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Industrial organisation, collective bargaining and economic efficiency

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Introduction

There is great current interest in precisely what is the effect of unions and collective bargaining on the efficient operations of firms and industries. This debate has focused on two central issues: the relative benefits of centralised or decentralised bargaining and the effect of trade unions on the level and rate of increase of productivity. The argument in favour of decentralised bargaining is the perceived need to relate pay determination more closely to the ability of the firms to pay (Meade, 1982; Weitzman, 1984), a reform strongly supported by the British government. If workers were prepared to relate their pay and its movement more closely to each firm's marginal revenue product, which is supposed to diminish for technical reasons and/or because of product market imperfections, a higher level of employment would be possible.

The interest in the consequences of trade unions for productivity has been sharpened by the evidence that productivity in the UK has increased faster than its sluggish 1970s performance following the implementation of policies in the early 1980s designed to weaken trade unions. Metcalf (1989), for example, has argued that productivity benefits from both a greater degree of co-operation from labour and a stronger management and that this is more likely to result from weaker than stronger trade unions. By contrast, it has been suggested that greater co-operation by workers merely increases management's complacency in continued commitment to outdated techniques and products while conflict generated by strong trade unions is likely to shock them out of this and into higher productivity strategies (Nolan, 1988; Allen, 1966; Slichter, 1941).

In addressing the trade union and productivity question from a US perspective Freeman and Medoff (1984) explore the links between trade unions and productivity in close detail. They found both negative and positive effects. By exercising their monopoly power unions could raise wages, and the subsequent substitution of capital for labour in the unionised plants would raise labour productivity in the organised sector. However, this would be offset by lower wages and a greater degree of labour intensity in the non-union sector where workers would be crowded as a consequence of union organisation elsewhere.

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Trade unions are also seen as having an ambiguous effect on the growth of productivity. On the one hand, they might goad management into introducing new techniques, but, on the other, the possibility that organised workers might secure some of the productivity benefits of improved methods by raising pay could lower profits expectations, discourage investment and slow technical progress. In the workplace, trade union monopoly power could directly reduce productivity by the imposition of work rules and indirectly by reducing managerial flexibility. However, unions also give vent to the collective 'voice' of their members which gives them a greater degree of certainty about the future and improves workplace conditions. This enhances work organisation and lowers the quit rate resulting in savings on recruitment, training costs and the loss to the firm of specific skills (Lorenz, 1991). Effective labour organisation can also be expected to improve productivity by raising the quality of management by obliging firms to replace authoritarian and paternalistic strategies with greater professionalism. Much depends, however, on whether a good industrial relations climate can be engendered. If it can, this opens the way for management and unions pulling together in the interest of the firm. In this respect, unionism on its own has neither a negative nor positive effect on productivity; what is important is how well unions and management interact at the workplace.

An alternative explanation for the beneficial role of unions is that they help provide a governance structure and consequently lower transaction costs. Transaction costs result from the specific nature of skills used by the firm and the hiring and training expenses which impose labour turnover costs on employers who consequently prefer long-term employment contracts. But these are difficult to negotiate because workers have privileged access to information about jobs, particularly that acquired in learning by doing, which they withhold from managers; because the firm is uncertain about the future; and because of indeterminacy of small numbers bargaining. Unions lower transaction costs by intermediating between workers and management and by contributing to governance which reduces the cost of negotiating, monitoring and renegotiating contracts (Williamson, 1985; Addison and Barnett, 1982).

One problem with this literature is that usually no attempt is made to explore in detail product and labour market contexts within which the analyses are cast. Quite different outcomes can be expected depending on the degree of competitive structure of the product markets; the extent of the imbalance of power between labour and capital in bargaining and whether this inequality extends to intra-class relations so that factor markets are segmented.[1] A second, and much more fundamental, problem arises from the largely static nature of the analysis and particularly its failure to take into account the dynamic interactions between economic forces, technical opportunities and the social relations of production and exchange.

A way of overcoming these difficulties is to examine the effect of trade unions and industrial relations systems within specific economic, organisational, social and political contexts. This approach allows a closer and more detailed examination of the interrelations within 'productive systems',[2] between productive systems and their environments and how outcomes are moulded by these dynamic forces. In this

[1] In the sense that the services of labour and other productive factors which are otherwise comparable are available at different prices.

[2] For discussion of the 'productive systems' see Wilkinson (1983).

respect, the British iron and steel industry provides a valuable historical case study. A cursory glance at its fortunes from the mid-19th century to the 1930s would seem to lend support to the hypothesis that to some extent at least the effects of trade unions were deleterious. At the earlier date the industry dominated the world market and was almost completely free of trade unions and collective bargaining. By the 1930s the industry had lost its international pre-eminence and was rapidly declining. By then, the incidence of trade unionism was high and wages were determined by an elaborate system of collective bargaining which extended from the plant to the national level. Moreover, labour productivity was low by the standards of the USA and Germany, Britain's main international rivals, and although British wage levels were lower than those in the USA they were significantly higher than the German.

On the other hand, the iron and steel industry manifested none of the symptoms of what has come to be known as the British disease—militant trade union leaders, recalcitrant union members, unworkable or unworked collective bargaining or dispute procedures and a ready resort to strike action. On the contrary, the iron and steel unions' leaders were paragons of the virtue of 'responsibility', procedures were religously followed to binding arbitration (which throughout the industry served as the final stage in the procedure) and with very few exceptions the members honoured the agreements so concluded. This system of 'governance' which gave every opportunity for 'voice' consisted of joint determination of the terms and conditions of employment at both national and local levels; procedures which provided for the surveillance of local settlements by workers and employers independent of the plant in question, entailed binding arbitration by independent and well informed individuals acceptable to both sides. The outcome of the industrial relations process was a close linking of earnings to ability of firms to pay as measured by product prices[1] and by individual plant productivity so as to meet the ideals of those contemporary commentators who advocate decentralised wage bargaining. Moreover, the collective bargaining system in the British iron and steel industry was so successful in ensuring a good industrial relations environment and creating industrial harmony that its main architects from both the employers' and employees' sides played a leading role in the 1892 Royal Commission on Labour which laid down the guidelines for British governments' industrial relations policy for years to come.

But the fact that a collective bargaining system guarantees industrial peace and therefore receives official approval does not necessarily exonerate it from the charge of contributing to industrial decline any more than industrial disharmony can be taken as incontrovertible evidence to the contrary. Before any such conclusions can be drawn it is necessary to examine carefully the impact of a system of industrial relations on the determination of relative costs, the pace of technical change, industrial restructuring, the responsiveness to product market changes and other such determinants of competitive success.

