Technical Progress and the Evolution of Wage Arrangements in the British Cotton Weaving Industry

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1. Introduction

Historically, the payment of weavers in the British cotton industry was determined by piece rates prescribed in lists which were drawn up and agreed to on a district basis. By the end of the nineteenth century, the district lists were largely superseded by two lists which applied throughout most of the industry. One of these, the Uniform List of 1892, was applicable to the weaving of grey fabric. Its counterpart for the weaving of coloured woven fabric was based on the Colne List of 1890. Both lists continued to be used until the mid 1930's when they were revised and restyled as the grey and coloured sections, respec - tively, of the Uniform List. In their modified form, the two lists conti - nued in widespread use until at least the early 1950's. Throughout their history, their use was restricted to weaving on non-automatic looms. It is of interest that rates contained in the revised lists of the mid 1930's were made legally enforceable, and that, to the extent that the lists were still in use in recent years, this continued to be the case.

These traditional methods of payment purported to relate the wage payable to the skill and effort applied by the operative. This was achie - ved by specifying a basic piece rate to be paid for weaving a standard cloth under standard conditions. Extensive provision was made for variations in the piece rate to take into account the numerous deviations from the standard cloth construction and the standard weaving condi - tions that were possible. It is not known precisely what principles were applied in determining the adjustments, but it is more than likely that a good deal of subjectivity was involved and that influences such as the value of the product, and the trading conditions at the time the adjust - ments were agreed upon, played a role. Whatever the principles which

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were used, the arrangements were undoubtedly anomalous and failed to relate wages adequately to work loads.

The lists also failed to legislate for the determination of the appropriate piece rate for increased loom complements, for fundamental changes in technology, or for improvements in yarn quality, all of which have clear implications for the productivity of the weaving process. Thus, while the arrangements appear to have worked satisfactorily when applied in the context of fixed loom complements and the relatively static technology of a non-automatic Lancashire loom, when the indus - try, in an attempt to raise its productivity, considered loom comple - ments in excess of those which were customary and considered also the introduction of new technology in the form of automatic looms, the almost inevitable consequence was conflict between operatives and manufacturers. This is illustrated by the early British experience of automatic weaving [1] and by the "More Looms" issue of the late 1920's and early 1930's. It is with the second of these matters that this paper is concerned.

2. The "More Looms" issue

Throughout the late 1920's and the early 1930's, cotton textile manufacturers in Britain recognised the importance of reducing the cost of production in order that they might become at least as competi - tive as their rivals in America, Japan and Western Europe. It is of interest, however, that attempts to reduce unit costs were concerned largely with reorganising existing methods of production, specifically by allocating more looms to each weaver, rather than with the use of alternative technology.

Traditionally, each operative was assigned a complement of four non-automatic looms. An increase in this complement to six or more looms was now envisaged. If the manufacturers were to benefit from the new arrangement through a reduction in average total costs, the prices set out in the piece rate lists had to be reduced sufficiently to facilitate a decrease in unit labour costs while at the same time offsetting the in - crease in the fixed overhead costs per unit due to the reduction in out - put per loom arising from a loss of machine efficiency. The magnitude of the increase in fixed overhead costs per unit undoubtedly would

depend on individual curcumstances. In particular, the extent to which weavers were already fully occupied on four looms would determine the size of the efficiency loss, while the sensitivity of fixed overhead costs per unit to losses in efficiency was probably dependent on the extent to which machinery had been written off. On the other hand, in view of the probable increase in the weavers' work load, the new prices had to be sufficient to guarantee an increase in the weavers' wages. Thus, from the operative's point of view, the reduction in the piece work price was to be more than offset by an increase in each operative's output.

The balancing of these interests was the cause of much difficulty. The manufacturers attempted to obtain the highest possible share of the ad - vantages while the trade union for its part set out to obtain the most favourable terms for its members. The disputes at the turn of the cen - tury, arising from the introduction of automatic looms, were con - cerned with the same problem. Resolution of the problems was made all the more difficult in the absence of objective means for assessing work loads and determining remuneration.

The following is a summary of the principal events associated with the "More Looms" issue. In 1928, the cotton weaving operatives' trade union, the Amalgamated Weavers' Association (AWA), entered into a dispute in Burnley where the employers wanted each weaver to accept complements of eight looms instead of the traditional four looms. After two years of experiments and negotiations, the employers gave formal notice, expiring on 5th January, 1931, of their intention to operate a piece rate scheme which they had drawn up for a more than four looms system of weaving [2]. This was incorporated in a new wage list designed to take the place of the Uniform List in those cases where a weaver handled six, eight or ten looms. In a similar manner to the Uniform List, appropriate additions or deductions were made when a cloth was different from a prescribed standard [3].

