voortman was no exception. Generally speaking, the preparatory processing of raw material took place on

the ground floor, while the manufacturing of spun yarn proper was placed in the upper floors. These were two very different universes.

On the ground floor, bales of raw cotton were brought and their contents turned into coarsely drawn material, in sheets or sausage-shaped, and would be wound on bobbins. This semi-finished product was then routed though a specific predefined path, kept as short as possible and shown on the blueprint above by a set of arrows, through which it would reach the upper floors where spinning took place. The cotton fibers were again drawn, parallelized and twisted, to be turned into more or less fine yarn, ready to be sent to the weaving department.

On the ground floor, the first stage consisted in opening the bales imported from overseas and spreading out the cotton they contained.[11] This task, which did not require any specific skill, was generally tackled by unskilled labourers. Next, operatives called cotton mixers formed a more or less homogeneous whole out of bales from multiple geographical origins and categories, having first assessed by touch the various degrees of quality. Only then began the actual process of preparation of the material. In the Voortman mill as elsewhere, cotton bings were then carried over to the batting machines, where the process of separating the fibers would be started, and overseen again by mere labourers whose only task was to supply the machines. No particular skill was required either at this stage, the only requirement was to have the muscular strength needed to supply the machine, which set the pace of operation. This is why this task was usually entrusted to robust young men. The batting machines would be followed by carding machines, which would complete the process of cleaning the raw cotton. There again, operatives would service the mechanical process and make sure that it was well-maintained, so as to keep it at maximum efficiency. The cotton material came out of the carding process in the shape of rolls from which impurities had to be cleaned off. Then they would undergo the drawing process, which would result in the first sausage-like rovings or ribbons. At this point one meets women operatives, the bobbin tenters, in charge of producing small bobbins of cotton once the card strippers had removed the fluff and prepared them for treatment by the drawing machine. These female operatives were kept perpetually standing and constantly active, since they had to feed the machine with the thinned and parallelized ribbons of sliver. These were largely automatized tasks as well, in which one had to be attentive every second in order to be able to follow the rhythm relentlessly dictated by the machine. Up to this stage in the production process, all operatives received time wages, at first calculated according to the number of days worked, and then, from 1857 onwards as indicated by the payrolls, according to the number of hours spent in the factory shop. Why this change? In the absence of sources on this point, we can only suggest hypotheses. In a number of factories operating in Ghent, Voortman excepted, male and female operatives had just come out of a strike over wage demands. Should we assume that the

11 Oger, Traité élémentaire de la filature du coton, Mulhouse 1839, 2nd edn, revised and extended by B. E. Saladin, Paris 1855, 394 pp.; M. Alcan, Traité complet de la filature du coton, Paris 1864, 711 pp.; E. Delessart, La filature de coton par les machines modernes, Paris 1893, 592 pp.

setting up of a system accounting more precisely for the time actually worked was a bid to placate the workforce, to the extent that henceforth all the time recorded as work time would be giving rise to wages? This is very possible, considering that apparently up to then the workday was not very precisely defined. In the books, the daily yardstick for time spent working was the "day", which could be divided into two or four periods of equal duration, with no indication given as to whether the length of this day was always the same throughout the year. With the new system, the workforce would be able to rely on a fixed time unit, with a workday of 12 hours excluding breaks. In this case, male and female operatives gained nothing beyond the certainty that the actual worktime would always and rigorously be taken into account. On the management's side, on the other hand, it would become easier to enforce flexible worktimes in order to adjust as much as possible the daily output to market demand. Indeed, was not this a way in which the temporal framework of the day could be defined clearly, without waiting for or indeed asking for the introduction of legislation through which the authority of the State would have displaced the authority of the entrepreneur? All this would need a lot more substantiation, obviously. Still, it is a fact that in the 1886 inquiry on labour conditions, almost all business owners interviewed opposed the idea of a regulation of working hours through the law, even though the 12-hour workday was the accepted custom, especially in Ghent. Maybe for these entrepreneurs a customary norm was the preferred solution compared to a law, if only to gain flexibility in order to meet market demand, or maybe to avoid any need to increase wages for work done beyond the twelve-hour limit?

The third stage for the preparation of the raw material, still on the ground floor, was thus the drawing process, using coarse, intermediate, or fine drawing frames. This part of the process resulted in the production of coarse yarn, of varying thickness. One must point out that by mid-century there was no longer any reference made to coarse spinning, only to the transformation undergone through the drawing process. In Ghent almost all the workforce in the drawing room was made up of women, for a process which required deftness, concentration and diligence. Paired together, these young women would place the bobbins on machines made of large rolls carrying out the drawing process in order to produce yarn not yet twisted. These female operatives were paid in time wages at mid-century, but shifted to incentive wages later on, at least in the Voortman mill – a point to which we will return.

Once the preparation process was completed, the manufacturing of the yarn proper could start. Here we have to walk up to the second floor, where the work was carried on by the spinner, assisted by one or two piecers, according to the number of spindles included in the spinning frame. In the Voortman mill, the number of spinners dwindled with time, from about fifteen at mid-century down to barely ten by 1890 or so. We have no information, however, on the piecers, who were not mentioned in the payrolls since they were the personal assistants of the spinners[12]. Did the latter hire them? It's a dis-

12 In the 1851 payrolls, winders, and reelers were very probably included in the weaving room.

tinct possibility, since they were actually not included in the headcount belonging to the spinning mill. Indeed, while the spinners received incentive pay in accordance with the going rate, it is hard to say whether their helpers too were paid a variable wage calculated to rise and fall with the wage of their "boss". They may have only received a set wage, determined by the day or by the hour, but truth be told we don't have any certainty in this matter. Lastly, female bobbin winders or cop reelers wound the finished product on bobbins or cops, according to the count of the yarn; whereupon weaving operations could start.