The iron and steel industry

In 1870 wrought iron met the main demand for ferrous metals; steel was expensive to produce and was used only for special purposes. The invention of the Bessemer and open hearth steel-making processes opened the way for mass-produced steel

[1] An example of a 'share system' looked on favourably by Weitzman (1984, pp. 76–78).

which progressively replaced wrought iron. From 1870 world demand for iron and steel products grew rapidly but was highly unstable. In the 1880s, for example, production of wrought iron and steel in Britain declined by 43 and 14% respectively from the peak to the trough of the cycle but rose again by 43 and 100% respectively to the peak of the next upswing in demand. The swings in demand resulted in wide variations in prices which, if anything, fluctuated more widely than production. Over the period from 1870 to 1930 British output of steel increased from 0·2 to 9 million tons while that of wrought iron declined from 2·5 to 0·1 million tons. But despite growing steel production, it was in this period that the British industry lost its world pre-eminence. In 1870 Britain's share of world ouput of both wrought iron and steel was around 40%. In 1930 these proportions had declined to 19% for wrought iron and 8% for steel, and Britain had fallen from first to fourth in the rank of world producers, behind the USA, Germany and France (Burnham and Hoskins, 1943). By the later date, the British industry was, with a few notable exceptions, and particularly when compared with US and German producers, fragmented into small-scale and vertically disintegrated plants, technically backward and increasingly uncompetitive. This relative decline finds its expression in trade performance. In 1870 British producers dominated world markets and exported 70% of their output of wrought iron and steel while imports took a negligible proportion of the home market; by 1930 only 38% of output was exported while imports supplied 35% of domestic demand (Burnham and Hoskins, 1943). Such outcomes will be only too familiar to students of the decline of British industry; iron and steel is only exceptional in that it took the lead in this process.

Production processes and labour organisation

The three basic processes in iron and steel making are: pig iron production in blastfurnaces; the refining of pig iron and/or scrap into wrought iron in puddling furnaces or into steel in open hearth furnaces or Bessemer converters; and the shaping of the metal mainly by rolling but in earlier days also by hammering. In the middle of the 19th century the level of mechanisation of iron and steel production was low, materials were manhandled to, and between, processes and so even in integrated works the stages of production were not closely linked. Managerial methods were rudimentary, metallurgy was underdeveloped as a science and therefore furnace and mill operations were very much dependent on know-how and rule of thumb. In these circumstances the skills to operate the processes, much of the setting up and maintenance of machinery, metallurgical know-how, labour management—hiring, training, organising and paying—and the control of quantity and quality of output were the responsibility of contractors. These were paid by the ton and hired, paid (usually on time rates) and organised their own underhands.

The scope of the contractors' responsibility varied by process. The puddlers, who operated the wrought iron furnaces, hired at most two underhands, whereas for the more complex steel-making and rolling processes large teams were required. The relevance of contracting as a form of labour organisation declined with the growing requirement for, and possibility of, centralised control as mechanisation integrated processes more closely, with the development of instrumentation and scientific controls of production and of product quality, and with the improvement of managerial

methods. But in the middle of the 19th century contracting was almost universal in wrought iron and steel making and rolling and, apart from a small number of administrative, ancillary and maintenance workers, the contractors were the only personnel directly employed. Moreover, the early history of the institutionalisation of wage setting and the development of trade unions and collective bargaining is a history of the determination of the contract rate.

Wage determination

The origins of institutionalised wage determination are to be found in the collusion of ironmasters organised into regional associations. These had originally fixed prices but their ability to do so declined as it became increasingly difficult to control the product-market activities of members and with the growth of inter-regional dumping, especially in the downswing of the cycle, as production became increasingly dispersed geographically. Nevertheless, from at least as early as the first decades of the 19th century, the ironmasters met regularly to agree on the tonnage rates for contracting (Birch, 1967). This had the advantage of taking wages 'out of competition' both in the product market (Jones, 1907)—thereby providing some underpinning for price—and in the labour market—where, because the trend increase in production was high, skilled labour was periodically in very short supply (Birch, 1967). The employers also colluded on wages to present a united front to labour organisations which frequently emerged, but which, until the 1850s, failed to survive the combined effect of collective action by the ironmasters and the downturn in the demand for iron (Royal Commission, 1868, Q9839; John, 1950).

One of the early conventions in wage fixing was an automatic link between the contractors tonnage rate and the price of iron. This was formalised in 1846 when the failure of the tonnage rate to rise in line with the price of iron in the Staffordshire iron producing region prompted a strike by the puddlers employed by Mr Thorneycroft. A settlement to this dispute was reached by the introduction of an agreed formula by which the tonnage rate for puddling was fixed at one shilling[1] for every £1 in the selling price of iron (Royal Commission, 1868, Q9836). Compared with puddling furnaces, rolling mills and other types of equipment were much less standardised in terms of productive capacity and base[2] tonnage rates for these processes varied widely. But they were linked to the puddling rate so that when it changed by one shilling other rates were adjusted by 10%. By these means the general level of wages in the iron trade came to fluctuate automatically with product prices.[3]

The evolution of collective bargaining

The 1850s and 1860s witnessed intensive trade union activity which culminated in a decision by the various regionally based ironmasters' associations to oppose organised labour collectively. The result of this employer combination was a successful lockout across the English iron producing regions (Royal Commission,

[1] £0·05.

[2] Those tonnage rates to which sliding scale or other wage changes negotiated centrally were added or subtracted.

[3] The Thorneycroft Scale is not the earliest example of the use of sliding scales in the iron industry. Such an expediency resolved a dispute over prices to be paid to charcoal burners in 1746 (Ashton, 1951).

1868, Q8205–Q8599). This employer victory, combined with the 1867 recession, almost destroyed the newly formed unions. But as the industry began to show signs of recovery, and fearing that renewed militant action by organised labour would ruin the expected improvement in prosperity, the ironmasters of the northeast of England suggested the formation of a joint board of arbitration and conciliation to resolve wage disputes peacefully (Odber, 1951). This was agreed and the Board of Arbitration and Conciliation for the Manufactured Iron Trade of the North of England (the Joint Board) came into being.

The Board operated at two levels. The full Board consisted of one contractor and one employer representative from each of the member works and had an independent chairman acceptable to both sides. The full Board had the responsibility for settling the question of the general level of pay, and if it failed to agree, the chairman acted as an arbitrator with the power to make binding decisions. The deliberations of the board and the presentation of evidence before the arbitrator allowed the consideration of a wide range of factors including the 'state of trade', the price of raw materials and the cost of living. But although these were taken into account, the price of the product remained overwhelmingly the most important determinant of general wage movements and automatic sliding scales were agreed upon periodically (Price, 1887; Royal Commission, 1892, Q14978). The constitution of the Board also provided for the establishment of a Standing Committee charged with resolving local disputes over base rates. As has been already noted, the tonnage rate for puddling was standardised. This was possible because the puddling process proved impervious to technical change so output varied little between wrought iron furnaces. This was not the case for rolling mills of which there was a wide variety and which were subject to continuous technical modifications which progressively increased mill productivity. Nor was it to be the case for the new steel-making processes which were displacing the puddling furnaces and which were being continuously improved. Therefore tonnage rates for processes other than puddling were agreed on a plant-by-plant basis and the question of their level could be re-opened if it could be established that technology or working conditions had changed sufficiently to modify job content substantially. In these circumstances a procedure for resolving local disputes was an essential complement to the work of the full Board to prevent the effects of Board decisions being offset by local adjustments to rates and to bring order into negotiations over base rates.