In reply, the AWA announced its intention of calling a strike of all weavers at mills where any looms were worked under such arrange - ments [2]. The reasons given were:

" (1) The absence of a fall back wage to ensure maintenance of a satisfactory standard of quality in the yarns such as will enable the weaver to earn a satisfactory wage.
(2) The absence of a minimum wage to provide for the contingency of underemployment.
(3) That acceptance of the proposal would further impove - rish the weavers, without cheapening production suffi - ciently to stimualte demand on the desired scale." **[3]**

From the first of these statements, it is evident that the AWA was con - cerned with protecting weavers in circumstances where yarn quality was not maintained at a reasonable level. No doubt it was felt that, under these circumstances, the work loads might increase to the point where a fall in earnings to a level below that for the four loom system would result. The second statement reflects a desire to prevent the misuse of the system by the payment of the revised piece rates in respect of loom complements lower than those to which they were in - tended to apply. So far as the third statement is concerned, not sur - prisingly, there was considerable divergence between the views of the trade union and the employers' sides.

The result of the refusal to operate the "More Looms" system in Burnley was a lock-out which spread throughout Lancashire and ulti - mately affected about 200,000 operatives **[4]**. The lock-out started on 19th January, 1931, but was called off on 13th February, 1931, with - out any progress having been made. However, by August, 1931, a number of developments had taken place, perhaps the most important being an agreement between James Nelson Limited and the Nelson Weavers' Association. This provided for eight looms per weaver with the firm proposing impartial investigation of the best loom speeds, and careful selection of yarns to reduce thread breakages. In addition, the firm had organised ancillary labour for sweeping, cleaning, oiling, cloth and weft carrying **[5]**. This was an important concession in view of the reluctance of the employers to make ancillary labour available some years before in the context of automatic weaving **[1]**. In Burnley, where the "More Looms" system was pioneered, the Burnley Weavers' Association entered into an unofficial agreement with the employers in September, 1931, on the basis of which work on a "More Looms" basis was commenced. Nationally, however, the AWA sub -

sequently repudiated the arrangements made locally and the issue remained unsettled [6].

In 1932, unemployment in the cotton industry, together with wide - *spread instances of breach of agreement by employers, brought about* a strike throughout the industry which lasted four weeks. The work stoppage gave rise to negotiations and, in due course, an agreement which was concerned with a range of problems including the "More Looms" issue. So far as this matter was concerned, it was established that firms already operating the more looms to a weaver system were not to make any reductions in the wage rates they were currently paying. Clearly this was to encourage the retention of the system where it was already operating. The existing strikes over the issue were to be called off where this condition was observed, and the matters in dispute were to be referred to conciliation. However, no further extensions to the more looms to a weaver system were to be attempted until a specific industry wide agreement on the issue had been achieved.

To this end, negotiations were conducted and an agreement was entered into with effect from 2nd January, 1933. This embodied a price list which assumed six looms to a weaver and was subject to a number of general conditions. Among these conditions was a clause preventing the payment of the six loom system price rates for loom complements of less than six. In such circumstances, the Uniform List for four loom weavers was to apply. A further clause specified that ancillary labour was to be provided for sweeping, cleaning and oiling of looms [7].

This agreement related specifically to the six loom system. An agree - ment relating to the more than six loom system was eventually achieved in 1935. Had there been a wage system based on objective measurement of work load available, it is possible that these issues would have been resolved more readily and at an earlier stage.

3. The Uniform List and more looms per weaver

As explained above, the six loom and more than six loom system of weaving were established as a result of several years of dispute and

bargaining, following which due provision was made in the piece rate lists of 1935. These lists in turn were revised in 1937. Unfortunately, there were anomalies attached to the new arrangements, especially to the list for the more than six loom system, in that they did not neces - sarily provide adequate compensation for the operatives concerned, compared with their counterparts who continued to work under the traditional four loom system. The account of these anomalies given below follows closely the discussion set out in the Cotton Manufac - turing Commission (CMC) report of 1948 [8]. However, the present account deals with the issues more fully.