To sum up: by mid-century, the ground floor was occupied by all the workers paid in time wages, who probably worked under the supervision of one or two overseers. On the second floor, paid by the piece, spinners were "specialty subcontracting entrepreneurs" who subcontracted and allocated work among their assistants. Through them, the "master's eye" would thus be subdivided and multiplied, so to speak, to the point where it would be felt continuously within each subgroup of operatives, seen as as many autonomous teams.

The growing share of incentive wages

As the century went by, there was a corresponding increase in the popularity of piece work among textile entrepreneurs, just as among many other industrialists of the era. At any rate, this is the conclusion one must draw from the analysis of the modes of remuneration for each work stations, even in some cases within one, for the three years we chose to sample.

Time wages were the rule for the remuneration of the first stage of the preparatory work. Should we consider this a sign that the managers wanted to stress the quality, rather than the quantity of production? This is unlikely, given that only very simple movements were required to complete the work. Was the nature of the labour such that it would vary from day to day, so much so that it would be impossible to set a fixed piece rate? Certainly not, since the tasks involved were on the contrary highly repetitive. One last hypothesis is that these tasks were not continuous, that they were constantly interrupted, so that the effort required was highly discontinuous as well. Since both in scutching and carding the only requirement was to feed the machines and follow their pace, why would one want to measure the effort provided by the human machine, since its intensity was constantly and randomly changing? The labourers were passively submitting to the varying fluidity of the process of production, and fulfilled the needs of the machine at a pace over which they had no control.

There were two ways in which the labour provided over a given week was assessed. When dealing with the drawing room, the calculation was based on the number of *montures* (mounted spindles) and *degrees* (yarn weight). As far as spinners were concerned, the pay depended on the weight of the yarn manufactured, with the pay rate correlated to the fineness of the yarn.

Tab. 1: Modes of remuneration (time wages or piece work), by work station

		1851	1871	1891
Overhead		Time wages	Time wages	Time wages
Overseer		Time wages	Time wages	Time wages
Preparation: carding	Scutchers	Time wages	Time wages	Time wages
	On cylinders	Time wages		
	Bobbin tenters		Piece wages	Piece wages
	Card strippers	Time wages	Time wages	Time wages
	Doubler	Time wages		Time wages
	Can tenters	Time wages	Time wages	Time wages
	Sweeper	Time wages	Time wages	Time wages
Preparation: drawing and roving	Drawings	Time wages	Time wages	Time wages
	Coarse bobbin-frames	Time wages	Piece wages	Piece wages
	Coarse spinner	Time wages		
	Intermediate Bobbin-frames		Piece wages	Piece wages
	Fine Bobbin-frames	Piece wages	Piece wages	Piece wages
	Doffer	Time wages		
Spinning	Fine spinners	Piece wages	Piece wages	Piece wages
	Throstle spinner			Piece wages
	Twisters		Piece wages	Piece wages
	Winders and Reelers		Piece wages	Piece wages

The finer the yarn, the higher the remuneration for a kilogramme of spun yarn, since more time was needed to make the same weight for such a product, compared to a coarser one. Was the material manufactured weighed under the supervision of each spinner? Or were the bobbins merely counted upon being sent to the weaving room, since bobbins of the same yarn count would weigh the same? We don't know, and indeed other systems were used elsewhere to assess the output of spinners. At the Cox mill in

Lille around 1860, for instance, each spinning frame was equipped with a tachometer tracking the main rotating movement in the frame. At any time, the operative could "by looking at the dial, appreciate what his earnings were" ["par l'inspection du cadran, se rendre compte de ce qu'il a gagné"] and be mindful of his performance. Whether measurement took place by weight or length was immaterial; both systems converged since in both, what was measured, whether by length or weight, was the fineness of the yarn.
Thus in the Voortman mill, just as in any other cotton spinning mill, time and incentive wages had been coexisting ever since the birth of the factory system. However, while each mode of remuneration implied a particular relation to the work time, both modes were actually related. On one hand, the day wage implied, if not the determination of a given average quantity of carded material produced within a given time span, assessed usually by weight, at least a complete availability of the operative whenever the machine needed to be fed. This implied a work pace made all the more intense by the fact that the male and female operatives downstream from the time workers, but paid by the piece, would not stand for any slow down – to earn a living, they needed immediate access to the necessary material, as long as nothing came along to otherwise upset the process of production. Only then could they achieve a level of performance which would guarantee them the highest possible wage. To sum up, on top of the overseers' supervision over the proper execution of the operatives' tasks dealing with the preparation of the manufacturing material, one should add the demand from skilled workers for a constant flow of supply, with consequences on the work pace of unskilled workers paid by the day. This *de facto* solidarity within the workforce ensured the constant exertion of all workers, since each of them regardless of their mode of remuneration was part of a chain which had to be kept whole.
On the other hand, as the century went by, remuneration by the piece became more and more frequent downstream in the process of production. In 1851, excluding the wages listed for middle management (overhead and overseers), there were only two job descriptions which entailed piece work, namely fine spinners and fine bobbin-frame tenters, making up 4/10th of the total headcount, with the other 6/10th receiving time wages. Twenty years later, in 1871, the distribution of the modes of remuneration had been entirely modified. With the exact same calculation methods, there were now seven job positions entailing piece work, as against five in which payment was made on the basis of time. Moreover, when the headcount is taken into account, this evolution looks like a radical transformation, with eight male and female operatives out of ten henceforth paid by the piece, both in 1871 and 1891. One should note that the job positions in the drawing room, particularly fine bobbin-frame tender, were the ones at the root of this revolution. The development of incentive pay concerned primarily the women and girls hired en masse for this stage of the production process.
Still, the increasing reliance on incentive-based pay rather than on wages dependent on the time passed in the factory became a quasi rule within the spinning mill. Indeed, this massive shift was not limited to the textile industry, and can be observed in a variety of other branches. When the Belgian State launched a national inquiry on labour in 1886,