The employee representatives on the Joint Board were elected by a ballot of all direct employees (Odber, 1951),[1] who were also levied to finance the expenses of the Workers' side of the Board. The Amalgamated Malleable Ironworkers' Union (the Ironworkers) had no official standing although the General Secretary of the union served as the secretary of the workers' side of the Board and the workers' representatives were invariably union members. The absence of direct union representation on the Board can be explained by the antagonism among the employers towards labour organisation and by the unwillingness of the unions, who only partially organised the workforce and who were not fully recognised by the employers, to accept responsibility for enforcing Board decisions (Wilkinson, 1977). One important effect of the unofficial standing of the Ironworkers on the Board was that, so long as this was the

[1] The underhands who were employed by the contractors were not within the jurisdiction of the Board.

case, it proved impossible for unions organising ancillary and maintenance workers to gain any degree of standing within the collective bargaining system (Odber, 1951), and ancillary and other directly employed workers had to deal with the Board through the contractors union (Royal Commission, 1892, Q17324).

An arbitration board similar to that in the north of England was effectively operating in the Staffordshire iron and steel producing region by 1876 and the tendency developed for the general level of wages in the two areas to move in line with each other (Price, 1887). Moreover, the decisions of the two Boards were followed in other iron-making regions in England and Wales (Royal Commission, 1892, Q15368 to Q15370). In other respects, however, the Boards were closed: they remained principally concerned with the relationship between the employers and contractors in the wrought iron industry in England. Underhands, ironworkers in Scotland, and operatives in the rapidly growing open hearth steel industry remained unorganised and unrepresented. Thus the second major stage in the development of collective bargaining in iron and steel came from outside the jurisdictional area of the arbitration boards: from the underhands on the new open hearth steel-making plants in Scotland.

These new developments originated in a strike by underhands against the contract system in Colville's Motherwell works near Glasgow. Out of this dispute emerged the British Steel Smelters' Association (the Smelters) which spearheaded the underhands' offensive against the contract system. The underhands objected to contracting because the system by which the contractor was paid by the ton and they were paid by time meant that all the benefits of increased output accrued to the contractors. The contract system was also becoming out-moded as a form of labour organisation because mechanisation and other technical changes were shifting the requirement for control from the individual process to the plant manager's office; there, new systems were being introduced to make the exercise of that control more effective. Technical improvements were also progressively converting the underhands from manhandlers of materials under the direct supervision of the contractors to machine operators with a significant degree of control over output. The employers and the underhands therefore had a common interest in ending contracting and extending the incentive payment system to include all production workers.

The Smelters' Union grew rapidly and whenever it organised a plant the contracting system was abolished, so that the system progressively declined. The final major struggle came in 1909 at the Hawarden Bridge works of John Summers, which brought the Smelters, representing the underhands, into direct confrontation with the Ironworkers, representing the contractors. This led to the termination of the contract system but not before the Smelters had been expelled from the Trades Union Congress on the Ironworkers' charge that their jurisdictional territory had been invaded (Pugh, 1951).[1] With the ending of contracting, the tonnage rate was divided between all the members of the furnace or mill operating team in agreed proportions and the contractor usually retained his position as leading hand. In effect then, the individual contract was converted into a group contract and the incentive

[1] The President of the TUC at the time was the General Secretary at the Cotton Spinners Union which also consisted mainly of contractors.

effects of piece-rates and their benefits to earnings, where and when output was rising, were extended to the underhands.

A second major issue, this time internal to the Smelters, was the question of access to skilled jobs. The skilled workers—for example, the first hand melters on open hearth furnaces—attempted to establish craft status for themselves to allow horizontal mobility between plants along occupational lines. The underhands resisted these claims and successfully instituted the seniority principle whereby access to process jobs was via unskilled labouring and progression to skilled occupations was by climbing a hierarchy of jobs attached to each production process. In this way, the underhands secured guarantees of jobs within a narrow range within particular works but at the cost of opportunities outside that promotion line. By doing so, they divided the iron and steel labour market into narrow vertical segments and firmly tied the fortunes of each process worker to a small section of a particular plant.

In their negotiations with the employers the Smelters resisted the formation of arbitration and conciliation boards and insisted on direct negotiations. But they progressively developed collective bargaining procedures reminiscent of the Joint Board system. Thus the questions of the general level of pay came to be considered at national conferences attended by employer and union representatives from each participating works. A neutral committee system was also evolved to progress local disputes. Under this scheme local failures to agree were referred to a small committee consisting of an equal number of union and employer representatives from works not directly involved in the dispute, who were given the power to reach binding settlements. For both industry-wide and local issues, binding arbitration came to the final stage in procedure. The Smelters also originally opposed product price related scales but in 1906 signed the North of England Melters' Sliding Scale agreement with the Steel Ingot Makers' Association. This came to be the most widely used means of regulating the general level of wages in the iron and steel industry until it was frozen as a wartime measure in 1940.

This largely completed the second stage of evolution of collective bargaining in the British iron and steel industry and by 1911 when the Board of Trade surveyed industrial relations it found the industry covered by a web of sliding scale agreements and procedural arrangements for resolving disputes which ruled out strike action (Board of Trade, 1911). However, while these arrangements encompassed the majority of process workers almost all the lower-paid ancillary and lower-skilled workers were excluded. Coverage was extended to these by the events of the First World War and its aftermath in what can be regarded as the third and final stage of the institutionalisation of wage determination in the British iron and steel industry, and which closely followed the pattern of earlier development. The coverage of sliding scale agreements was extended to cover groups previously excluded, there was some redistribution of the industry's wage share in favour of the low paid and a payment-by-results element was added to their pay. These changes were secured through the industry's collective bargaining procedures and without militant action during the 1920s, when unemployment was very high, the industry was depressed and industrial unrest outside the iron and steel industry was endemic.[1]

[1] For a detailed analysis of this episode see Wilkinson (1977).

Why industrial peace?

Labour historians and industrial relations specialists have attributed the extraordinary success of industrial relations in the iron and steel industry in securing and ensuring industrial peace to one or more of three main factors: the ability of the union leadership to exercise control over their membership, the dominant role of key process workers in the unions, and the economic conditions of the industry. It has been suggested, for example, that the high pay of the contractors made them vulnerable to replacement from among the underhands, and that the union leaders, acting as the secretaries of the workers' side of the Joint Boards, used this threat to ensure compliance with Board decisions (Clegg, Fox and Thompson, 1964). However, there is no evidence that such a centralisation of power existed (Wilkinson, 1977) and in the one recorded case when contractors in particular works were replaced it was only done with the consent of the employee subscribers to the Board (Royal Commission, 1892, Q15157). The Joint Board system meant that a representative of each member works was a direct party to agreements and the Smelters continued this practice in their direct negotiations with steel employers in the requirement that the representative of each plant-based branch should sign national settlements, including the 1905 Melters' Sliding Scale Agreement. Branches also exercised the right to 'appeal to the trade' by calling for a vote in opposition to union executive decisions (Pugh, 1951). These examples indicate a high degree of decentralisation of power in the union exercised through the branches' democratic control of decision making. The argument that the union leaders lacked the power accredited by the commentators can also be deployed against the suggestion by Clegg, Fox and Thompson (1964) that promotion by seniority placed a powerful weapon in the hands of the union leaders; promotion has traditionally been a branch affair.