Under both the six loom and more than six loom systems of weaving, the precentage additions or deductions stated in the Uniform List for the four loom system were retained. However, under both systems, special conditions were to be observed, including the provision of a minimum length of yarn on the pirn (in order to reduce the frequency of shuttle changes) and the use of ancillary labour to perform certain tasks. So far as the piece rates are concerned, the six loom system prescribed a rate of 19.5d* per 100,000 picks, compared with 22d* per 100,000 picks for the four loom system (1937 basis). The more than six loom system involved a wage of 51s 6d* for a 48 hour week, to which was added one-fifth of the piece rate earnings from all the looms in the weaver's complement, calculated using the rate appro - priate to the six loom system (1937 basis). In all cases, corresponding adjustments were made for the weaving of coloured cloths.

By way of criticism, it was stated in the CMC report that, in the weaving of cotton cloths, the wages earned by some six loom weavers under the Uniform List did not provide an adequate incentive for the adoption of the system. On the other hand, it was pointed out that, in the case of rayon weaving, where (in contrast to cotton) the yarn was of better quality and a greater length of weft was provided on the pirn, weavers on four looms tended to be underemployed and were able to achieve significant increases in output and earnings where the six loom systems was operating [8].

*Here and in the account below, reference is made to the system of currency under which £1 = 20 shillings (s) and 1 shilling = 12 pence (d).

A more serious criticism mentioned by the CMC report concerned the more than six looms system, under which anomalies arose because of the significant time rate component included within the weavers' wage. It was stated that the effect was that the eight loom weaver was better off than the six loom weaver only when the latter's piece rate earnings were relatively low **[8]**. This can be illustrated as follows. If a given fabric is produced at the same efficiency under both systems and if x is the wage under the six loom system, the wage of eight loom weavers (1937 basis) is:

$$51.5 + 0.2(x+x/3) \text{ shillings.}$$

The wages under both systems are equal when the following relation - ship exists:

$$x = 51.5 + 0.2(x+x/3)$$

i.e., when the six loom weaver's wage is 70s 2d.

Therefore, so long as the piece rate earnings under the six loom system were below 70s 2d, the eight loom weavers were at an advantage. If, on the other hand, the piece rate earnings under the six loom system exceeded 70s 2d, six loom weavers were favoured and the advantage increased as piece rate earnings rose.

If, as seems likely, the efficiency under the eight loom system was less than for the six loom system, then the break-even point of 70s 2d was lowered and the probability that the wages of six loom weavers would be more than those of eight loom weavers was increased. This can be shown by assuming that the production per loom is decreased by 10 percent when the weaver has eight looms rather than six. In this case, the wages on the two systems are the same when

$$x = 51.5 + 0.9[0.2(x + x/3)]$$

i.e., when the six loom weaver's wage is 67s 7d.

Here, if the wages of six loom weavers were below 67s 7d, the eight loom weavers were better off. However, if the wages of six loom

weavers were more than 67s 7d, it was to their advantage to change over to the eight loom system.

A similar anomaly emerges when the four loom system is compared with the more than six loom system. If x, in this case, is the wage of a four loom weaver, the wage of an eight loom weaver, weaving the same cloth, at the same efficiency is

$$51.5 + 0.4(0.887x) \text{ shillings}^* .$$

Thus, when the following relationship exists, the wages of the four loom weavers are equal to those of the eight loom weavers:

$$x = 51.5 + 0.4(0.887x)$$

i.e., when the four loom weaver's wage is 79s 10d.

Therefore, so long as the earnings of the four loom weavers were below 79s 10d, the eight loom weavers were better off. If, on the other hand, the earnings of four loom weavers exceeded 79s 10d, the four loom weavers were better off and the effect was emphasised as the piece rate earnings rose. However, if the eight loom weaver did not maintain the same efficiency as the four loom weaver, the break-even point was lowered.

The relationship between the wages earned under the four loom and other systems of weaving is illustrated in Figure 1, which has been constructed by reference to equations of the type given above. The break-even points discussed earlier are evident in the graph. Below these points, it was to the weaver's benefit to accept more looms. Beyond the break-even points, however, it was not to the weaver's benefit to accept more looms. Therefore, depending upon circumstances, the weaver could be better off or worse off. This arose from the introduction of a time rate component into the weaver's wage under the more than six loom system. Indeed, as pointed out in the Cotton Manufacturing Commission report,

*The wage of the four loom weaver is multiplied by 88.7% because the base rate under the six loom system was reduced by 11.8% from 22d to 19.5d. Since the number of looms is eight, the piece rate component is $2(0.887x)$.