a large number of entrepreneurs made clear their preference for taking performance into account. Doing so offered a powerful incentive to work as efficiently as possible, resulted in greater accountability among the mass of operatives, entailed a lesser need to oversee task execution and coordination, and a consensus was readily apparent that this mode of remuneration was to be preferred to any other which would primarily take into account the time spent on the job. Anyway in spinning the case had long been closed, and strongly reaffirmed as early as mid-century; in his *Manuel des affaires* published in 1855, Jean-Gustave Courcelle Seneuil already asserted that

> *The workshop is better and more easily organized and handled every time one introduces piece work into it, that is, a wage in proportion of the work completed and not the time spent completing it* […] *Piece work has been introduced in a number of industries ; and will be introduced in many more*.[13]

It would not do to credit the author of the *Manuel des affaires* for his claim that all these changes affecting industrial production had taken place while he was writing. Indeed, he could have added that as far as the observations he himself could make went, the extension of the piece-based mode of remuneration to all the stages constituting the manufacture of spun yarn was probably dependent on significant improvements of the whole range of machines used, so that it would become possible to quantify even more systematically than during previous periods in the history of the industry the effort and the yield of each operative. Even though, one also needed to adopt a rate policy flexible enough to reconcile the diverging goals of incentivizing the workforce, increasing machine productivity, and keeping the wage bill under control, since investing in ever more sophisticated manufacturing tools made sense from the point of view of the entrepreneurs only if these investments helped push cost prices down, keep the competition at bay, and increase the margin of profit. Thus while one should not dismiss possible increases in nominal wages, any rate policy would still remain the *de facto* primary element one could play on to survive in the capitalist economic competition.

A proliferating, tangled mass of rates

In the payrolls of the Voortman mill, rates were systematically recorded for each job description and each individual. Reading them brings home the extreme complexity of wage calculations: there was a rate for each task within each job description. Moreover, as the century went by, the system became ever more complex.

13 "L'organisation et la tenue de l'atelier sont meilleurs et plus faciles chaque fois qu'on y introduit le travail aux pièces, c'est-à-dire un salaire proportionné au travail fait et non au temps passé à le faire (…). On a introduit le travail aux pièces dans un grand nombre d'industries; on l'introduira dans un plus grand nombre." Courcelle-Seneuil, Manuel, p. 86.

Leaving aside the middle management jobs, there were 19 rates for 12 job descriptions in 1851, and more or less the same ratio in 1871, with 20 rates for 12 job descriptions – but in 1891, however, one finds 39 rates for 13 job descriptions, almost doubling the ratio compared with previous years.

Tab. 2: Number of rates applied to each job description

		1851	1871	1891
Overhead		6	5	6
Overseer		5	2	5
Preparation: carding	Scutchers	1	3	3
	On cylinders	1		
	Bobbin tenters		1	1
	Card strippers	2	1	1
	Doubler	1		
	Can tenters	1	1	1
	Sweeper	1	1	1
Preparation: drawing and roving	Drawings	1	1	3
	Coarse bobbin-frames	3	1	3
	Coarse spinner	1		
	Intermediate Bobbin-frames		1	5
	Fine Bobbin-frames	1	2	7
	Doffer	1		
Spinning	Fine spinners	5	6	5
	Throstle spinner			1
	Twisters		1	4
	Winders and Reelers		1	4

In 1851, all the operatives working the batting machines were paid by the day, with one common rate for all. Other jobs in the preparatory stage of the material followed the same principles. So far, then, everything was quite simple – while day rates varied depending on which task they governed, each operative answering to a certain job description was paid the same way and at the same rate as all others. The whole situation started to become became much more complex as time went by, though given the current amount of sources we have been able to analyze so far, we are not in a position yet

to propose a chronology of this evolution, much less to relate this increasing diversity of rates to the parallel technical improvements, the existence of which seems beyond doubt. Anyhow, in less than four decades, rates had multiplied to the point where there was almost as many of them as there were male and female operatives, regardless of the mode of remuneration they were regulating. To give but two examples, operatives dealing with batting were paid according to three different rates ranging from 0.18 to 0.23 centimes an hour, while at the other end of the preparatory process, the 13 drawing tenters tasked with running fine bobbin-frames were paid according to seven different rates, depending on the characteristics of the bobbins they were turning out. The rovings on these bobbins could be more or less combined and attenuated, i. e. made more regular and finer so that bobbins of equal weight could be the result of a different amount of work. The finer the final product, the higher the rate at which work was remunerated, since in principle more time would be necessary to turn out a full bobbin. As the century went by, the system whereby the operatives' zeal for work could be stimulated through yield requirements had thus been developed in increasing detail, and was applied to job positions occupied by women, even though at this point of the manufacturing process, only minor technical changes had been introduced, especially compared to the advances realized in spinning per se. These female operatives would henceforth receive incentive-based pay, with rates set more or less according to the same principles used for spinners' rates. Both in the middle and toward the end of the century, spinners were remunerated according to the weight of spun yarn put out, with a higher rate applied to finer yarn, and a lower rate to yarn of a lower count (that is, of shorter length for the same weight).