There is much more substance in the argument that industrial peace was secured because of the dominant role of the key process workers in the union. We have seen that the Joint Boards mainly served the interests of the contractors. With the abolition of contracting this control was extended to include the rest of the furnace and melting crew members. The extent of this control is indicated by the protracted negotiations at the industry level in the 1920s, when the unions were demanding an increase in pay for the lower paid which the employers were only prepared to concede if the cost was met by a reduction in the base tonnage rate of the highest-paid process workers and an extension of the production week. Attempted draft agreements at the national level met repeated resistance from the open hearth branches, so that the negotiations stretched from 1921 to 1929 before a lasting settlement was concluded (Wilkinson, 1977).

However, evidence that key process workers operating through their local branches exercised a considerable degree of control over union affairs does not provide a convincing explanation of why, for example, price-related sliding scales operated successfully. There is no difficulty in explaining, in an industry in which price movements were determined by world market forces, the keenness of producers to see wage costs linked to prices as they fell even if this meant retaining the link when they rose. However, it is less easy to identify the attraction of such a scheme to labour. The acceptance by organised labour of the price–wage link can be explained by the specificity of the skills of the process workers which tied their economic fortunes

closely to that of the industry and by the tonnage payment system which gave them a particular interest in the continuity of production. This would be particularly important in an industry where demand fluctuated widely, so that when workers were in the strongest bargaining position—i.e. in booms—the cost of strike action was at its highest in terms of tonnage payments foregone. It is therefore not surprising that once labour had sufficient organised strength to use an increase in demand, and hence a return to prosperity, to press effectively for a restoration of wage cuts made in the previous slump, the conditions existed for the masters and men to devise a scheme whereby they could together enjoy the booms and weather the slumps. But, while this is a plausible argument for explaining why both the employers and the workers should be interested in conventions designed to secure industrial peace, it is hardly sufficient to explain why, by the 1930s, that peace had lasted for 60 years except for minor skirmishes. This is especially so when it is remembered that similar sliding scales agreements concluded in the coal mining industry quickly broke down (Clegg, Fox and Thompson, 1964).

This brings us to the third explanation for industrial peace: the underlying economic conditions of the industry. The reason given for the rapid demise of sliding scales in coal mining was the industry's tendency to diminishing returns as the most readily available supplies of coal were used up. With tonnage bonus earnings declining with productivity, the automatic downward pressure on wages as coal prices fell reduced living standards below an acceptable level. Consequently, the mineworkers' unions abandoned sliding scales and pressed for a minimum wage. By contrast, in the iron and steel industry productivity rose steadily and the effect of this on tonnage earnings provided a cushion between the downward pressure of iron and steel prices and the standard of life. Thus an explanation for the successful avoidance of industrial disputes and the acceptance of sliding scales in the iron and steel industry is to be found in the underlying economic conditions of the industry rather than the disciplinary powers of union leaders or the industry's more than fair share of men of good will (Pool, 1938).

Summary

The argument so far is that a system of trade unionisation which developed in the steel industry had a branch structure which was both process and plant based. The branches were dominated by the skilled process workers who exercised a high degree of democratic control over the decision-making processes both within the union and in the system of collective bargaining. This basic structure, which originated in the wrought iron industry to regulate the relations between the contractors and the ironmasters, persisted despite the superceding of wrought iron by steel, the replacement of the Joint Arbitration and Conciliation Boards by direct negotiations between the unions and the employers' association, and the progessive widening of the organisational base of the unions to include firstly the former contractors' underhands and later the mass of the lower-paid ancillary workers and labourers.[1] On the employers' side the associations consisted of a large number of

[1] The only group of workers remaining outside the system were the maintenance workers. These were organised by the craft unions and tended to be paid the local rate for the job. They were also not covered by sliding scales.

firms of variable size operating relatively small-scale plants of a wide span of technical vintages.

The system of wage determination had two features which linked it closely to the industry's ability to pay. The Joint Boards, and later national bargaining, related earnings to the industry's ability to pay by forging a direct link between product prices and the general level of pay. Local bargaining related earnings to the individual plant's ability to pay through the determination of the base tonnage bonus rate. This meant that on a day-by-day basis earnings fluctuated with output. But, in addition, inter-plant differences in productivity were also reflected in relative earnings. This happened because base rates were difficult to change once agreed and because the output of furnaces, mills and other equipment tended to rise progressively as the result of learning by doing, piecemeal technical change to the equipment, and technical developments at other production stages which removed production bottlenecks and increased throughput. The stickiness of base rates can be explained by the risk to the incentive effects of earnings that could be incurred by the frequent adjustment of rates in a system of labour organisation in which the pace of output continued to depend on the co-operation of the skilled process workers (ISTEA, 1927).[1] A second reason why tonnage rates were sticky can be found in the way by which disputes were processed through to binding arbitration, which necessarily took the final decisions away from the individual firm and invested the settlements with a quasi-legal status based on precedence and due procedure. This made base rates difficult to change within the rules for the collective bargaining system and meant that any attempts from outside this structure threatened the whole procedural framework upon which the industry, the unions, and each separate plant and its union branches had come to rely for continuity of production uninterrupted by strikes and lockouts.

Output and earnings

Table 1 suggests some of the effects of the combination of sticky tonnage rates and increasing productivity on the wage structure. For time work (see Table 1a), earnings were narrowly dispersed mainly in the below £2 per week range in each of the production processes, although the tail of relatively high time work earnings was somewhat longer in open hearth steel making and in cogging and rolling than in either wrought iron puddling or Bessemer steel making. The major differences between processes in the dispersion of earnings are to be found in those for piecework, which are shown in Table 1b. In puddling and in Bessemer steel making around 90% of piece-workers received less than £3 per week and the rest were paid between £3 and £6. In open hearth steel making and cogging and rolling respectively 52 and 69% were paid less than £3, 38 and 26% were paid between £3 and £6, and 9 and 6% were paid between £6 and upward of £8.

Earnings dispersions can be explained by differences in the skill mix within production processes as well as by inter-plant differences in the earnings of particular occupations. There can be little doubt that both factors were operating on the wage

[1] For these reasons the 1905 Melters' Sliding Scale Agreement included as clause 8 the stipulation that base rates could be changed if there had been a change in practice or working conditions (Pugh, 1951, appendix 2).