" ...The introduction of an arbitrary time-rate wage into 'more than six loom' weaving has upset completely the relationship between earnings under that system and earnings under straight piece-rate methods of payment."[8]

By way of illustration, Table 1 has been constructed to show the weekly earnings of four, six eight, ten and twelve loom weavers, each producing a different fabric type. Loom efficiency is assumed to be 85% at a loom speed of 150 picks per minute. The working week is taken to extend over 45 hours. The fabrics chosen are known to have been produced in quantity by the British cotton industry before 1939. For each fabric type, two different specifications have been applied.

The table shows that a differential between the wages of four loom and six loom weavers is maintained consistently, the wages of six loom weavers being about 1.33 times those of four loom weavers. However, this assumes that the same efficiency can be achieved for both types of operation. In the event of a lower efficiency for the six loom system, the differential would be reduced correspondingly.

On the other hand, there is no clear cut relationship between the wages earned on the six loom system and the more than six loom system. In several cases, it is not to the weaver's advantage to mind eight or ten looms rather than six. This can be seen in the table for fabrics 1, 2, 9, and possibly 10. However, when earnings under the six loom system were low, it did pay the weaver to accept higher loom complements, as may be seen by reference to fabrics 3 to 8, inclusive. Nevertheless, the differential in favour of more than six looms would be eroded some - what if loom efficiency fell as complements increased.

4. Conclusion

The illustrations cited above highlight what was probably the most damaging feature of the Uniform List: that in the production of certain fabric types it tended to deter rather than assist increases in produc - tivity arising from the reorganisation of working methods.

In 1947, the "Textile Recorder" published a more generalised criticism of the Uniform List which concentrated on the extent to which em - ployers were encouraged to improve operating conditions:

> "The provision of a uniform price for a task, irrespective of how, when or where the tasks performed with no reference to the work load, influences the employers not to provide conditions to improve production, since the result of their effort would be reflected in inflated earnings with no reduction in the labour cost."[9]

This extract acurately conveys that, under the Uniform List, since wages increased in proportion to output rather than work load, it was the weaver rather than the manufacturer who enjoyed much of the benefit arising from improved operating conditions, except when spe - cific improvements were provided in return for an increase in the number of looms per weaver and a reduction in the piece rate.

However, a major opportunity for improved operating conditions was represented by the use of better quality yarns. This policy involved additional costs (which may have been offset to some extent by savings in average fixed costs arising from an increase in production per week), although no reduction in unit wage would be expected under the four loom and six loom systems. (The same comment applies to the more than six loom system in so far as piece rate earnings were incorporated, although the existence of a time rate component implies some reduction in unit wage costs as output in incresed through the improvement of yarn quality.) While a higher revenue would have resulted from selling the additional output, this may not have led to a proportional increase in profit.

On the other hand, both the weaver and the manufacturer would be disadvantaged by a worsening in operating conditions brought about, for instance, by a deterioration in yarn quality, because any factor that resulted in a reduction in output meant a corresponding loss in the weaver's earnngs (even though the work load may have increased), an increase in average fixed costs (possibly offset by a reduction in yarn costs) and a lower revenue.

The existence of such anomalies in the Uniform List was appreciated by the management and work force. The introduction of alternative, work study based methods of payment following the Second World War was undoubtedly the consequence of a realisation that reorganisation and re-deployment of existing machinery or the introduction of new technology was virtually impossible to achieve under existing wage arangements. That work study based payment systems were not introduced earlier is perhaps surprising, although arguably, the difficulties which attended the various attempts at technical progress would also have been encountered in relation to radical changes in the basis of piece rate determination given the commercial conditions of the pre-war years.