The interesting feature of rate lists for employers was the possibility of lowering the rates in a relatively painless way, since it would not necessarily lead to lower wages as long as the machines relied on could be used to increase production. Peter Scholliers had already pointed out this phenomenon in 1996: in order to maintain or even increase the same wage level, the male or female operative had to speed up the pace of their work and increase their effort and/or work longer hours.[14] In a way, the multiplication of the rates offered the employer the opportunity to fit the wage level as closely as possible, job position by job position and task by task, to the highest level of effort the "human machine" could possibly provide for each.

14 Scholliers, Wages, p. 137.

2. A Crucial Issue: The Remuneration of the Spinners

"The skill demanded from a spinner, the rank he holds in the labour hierarchy, makes of that class of labourers a somewhat particular one, of the first order, entitled to receive the price owed their professional capacity and the fruits of their often long experience."[15] Generally, in their prime adulthood, spinners were more stable than the rest of the workforce. Peter Scholliers has shown that they would stay on in the mill for about a decade on average, which means that, just as the weavers, some of them would remain in the same job for their entire career, at least as spinners.[16] These were skilled operatives, and it was in the interest of the firm to gain their loyalty, even while trying to hold their wages down as much as possible. This is why in the Voortman mills as in all others, employers came up with a way to calculate the remuneration of the spinners which, while placing them at the top of the wage hierarchy within the firm, still ensured that they would not generate too much upward pressure on the cost price of the spun yarn.

The spinners, an aristocracy?

Building a synthetic table totalling for each job position the number of male and female operatives employed and the total wage bill for them allows us to easily isolate the spinners, who stand out in every one of the three years we sampled. In 1851, they made up less than a quarter of the workforce, but their wages represented 42 per cent of the total wage bill. Twenty years later, the proportions had not changed significantly – while their numbers had been reduced by a third, their share of the total cost of labour remained exactly the same. On the other hand, in 1891, while numerically their relative weight in the headcount was unchanged, their wages ate up 53 per cent of the wage bill. Still, one should remember that this remuneration was not theirs only; the piecers attached to them must be included, since apparently they were remunerated by each spinner autonomously.

How can we explain this 11-per cent increase in the spinners' share of total remunerations? They non longer had to use brute muscular force, as with the mule-jenny, to achieve three crucial steps: twisting the yarn by actioning a fly-wheel with their right hand; winding the yarn while moving the carriage, by lifting the threads and properly guiding them on the cops with their left hand; then pushing back the carriage with their knee in order to start a new cycle. With the self-actors, given that the process had become automatic, the gestures, body positions, and movements of the spinner were completely different from what they had been.

15 "L'aptitude qu'on exige d'un fileur, le rang qu'il occupe dans la hiérarchie ouvrière, en fait une classe un peu spéciale d'ouvriers de premier ordre, en droit de gagner le prix de leurs capacités professionnelles et de toucher le fruit d'une expérience souvent longue." J. Houdoy, La filature de coton dans le Nord, Paris 1903, pp. 360–361.

16 Scholliers, Wages, p. 102.

		1851				1871				1891			
		Total wages	Number	Average wages	%	Total wages	Number	Average wages	%	Total wages	Number	Average wages	%
Overhead		208.87	13	16.1	18.22	140.6	8	17.6	12.9	218.67	11	19.9	11.0
Overseer		193.43	6	32.2	16.87	169.6	4	42.4	15.6	145.97	5	29.2	7.4
Preparation: carding	Scutchers	23	4	5.8	2.01	33.00	3	11	3.0	59.94	4	15	3.0
	On cylinders	23	4	5.8	2.01								
	Bobbin tenters					28.32	3	9.4	2.6	55.05	5	11	2.8
	Card strippers	35.16	5	7	3.07	10.35	1	10.4	1.0	30.02	2	15	1.5
	Doubler	6.21	1	6.2	0.54								
	Can tenters	15.51	3	5.2	1.35	7.74	1	7.7	0.7	19.1	2	9.6	1.0
	Sweeper	5.75	1	5.8	0.50	7.74	1	7.7	0.7	9.55	1	9.6	0.5
Preparation: drawing and roving	Drawings	23	4	5.8	2.01	25.23	3	8.4	2.3	54.57	5	10.9	2.8
	Coarse bobbin-frames	33.68	5	6.7	2.94	23.76	2	11.9	2.2	39.91	3	13.3	2.0
	Coarse spinner	37.58	1	37.6	3.28								
	Intermediate Bobbin-frames					36	3	12	3.3	59.55	6	9.9	3.0
	Fine Bobbin-frames	56.94	4	14.2	4.97	75.34	7	10.5	6.9	126.79	13	9.8	6.4
	Doffer	3	1	3	0.26								
Spinning	Fine spinners	481.4	15	32.1	41.99	443.2	10	44.3	40.8	647.46	12	54.0	32.7
	Throstle spinner									17.4	1	17.4	0.9
	Twisters					46.2	2	23.1	4.3	266.25	5	53.3	13.5
	Winders and Reelers					38.7	5	7.7	3.6	229.14	15	15.3	11.6
	Total/Average	1146.53	67	17.11	100	1085.8	53	20.5	100	1979.37	90	22	100