Table 1. *Distribution of weekly earnings in iron and steel processes: time and piece rates, 1906*

£'s	Wrought iron pudding (%)	Beesmener steel making (%)	Open hearth steel making (%)	Iron and steel cogging and rolling (%)
(a) Timework				
Under 1	36·1	31·8	13·2	20·9
1 to 2	59·5	59·3	73·0	67·6
2 to 3	4·4	8·9	9·4	8·9
3 to 4			2·3	1·7
4 to 5			1·1	0·6
5 to 6			1·0	0·3
Total	2552	973	2352	10,006
(b) Piecework				
Under 1	10·2	12·3	4·2	4·9
1 to 2	50·1	47·2	18·7	33·5
2 to 3	29·5	28·5	29·3	29·7
3 to 4	7·6	8·4	21·1	15·4
4 to 5	1·7	2·4	10·3	7·4
5 to 6	0·9	1·2	7·0	3·5
6 to 7			5·6	2·5
7 to 8			1·7	1·7
More than 8			2·1	1·5
Total	2575	816	1721	6984

structure illustrated by Table 1. But one of the major factors differentiating wrought iron puddling and Bessemer steel making from open hearth steel making and cogging and rolling was the different extent to which these processes, as operating in Britain in 1906, had been affected by technical progress. The puddling furnace technology was static from its discovery in the late 18th century to its progressive demise from the second half of the 19th century onwards. Bessemer steel production was introduced early in Britain but its product was progressively superceded by open steel (Burn, 1940) and so the Bessemer plants in existence in 1906 tended to be of an early technical vintage and therefore similar in levels of productivity. By contrast, open hearth steel making and cogging and rolling were both subject to continuous technical change and a wide range of vintages were in operation in 1906.

The question of the range of earnings for particular occupations kept on emerging as an issue for collective bargaining. The deliberations of the North of England Joint Conciliation and Arbitration Board in 1879 revealed earnings for rollermen of between £0·95 and £1·9 per shift[1] and in his evidence given in 1892 Edmund Trow, the General Secretary of the Ironworker's Union, informed the Royal Commisson on Labour that differentials of 100% existed betwen the earnings of rollermen on different mills *in the same works*. He went on to explain[2] that the differences lay 'not

[1] Board of Arbitration and Conciliation for the Manufactured Iron Trade in the North of England, report of the discussion before the arbitrator at Darlington, August to October, 1879.

[2] To the economist Balfour in an exchange which revealed how wide the gap was between the theorists and practitioners of wage determination even in those days.

Table 2. *Distribution of open hearth street, melting furnaces by the earnings of melters, 1925*

Earnings (£)	1st hand	2nd hand	3rd hand	4th hand
15–17·99	6			
13–14·99	39			
11–12·99	42	5		
9–10·99	62	38	5	
7– 8·99	37	62	33	
5– 6·99	15	75	107	
3– 4·99		21	56	18
Less than 3				40
No. of furnaces	201	201	201	58

Source: ISTEA (1926).

in himself [the rollerman] but in his mill'; how these developed through a combination of unchanged tonnage rates, mill improvements and learning by doing; that the union accepted these differences because of their fear that pressing for upward revisions of the rates on the lowest paid mills would precipitate claims against the higher earnings which would 'spoil the job'; and how discontent within the union branches over wage differences was allayed by arranging promotion by seniority between the mills so that each of the contractors had access to the higher earnings in turn (Royal Commission, 1892, Q15351 and Q15352).

In open hearth steel-making plants three main factors operated to increase productivity. Furnaces increased in size and hence productive capacity, mechanical charging was introduced to replace the laborious hand loading, and hot metal charging was developed which reduced the length of the steel-making cycle. The employers obtained tonnage rate concession for furnaces which were machine charged when hot metal 'practice' was introduced, but not for the increase in furnace size except for very large fixed furnaces and more generally for tilting furnaces (Pugh, 1951; ISTEA, 1926).[1] There was merit in the union's arguments resisting rate revision for larger furnaces when they were hand charged because the heavy manual work this entailed rose with the level of output. But their arguments had much less merit when machine charging became the normal practice because the machines used for charging increased in capacity to match furnace size. Despite this, increase in size was not established generally as a change in practice and so tonnage rates for fixed furnace operations were fairly standard across the industry and inter-plant wages differentials reflected inter-plant differences in furnace productivity.

The wage structure consequences of this are shown in Table 2, information in which is derived from a survey of open hearth furnaces undertaken by the Iron and Steel Trades Employers Association in 1926. This shows enormously wide occupational wage differentials with a more than 300% gap between the highest and

[1] Fixed furnaces were 'tapped' from the bottom whereas the molten metal was poured from the top of tilting furnaces. This allowed a proportion of the molten metal to be retained in the tilting furnace which hastened the smelting of the next charge and made the steel-making process more continuous. The lower rates on large fixed furnaces and on tilting furnaces were generally fixed by neutral committee or by arbitrators.

lowest paid first hand melter and a greater than 800% gap between the lowest fourth hand melter and the highest paid first hand melter.[1]

Wages, wage structure and industrial decline

There is some debate as to whether the British iron and steel industry was becoming increasingly uncompetitive in the late 19th and 20th centuries although the burden of opinion seems to be that it was.[2] Explanations for this relative decline include growing cost disadvantages resulting from the relatively high prices of British raw material inputs and the productivity lag resulting from the industry's failure to adapt the latest technology. The productivity lag has been explained by the inheritance by the steel industry of a small-scale, fragmented industrial structure from the earlier wrought iron industry; by the slow rate of increase in demand relative to the minimum efficient scale of the production of the latest technology,[3] and more generally by entrepreneurial failure. Compared with the detailed attention to these factors in the literature little attention has been paid to the effect of industrial relations, wage levels and wage structures. It is understandable why industrial relations have figured little in these debates because, as we have seen, the iron and steel industry's record would seem to have been impeccable in this respect. Burn (1940) found that Britain suffered some additional cost disadvantages in the 1920s after the introduction of the 8-hour shift to replace the 12-hour one raised hourly earnings, and it was generally recognised that although wages in Britain were lower than in the USA they were higher than in Germany. Allen (1979) recognised that British producers had some wage disadvantage but argued, 'High British wages reflected higher British per capita incomes and were thus beyond the control of the steel industry' (p. 935); however, Elbaum (1986) took the effect of wage levels and especially the wage structure more seriously.

In a situation where product prices were determined by world market forces and therefore 'given' to individual firms, it can be shown that a direct link between plant productivity and wages can be a discouragement to both investment in more productive equipment—by reducing the expected rate of return on innovation—and to scrapping—by maintaining the profitability of obsolete plants. In answer to this, it might be counter-argued that, however true it might be, it was of little consequence in the iron and steel industry because wage costs were only 21% of total costs (Allen, 1979). Nevertheless, as returns to capital were only 8% of total costs, wages accounted for 72% of value added. Consequently, the ability of producers to control wage costs was of central importance in determining profitability, especially as the prices of raw materials, fuel, and other non-labour costs were largely determined by world market forces and therefore outside their control.