Figure 1. Wages under all systems of weaving

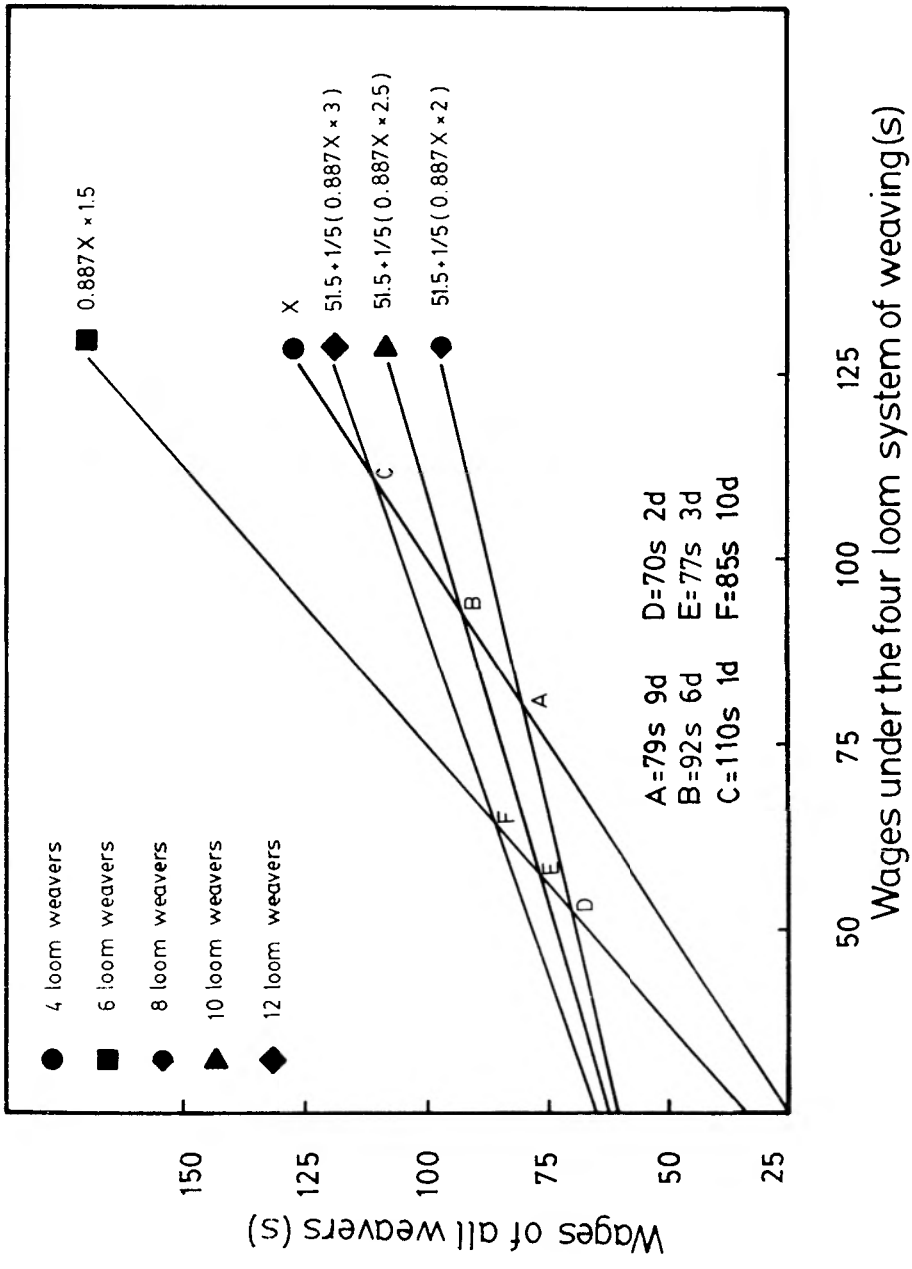

TABLE 1

CALCULATED WEAVERS' WAGES FOR DIFFERENT LOOM COMPLEMENTS

Fabric*	4 Loom Weavers	6 Loom Weavers	8 Loom Weavers	10 Loom Weavers	12 Loom Weavers
	s.d.	*s.d.*	*s.d.*	*s.d.*	*s.d.*
1	60/2	80/-	72/10	78/1	83/6
2	61/4	81/7	73/2	78/8	84/2
3	30/11	41/10	62/5	65/2	67/11
4	33/4	44/4	63/3	66/2	69/2
5	35/-	46/6	63/11	67/-	70/2
6	36/11	49/2	64/8	67/10	71/2
7	34/2	45/4	63/6	66/7	69/7
8	36/7	48/7	64/5	67/8	70/11
9	60/8	81/-	73/-	78/6	88/9
10	51/6	68/10	69/10	74/4	78/11

*Key to Fabric Types:
Fabrics 1 and 2 : Duck
" 3 " 4 : Drill
" 5 " 6 : Flannelette
" 7 " 8 : Shirting (grey)
" 9 " 10 : Shirting (coloured woven)

Source: Calculated using the 1937 Uniform List on the basis of fabric specifications cited in Watson, W., "Textile Design and Colour", Longman.

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