Table 3: Number of workers and weekly wages for each job position

Henceforth, they would drive a machine which moved under it own motive force, which did not mean, pace the many "Pindar[s] of the automatic factory",[17] that they would loll on the job – rather the reverse. Thereafter, they would have to move over 30 or 40 meters, facing carriages which moved continuously forward and backward, so as to oversee the operations, and delegate to their helpers, now three in all (two piecers and a doffer), the subordinate tasks, particularly repairing yarn breakages and supplying the machine. Accordingly, their remuneration was a global enveloppe which had to include more cash transfers to the benefit of these helpers. As far as the management of the factory was concerned, this was the price to be paid in order to use incomparably more efficient tools. While there is no certainty on this point, the upshot is undoubtedly that the share of the wages paid over to spinners and their helpers in the composition of the cost price of spun yarn was very large – we would be so bold as to set it at somewhere around a quarter of the cost price of the finished product towards the end of the century. The spinners alone, the best-paid operatives, who can be thought to have captured close to 60 per cent of the amounts earned with their helpers and paid by the piece, were thus heavily weighing on the cost prices of the spun yarn.[18] It is easy to see the extent to which this particular workforce was both indispensable and costly, and how much it would be conscious of its position on the labour market, and also of its rank in the hierarchy of wages. The remuneration of the spinners (and of their helpers) is therefore not an issue to be taken lightly.

Piece wages and individual performance

It seems relevant to study the spread among the spinners' weekly wages, from the lowest to the highest, throughout the years 1851, 1871, and 1891, for several reasons. First, this study allows us to measure the extent to which the weekly variations in the productive performance of each spinner was synchronous, since they were necessarily linked to the weekly length of time worked, theoretically identical for all the operatives concerned. Indeed, there is a very close relationship between the uneven length of the work day and the earnings of piece work. A second observation is that while the weekly yield of the two spinners taken as points of reference in 1851, Bontinck and Baecklehant, were moving relatively in parallel, the later situation seems much more muddled. From the wage curve, one can derive the performance of each worker: the spread between the lowest and highest numbers of kilogrammes of spun yarn manufactured, namely by Roegiest and Horvan in 1871, and Vurke and Vermeulen in 1891, continuously narrowed, even as the overall amount manufactured was constantly increasing for all concerned.[19]

17 Karl Marx, Capital: A Critique of Political Economy, Chicago 1909, p. 458.

18 In Tourcoing in 1860, in the Flipo-Desurmont mill, a spinner earned 28.20 francs per week, a big piecer 10.50, and a little piecer 7 francs. Spinners earned as much as overseers or mechanics, and almost double what was earned by the male or female operatives the best paid next to them in the mill. The proportions one finds there are very close to those found in this matter at the Voortman mill. See Enquête 1861. Traité de commerce avec l'Angleterre. Textile. Coton, vol. 4, p. 360.

19 Source for the following figures: Voortmann Fund, Looneboeken van de spinnerij, pp. 343–344.

Fig. 2: Highest and lowest weekly wages for cotton spinners, 1851
Wages in francs

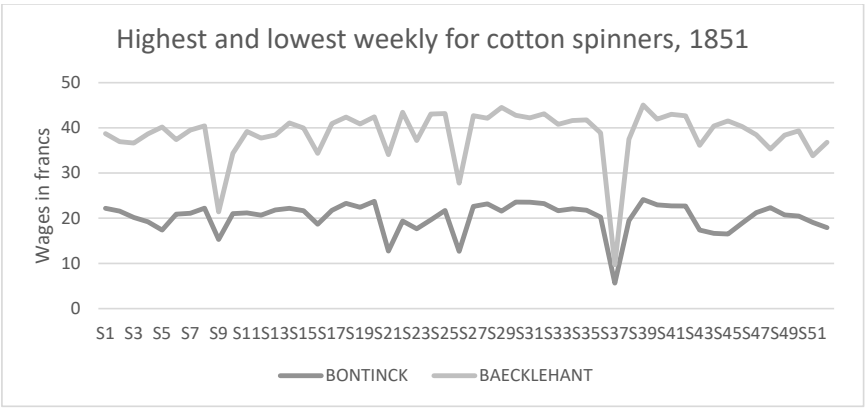
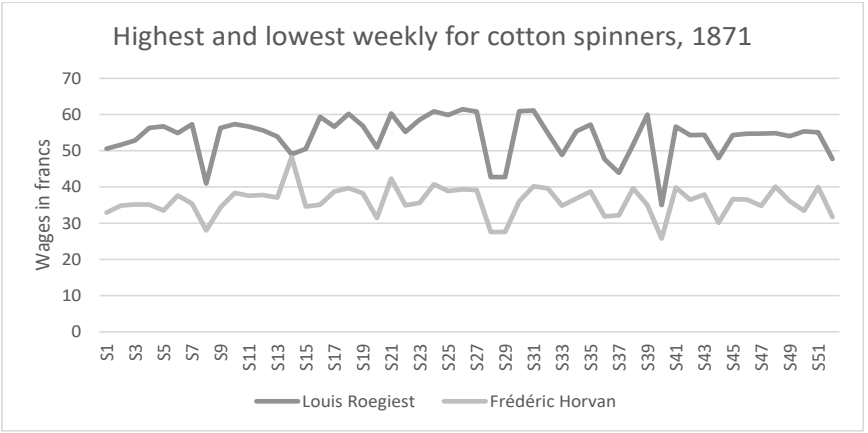
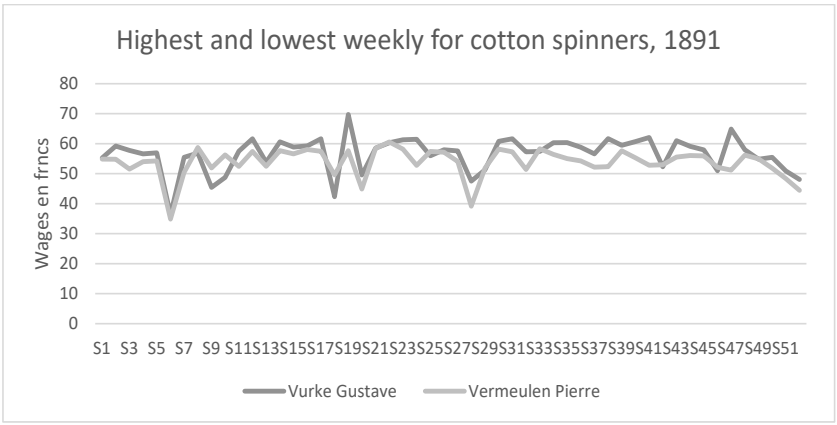