In theory—given product prices, the cost of non-labour inputs and the rate of interest—a firm can be expected to invest in a new vintage of capital equipment when

[1] The share of the tonnage rate going to each of the grades of furnace men was fairly standard and therefore the wage differentials among the furnace grades in each plant were fairly standard. Some plants had an extra furnace man—the fourth hand—and as the wage for this grade also came out of the tonnage rate this affected the differentials among the earnings of the first, second and third hand melters.

[2] See, for example, Burn (1940); Carr and Taplin (1962); Burnham and Hoskin (1943); Allen (1979); McCloskey (1973); Temin (1966) and Elbaum (1986).

[3] This meant that the securing of the full economies of scale risked below full capacity operation, the cost of which would offset the benefits of innovation.

the expected flow of quasi-rents from its employment, when discounted at the appropriate interest rate, provides a sufficiently high surplus to cover the capital cost of the new equipment and the required profit margin. If the firm expects wages to rise with the increased productivity then the anticipated flow of quasi-rents will be reduced and the investment in the more technically advanced equipment discouraged. Under the same assumptions, the most obsolete vintages will be scrapped when prime costs equal price, after allowance has been made for any scrap value of the equipment (Salter, 1963). If wage levels (for workers of comparable productivity) are lower in plants with relatively unproductive equipment, the rate of scrapping will be reduced and the tail of obsolete equipment in the vintage structure of the capital stock will be longer than in the case where all plants pay the same wage levels. Such impediments to scrapping would present a second obstacle to investment in the most technically advanced equipment, when, as was the case in iron and steel industry, the minimum efficient scale *and* the capital intensity of production tended to rise with technical progress. The requirement for profitable investment was a higher level of demand for the firm's product, which in the slowly growing market for steel in Britain meant an increase in market share. The obstacles to scrapping prevented the transfer of market share to the more dynamic firms and consequently slowed down investment.

I have estimated the possible impact of the wide dispersion of wages, and their relationship to productivity, on the structure of the industry by using the information from the ISTEA's 1926 wage survey to calculate the average level of earnings for the melting crews on machine charged fixed, open hearth furnace, assuming that each plant paid the average wage, and to compare wage cost outcomes with those resulting from the wage levels reported in the survey. This exercise has the effect of redistributing the industry's wage fund equally, rather than unequally, among the labour force without changing the aggregated share of wages. The results are shown in Table 3. The first column gives the distribution of furnaces by changes in the labour costs of furnace crews resulting from changes in the wage payment system. This shows that for 30% of the least productive furnace labour costs would rise by 20% or more and that for 10%, the increase would be in excess of 40%. At the other end of the furnace productivity scale the reduction in labour costs of the change I have engineered would be 10% or more for the 20% most productive furnaces and in excess of 20% for the 10% with the highest output.

The second and third columns of Table 3 show estimates of the effects of these cost changes on the shares of wages and profits in total costs, on the assumption that before the change in wages the distribution of costs was that given by Allen (1979)—i.e. 71% for raw materials, fuel and other non-labour costs, 21% for labour costs and 8% for profits—and was the same for each furnace plant. It is also assumed that piecework earnings accounted for 50% of total labour earnings so that the effect of the change on overall labour costs is only half of that incurred by furnace crew.[1] These estimates suggest that for the least productive plant the wage change would result in negative profits; for 10% of the furnaces the fall in profits would be at

[1] This is probably an underestimation for 1926. The Board of Trade (1911) estimated that tonnage earnings made up 50% of the steel wage bill. Between 1911 and 1926 tonnage earnings increased much more than did timework earnings (Wilkinson, 1977).

Table 3. *Changes of labour costs of furnace melting teams and the share of wages and profits on the assumption that on each furnace piece workers were paid the average earnings for the industry*

Changes in labour costs of furnace teams (%)	No. of furnaces	Share of wages and profit % in total costs	
		Wage	Profits
+80–90	1	29·9	−0·9
+70–80	10	28·9	0·1
+60–70	2	27·8	1·2
+50–60			
+40–50	6	25·7	3·3
+30–40	26	24·7	4·3
+20–30	16	23·6	5·4
+10–20	7	22·5	6·5
+0–10	36	21·5	7·5
−10–0	29	20·5	8·5
−20–10	44	19·4	9·6
−30–20	18	18·4	10·6
−40–30	6	17·3	11·7

Source: ISTEA (1926).

least 60% and for 20% it would be at least one third. For the 20% most productive furnaces the increase in profitability would be at least 20%, for the top 10% the increase would be at least 33% while for the most productive six furnaces the profits would rise by almost 50%. It is only possible to speculate on what effect changing the system of wage determination from one based on the productivity of individual plants to one based on the productivity of the industry would have on the vintage structure of the industry's capital equipment and consequently on the average level of productivity. But there seems to be little doubt that a different system of wage determination and the elimination of wide inter-plant wage differences could have induced both a higher rate of scrapping, the replacement of existing with new equipment and an expansion of capacity. This could have increased productivity, average wages and profitability and improved the competitive position of the British iron and steel industry.

The determination of wage inequality

Elbaum (1986), reviewing the evidence analysed above, concluded that the inter-plant dispersion of wages and its effect on the structure of the iron and steel industry resulted from the two-tiered bargaining system 'which combined the leverage of a national union with a highly decentralized structure of bargaining authority, [by which] the Smelters approximated the behaviour of a discriminating monopoly' (p. 70). This strategy was successful, Elbaum went on to argue, because of the union

strike threats against individual firms to resist wage reductions when furnace output increased, and because the employers were unable to combine to form a united front against high earnings because of atomistic competition in the product market. There can be little ground for disagreement about the outcome of collective bargaining and there is no doubt that the British iron and steel producers were under considerable competitive pressure from the latter half of the 19th century onwards. But to suggest that competitive weakness was the *only* reason the firms did not combine in an offensive against labour *outside* the established procedures ignores more important considerations.

In their review of tonnage bonus rates in 1927 the Iron and Steel Employers' Association, while keen to break the link between earnings and increases in output resulting from technical change, clearly recognised the dangers to collective bargaining procedures and incentives of indiscriminate rate cutting. It was argued:

> Unless there is a particular change in practice as understood in the trade within Clause 8 of the Melters' Sliding Scale Agreement, it would be a retrograde step on the part of the Association to seek a revision of any tonnage rate simply due to increased tonnage. By doing so, damage would be done to the change in practice principle and to the trade generally, in as much as psychologically an impression would be created in the minds of the workers that to increase tonnage—apart from change in practice—simply invites employers to seek a revision of rates ISTEA (1927).

These considerations apart, it is not at all clear that employers shared a common interest in reducing tonnage rates. Very high earnings affected only a relatively small proportion of plants and, as they were relatively efficient, it is unlikely that the burden of competition fell as heavily on them as it did on the less productive plants. The latter had little or nothing to gain from attempts to revise tonnage rates at the national levels because their levels of earnings were low and, as we have seen, they depended to a large extent on this status quo to remain in business. Their main concern was survival and, apart from the immediate cost to them of militant action against the union, they had a vested interest in a wage-determining process that confined the earnings they paid within the capacity of their plants to pay. It might also be noted that it would have proved difficult to raise their enthusiasm for a change in Association policy which improved the relative competitiveness of the most efficient producers if the least efficient stood a strong chance of being the main victims. This suggests that within the employers' camp there were parties with quite different interests: one that wanted to reduce tonnage rates, increase profitability and to expand output and a second that was hard put merely to stay in business; our Table 3 suggests that the latter group was numerically superior. It is therefore not surprising that the employers found it difficult to find a mutually acceptable policy on tonnage rates at the industry level.

Elbaum's argument also depends on the implicit assumptions that, while the employers were divided by imperfect product market competition, the Smelters had sufficient power at the national level to co-ordinate a local and national strategy designed to extract the minimum advantage from the inter-plant differences in quasi-rents and, secondly, that it was the common interest of the local branches *and* the national leadership to pursue such a strategy. Neither of these propositions receives

any substantial support from the historical record. In the first place, as we have already seen, the Joint Board system of collective bargaining produced a similar dispersion of earnings in circumstances in which the unions had no direct hand in the operation of the institutions of collective bargaining, and when, by their own admission, the union leadership had insufficient power to enforce Board decisions unilaterally. Secondly, the negotiations of the 1920s revealed the extent to which power in the union was dispersed, and the extent of the differences between the union branches and the union leadership on policy. Progress on the employers' claims against high tonnage earnings was only possible after a national meeting of all melting shop delegates had given the union leaders the authority to negotiate on tonnage rates at the national level and the power to reach a settlement without reference back to the branches. The subsequent negotiations reached an agreement which substantially reduced tonnage rates on the most productive furnaces and increased them on the least efficient (Wilkinson, 1977).[1] Thus the national leadership eventually secured a greater degree of levelling out of earnings in the industry which required a substantial income sacrifice from some of its most powerfully placed members.

This success can be partly explained by differences in interest within the union at branch level. The promotion-by-seniority system narrowed the job opportunities of the individual process workers to their own particular plant. These plants had widely different capacities to pay wages and long-term survival prospects and, hence, ability to offer continuous employment. Within this framework, and from the perspective of the individual union members with whom much of the decision-making power resided, earnings and employment prospects were directly related. The highly productive and most competitively successful plants offered both the best job prospects and the highest earnings while the opposite combination was offered by the more obsolete production facilities. In these circumstances all tonnage-paid workers had a vested interest in the system of wage determination which linked pay to the ability of the plant to pay; but for some this protected earnings and for others it protected jobs.

The second main division within the union was between, on the one hand, the time-rated and low-paid ancillary workers and labourers and, on the other, the tonnage-paid process workers. This arose because the employers refused to increase low pay without concessions on the tonnage rates of the highest-paid workers. But the earnings redistribution required was not only within plants but also between plants because the very high levels of tonnage pay were concentrated at the efficient end of the spectrum of plants (and it is quite possible that the same may have been true of time rates). An agreement requiring an inter-plant reallocation of the industry's wage fund could only be concluded at the industry level and this was achieved within the existing collective bargaining framework by the union leaders repeatedly returning to the branches until they received the necessary authority to proceed to a national settlement. In this process the changing balance of power within the union resulting from the increased numerical strength of the low paid probably played an important part. The outcome was to make base tonnage rates negotiable at the industry level and to increase the relative power of the leaders of the unions in determining

[1] See in particular Table 3 (p. 126) which shows a reduction in melters' earnings of 30% on the most, but an increase of 8% on the least, productive furnace.

the structure of wages. This leads to the question of the interests of the union leaders in this outcome *independently* of the changing balance of power in the union.

From the discussion in the previous section of this paper it follows that an agreement which levelled out earnings between plants would lead to a greater degree of industrial efficiency. A question that can be asked is whether this outcome was completely fortuitous, arising from the necessities of bargaining. To claim more would be highly speculative but there are reasons to believe that the union leadership had a special vested interest in the future of the industry. Because of promotion by seniority, the only rights each union member had in the industry were to the narrow range of jobs in a particular promotion line in a particular plant. This, and local control over negotiation over tonnage rates, freed the union leadership from responsibility for individual members so that, theoretically at least, provided the union retained recognition rights, the leadership would be indifferent to the composition of the membership of its union.[1] From this perspective the future of the union, and especially its leadership, depended exclusively on the success of the industry and was quite independent of the prospects of any individual plants upon which the future of the current members within the industry depended.[2]

Conclusions

This concluding section returns to the question raised in the introduction: does this historical example provide any useful insights, of contemporary relevance, into the relative superiority in economic terms of decentralised as opposed to centralised wage determination and the effects of trade unions on industrial efficiency? The answer to this question turns on the effects on the wage-determining process of the underlying competitive organisation of the product market and power relations in the labour market which form the context for worker organisation and collective bargaining. Therefore, it is necessary to examine the structuring of the product and labour markets before enquiring into the consequences of a greater or lesser degree of trade union influence on wage fixing and the organisation of the internal and external labour market.

In the 19th and early 20th centuries the product market for iron and steel products was highly imperfect. Differentiation of product resulted from the overlapping ownership of makers and users of steel and the close relations between producers and consumers based on product specialisation. Regional concentration by product groups also fostered loose oligopolies but these tended to be destabilised by periodic bouts of fierce price competition and as a result of inter-regional and international dumping. Prices were therefore highly unstable (Tolliday, 1986). In the labour market, employer organisations held the balance of power. In the early 19th century the ironmasters colluded in wage fixing and in resisting and destroying the nascent

[1] This is quite different from the situation in craft unions in which the union card gives potential access to all jobs in that craft area.

[2] One of the important debates in the economics of collective bargaining is about the relative importance of economic and political motives in determining trade union policy (Dunlop, 1950; Ross, 1948; and see Craypo, 1986, for a critical review of this debate). In the British steel industry the economic considerations tended to dominate at the branch levels while political factors had greater weight among the leadership.

organisations of the contractors. Against this superior bargaining power the skilled ironworkers were not completely powerless because they controlled the process skills and work organisation. But without effective trade unions this strength could only be deployed strategically when the product market demand was high; but it was also very vulnerable to adverse economic conditions. Consequently, although the ironmasters could exact wage concessions in recessions, the contractors would fight bitterly for wage advances in the booms. The labour market was also deeply segmented by the control exercised by the contractors over skills, hiring and labour organisation and by the excess supply of labourers.[1] This probably eased the bargaining relations between the contractors and the ironmasters by providing an exploitable underclass to which the contractors could pass on wage reductions.