Fig. 3: Highest and lowest weekly wages for cotton spinners, 1871
Wages in francs



The average weekly wages of spinners increased from 30.45 francs in 1851 to 47.32 francs in 1871 (+55%), then 54.40 francs in 1891 (+15%). This is part of a general trend upwards for all wages within the spinning mill. Still, we should note that at the same time, the wage differential among spinners overall, which was quite important at first, had all but disappeared at the end of the period. While in 1851, one of them, for a reason we do not know, earned only a very modest wage (20 francs a week), the spread between the earnings of the other spinners was still fairly wide (see figure below). The highest earners were making 39, 34, and 33 francs per week respectively. Those bringing up the rear, however, made 28 and 29 francs, almost a third less.

Fig. 4: Highest and lowest weekly wages for cotton spinners, 1891
Wages in francs



All the other spinners were distributed more or less harmoniously between these two extreme levels. In 1871, spinners were no longer 15, but only 10, and this time nobody can be seen as having really fallen far behind – and still the pack was even more spaced out, with the three highest-paid spinners making 54 and 53 francs per week, while the three least-paid ones earned 36 to 37 francs, which comes down to 45 per cent less. But in 1891, the situation was entirely different: at that point all the spinners were bunched together, with the three best earners making from 57 to 56 francs per week, while the three worst still earned 52 to 51 francs. Overall the difference from the front to the rear of the pack was of only 12 per cent.

Fig. 5: Spinners' average weekly wages, 1851
Wages in francs

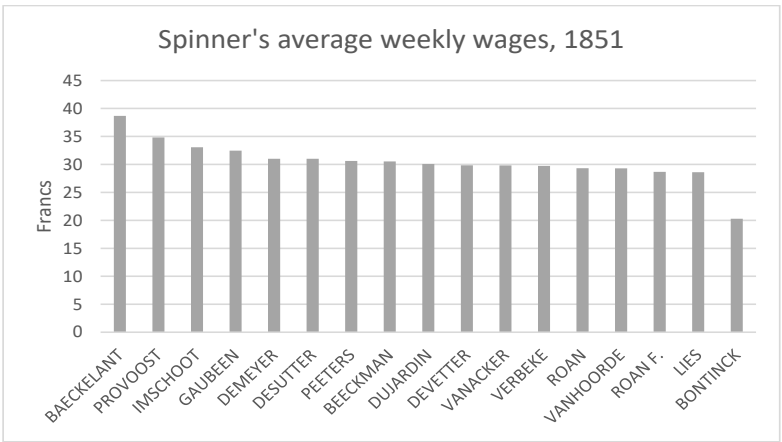


Fig. 6: Spinners' average weekly wages, 1871
Wages in francs

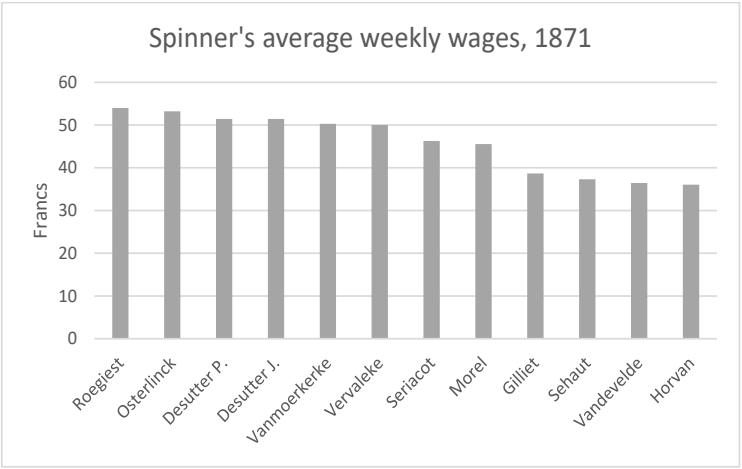
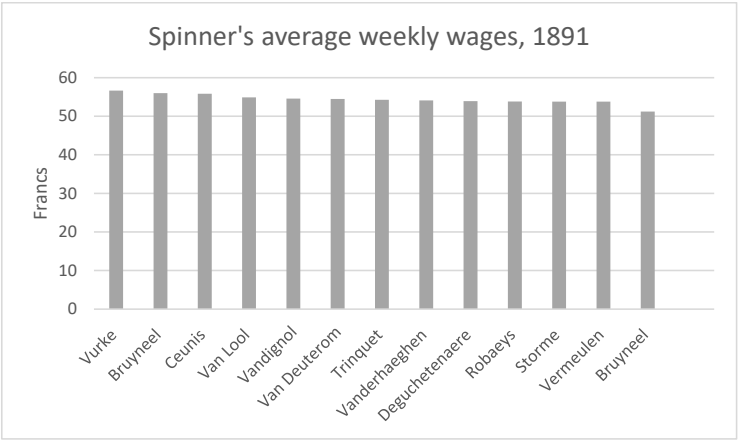


Fig. 7: Spinners' average weekly wages, 1891
Wages in francs

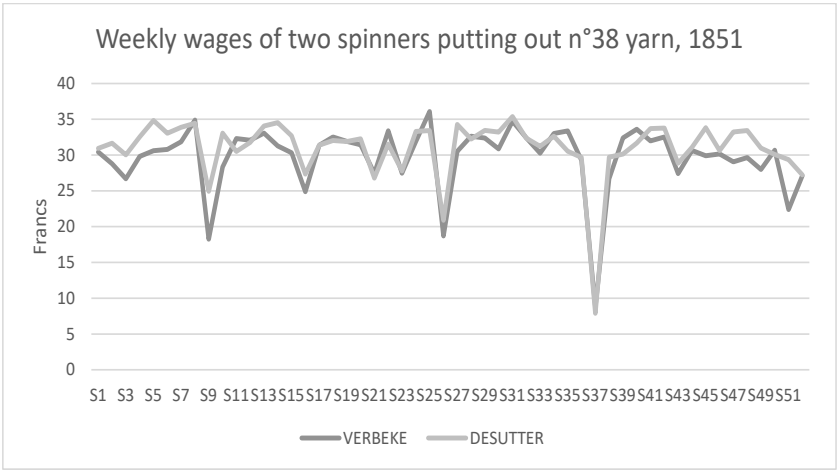


This is a trend too clear to ignore. Forced stops, piecing, doffing, were as many explanatory elements which could influence directly each spinner's performance at the beginning of the period, but became less significant as time went by.

The drive towards a predictable yield and uniform wage

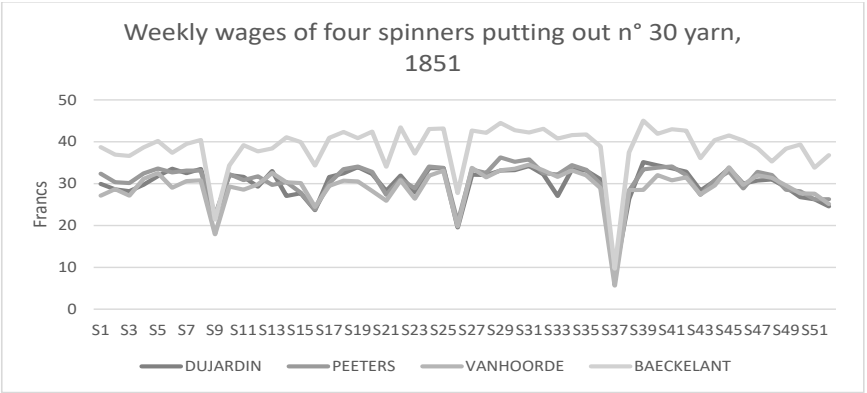
At mid-century, each spinner's earnings were narrowly constrained by the count of the yarn manufactured. The higher the count, the higher the remuneration, as if the spinner and his helpers were expected to provide a more elaborate know-how. However, when yarn counts were identical, weekly earnings were similar too. Thus in 1851, each spinner was given one count of yarn to make, and one only, so that it becomes possible to compare the weekly earnings of spinners putting out the same product. Obviously, even though they were driving spinning mules, which required intense physical exertions in order to follow the pace of the machine, they achieved the same level of performance, with the exception of Baeckelant, clearly above the pack in this respect.

Fig. 8: Weekly wages of two spinners putting out n° 38 yarn, 1851
Wages in francs



For a later period, in 1871, it was not possible to build the same analysis, since the spinners were frequently asked to change to new yarn counts. It would be necessary to track them moment by moment to see whether they were switching indifferently from one yarn count to another, or whether some of them were entrusted with the highest counts well beyond their proportionate share, and to the detriment of less skilled colleagues. Whatever the case, by 1891 the situation had changed again. Through the process of adjusting the rates and perfecting the technical environment, each spinner in the end earned more or less the same as his neighbor, regardless of the count of the yarn spun.
While the path which was taken to achieve the equalization of wages remains to be explored more in depth, the whole process could be seen as a transformation of piece wages into hourly wages. Henceforth each spinner would earn more or less the same amount, and every one of them would *a priori* succeed in reaching the expected target they had been assigned.

Fig. 9: Weekly wages of four spinners putting out n° 30 yarn, 1851
Wages in francs



We must insist on this point: variations in remuneration would arise only as a function of the weekly amount of time worked. The spinning process had come full circle, and the grip of the machine had become such that spinners had to follow the pace it set, and benefitted from only the narrowest margin to generate extra earnings. Woe unto them, however, if they "slipped up" and achieved a level of performance which did not live up to the forecast. The employer knew in advance how much each spinner was supposed to manufacture. Not reaching the assigned target was unacceptable; going beyond it to earn more was practically impossible. Piece wage thus simply came down to an illusion, used to "empower" operatives bound all day long to their self-actors.

3. Conclusion

The study of the way in which wages were calculated in the nineteenth century remains to this day a wide-open field of exploration. One thing is certain, though: many entrepreneurs went through a lot of trial and error before settling on systems in which time wages and incentive wages were combined. In the Voortman mill in Ghent, operatives were massively paid by days worked, at least in a first stage. Later on, around 1850, spinners' wages starting being dependent on the weight of spun yard manufactured, according to a rate which varied with the degree of fineness of the yarn. The finer the yarn, the higher the remuneration, since one needed more time to manufacture the same weight of a product made of more delicate material. Furthermore, it seems that on the spinning mule the fineness of the yarn was related to the dexterity of the spinner. Thus the multiplicity of rates may have hidden a skill hierarchy among operatives, with the more highly qualified ones earning on average 60 per cent of the wages of an overseer (after having first remunerated the piecers, and toward the end of the period the doffers, out

of their own earnings and according to modes which remain partly undiscovered). A few years later, drawing tenters in turn started to be assessed according to yield, i.e. according to the number of bobbins of a given weight produced, under a previously set rate which made possible to assess the weekly activity of each of them. In a way, by adapting to this stage in the preparation of the material the process used at first to calculate the remuneration of the spinners, employers were henceforth demanding from their female operatives manufacturing the cotton roving the same perpetual search for efficiency, along the same lines as with their male colleagues. Multiplying the number of rates for a single job description thus came down to taking into account once again the specificity of the tasks of each female operative, so as to place all of them under the same conditions, leading to more intense emulation.

In 1902, the economist Charles Rist rightly remarked that in a number of firms, one found drawn up

> *lists of rates for various works, very long and very complex, the common goal of which was always to remunerate equally an equal level of effort, by classifying and taxing the tasks according to their varying degree of difficulty, reducing them to a common denominator, so to speak, which would be used as the unit of account for remuneration.*

Consequently,

> *the price of each piece was set so that workers of equal skill, and of equal zeal, would receive at the end of the day a perfectly equal salary, even though the work they had done was different.*[20]

Jules Houdoy the following year was even more specific, writing on the topic of the piece wages of cotton spinners that

> *This mode of payment is obviously far superior morally, since it helps provide the worker with a stake in the production; but it is often impractical, since it demands abilities out of all proportion with what takes place in the preparatory stages needed in the manufacturing of spun yarn: actually, through the improvements of the mechanical industry, it tends to draw ever nearer to the day wage in its results, since the worker paid by the task cannot with his mere personal strength push the spinning frames into producing more in less time, and this is the reason why the wages of the spinners, for instance, hardly vary whatever the mode of remuneration used, whether by time or by the task. By accepting to work and be paid by the task, the worker knows in advance what he will normally be*

20 "listes de prix des différents travaux, de tarifs très longs et très compliqués, et dont le commun objet est toujours de rémunérer également des efforts égaux en classant et en taxant les travaux suivant leur difficulté plus ou moins grande, en les réduisant pour ainsi dire à un dénominateur commun qui sert d'unité de rémunération. […] le prix de chaque pièce est fixé de telle sorte que des ouvriers d'égale habileté et d'énergie semblable, quoique faisant des travaux différents, reçoivent à la fin de la journée un salaire identique." Charles Rist, quoted in Schloss, Les modes de rémunération du travail, p. xxii.

> *able to put out, and obviously it is the level of wages representing this amount of production which he would ask for by all the means at his disposal if he was paid by the day.*[21]

Overall the worker does seem to have become over time this "meticulous and silent automaton"[22] which employers had tried to create for a century, thus validating Marx's analysis as it had appeared as early as 1867 when he wrote that "the separation of the intellectual powers of production from the manual labour, and the conversion of those powers into the might of capital over labour, is […] finally completed by modern industry erected on the foundation of machinery".[23]

21 "Ce mode de paiement est évidemment beaucoup plus moralisateur, puisqu'il contribue à intéresser l'ouvrier à la production; mais il est souvent impraticable, car il exige des aptitudes hors de proportion avec les travaux préparatoires que nécessite la production de filés : en fait, par le perfectionnement de l'industrie mécanique, il tend à se rapprocher, en résultats, du travail à la journée, l'ouvrier à la tâche ne pouvant, par ses seules forces, contraindre les métiers à produire plus en moins de temps, et c'est pourquoi le salaire des fileurs, par exemple, qu'il soit payé au temps ou à la tâche, ne varie guère selon le mode de rémunération employé. En acceptant de travailler à la tâche, l'ouvrier sait à l'avance ce qu'il pourra produire normalement, et c'est le salaire représentatif de cette production qu'il réclamerait évidemment par tous les moyens en son pouvoir s'il travaillait à la journée." Houdoy, La filature, p. 361.

22 "automate minutieux et silencieux". CCCC, Record of deliberations of the Chamber of Commerce of Cambrai, sitting of 23 February 1886.

23 Marx, Capital, p. 462.