Effective unionisation helped redress the balance of power in the labour market between the contractors and the ironmasters. Joint wage determination at the regional and later national level largely guaranteed wage flexibility with respect to prices. Tonnage bonus rates also came under joint control limiting the unilateral action by employers. This prevented both the use by employers of their superior bargaining power to cut rates arbitrarily and the easy adjustments of base rates when techniques were changed. Early unionisation and the arbitration and conciliation boards, which were the exclusive preserves of the contractors, had the effect of reinforcing both horizontal and vertical segmentation of the labour market. Unionisation strengthened the hands of the contractors against the underhands, contractor control over the joint boards excluded other groups from bargaining, and the use of seniority rules to control movement between mills with different levels of earnings restricted inter-plant mobility. But growth and extension of trade unions to include the underhands broke the power of the contractors over employment and promotion and removed the horizontal divisions by allowing orderly progression to higher-skilled levels based on seniority within particular plants. This probably narrowed differentials between occupations but supported those between plants by reinforcing vertical segmentation by restricting labour mobility between promotion lines to the lowest grades. Finally, the organisation of labourers and ancillary workers bought into the unions the mass of the lowest-paid workers which eventually led to industry-level bargaining on minimum wages and narrowed differentials between the highest and lowest paid.

In assessing the effects of these developments on productivity and more generally on economic efficiencies it is valuable to distinguish between allocative, operational and dynamic efficiencies. Allocative efficiencies result from the role of wages in measuring the value of labour to the economy as a whole and ensuring that it is equally productive in all its uses. The close linking of wages to prices in that industry meant that real wages were measured in iron and steel prices (rather than the general price level in the economy) and this led to allocative inefficiencies by shielding iron and steel producers from product market discipline. It also fostered destructive price competition by allowing firms to cut prices in the knowledge that wages would fall in line. The wide inter-plant wage differentials which resulted from the

[1] This was reflected in the bye-turn labour system whereby unemployed labourers presented themselves at the works gates and, if lucky, were employed by the contractors to fill temporary vacancies. Regular employment required to acquire skill was also at the discretion of the contractor.

stickiness of tonnage rates and differences in the productivity of capital equipment and managerial capabilities were also allocatively inefficient. Equally capable workers were employed at different wages and these variations in the price of labour supported obsolete technologies and poor management while reducing the rate of return on the latest technology and from good management practice.

Operational efficiency refers to the level of productivity from a given assembly of equipment, labour and other productive factors. Work rules, promotion by seniority for example, can be interpreted as generating operating inefficiencies by restricting the right of managers to promote the most suitable workers. Alternatively, work rules can be seen as contributing to operating efficiency by protecting workers from arbitrary managerial decisions. More generally jointly operated dispute procedures and promotion by seniority and other work rules made a major contribution to operating efficiency by giving workers 'voice' and ensured the orderly settlement of disputes. This no doubt benefited productivity by guaranteeing continuity and predictability of production and by improving the industrial relations environment.

Dynamic efficiencies result from product and process innovation, the adoption of best practice techniques, learning by doing (itself related to the pace of technical change) and economies of scale and scope. Procedures for resolving disputes over new techniques might be seen as inhibiting technical change by raising the cost of investment and reducing the expected rate of return. But on the other hand, joint decision making no doubt reduces resistance to change as does the sharing of the benefits from productivity increases. But there can be little argument that the close linking of wages to plant productivity contributed to dynamic inefficiencies by preserving a long tail of increasingly obsolete plants and by lowering the rate of return to innovation. This also had its human capital counterpart in the preservation of redundant skills, complementary to obsolete technologies, and the training system for their reproduction which resulted in a major waste of labour resources by directing talents and energies into jobs which continued to require levels of technical and other competencies but had lost their economic value.

Product-price-related sliding scales made their own particular contribution to dynamic inefficiencies. With the loss of technical leadership the British industry came increasingly under price pressure from more efficient foreign producers. By feeding through prices determined at the frontiers of technical advance at the world level directly into the labour costs of British producers product-price-related sliding scales lifted one of the economic disciplines which might have induced radical restructuring.

The long tail of obsolete plants not only slowed down the rate of increase in productivity but also made the industrial structure extremely resistant to rationalisation. There was general agreement in the inter-war years that the steel industry would gain in efficiency if it was concentrated in fewer plants. But demand was growing slowly and any firm wishing to reap the economies of rationalisation would have needed to secure a much larger share of the market by dislodging inefficient producers whose continued existence was made more secure by the relatively low wages they paid. Moreover, given the imperfection of the product market, an expanded market share would have required substantial additional selling costs. This combination of barriers to and exit from and entry to the market

had the effect of considerably lowering the rate of return to capacity expansion by individual firms and therefore the inducement to invest in the capital intensive best practice techniques.[1]

There can be little doubt, then, that a system of wage determination which closely reflected an individual firm's ability to pay exposed the British iron and steel industry to widespread allocative and dynamic inefficiencies although these were probably offset to some extent by the operating efficiencies generated by peaceful industrial relations. The next question to be asked is whether the situation would have been substantially different in the absence of effective trade union bargaining power. Care has to be taken in constructing and interpreting such a 'counter-factual', but it does seem clear that changes in union power would have made little or no difference to the relative efficiency of firms as this depends on the level of technology, managerial efficiency and product market strategy. And it would have no effect on the underlying segmentation of the labour market which depends on the nature of skills and training processes, the hiring policies of firms and the level of unemployment and underutilisation of labour in the economy.

However, the balance of power in the labour market would have changed in favour of capital. The effect of this on allocative and dynamic efficiencies depends on whether it would have resulted in a reduction in the variations of wages with respect to product prices and plant productivity. It seems most unlikely that in the absence of trade unions the link between the ability of the industry to pay and the general level of prices would have been loosened. The smooth working of the sliding scales might have been replaced by direct employer action on wages as iron and steel prices fell and this, if anything, would have amplified wage movements and strengthened the link between wages and the ability of the employer to pay. This is turn would have increased allocative inefficiency by shielding iron and steel firms from product market discipline and increased the risk of destructive competition based on wage cutting.

But the more important question is whether the demise of trade union bargaining would have led to a narrowing of wage differentials between plants. There is no easy answer to this. It would depend on the extent to which wages in the most efficient works would have fallen, those in the least efficient plants would have risen or some combination of these two tendencies. The elimination of trade unions would force workers back on their 'natural' bargaining power; based on their control over specific skills moderated by the threat of unemployment. In this respect, the threat of unemployment would hang more heavily over the workers in the inefficient plants while the bargaining advantage of specific skills would be greater in the efficient plants. As the threat of bankruptcy would be greater for the inefficient than the efficient producer, the latter would be less willing to compromise in wage bargaining. It is therefore to be expected that wide inter-plant wage differentials would continue to exist in the absence of trade unions although there is no way of telling whether changes in the relative price of labour in the different plants would be such as to increase or reduce efficiency. However, it is to be expected that the abandoning of the orderly system of industrial relations, which depended on strong trade unions, would have exacted a heavy toll in terms of operating efficiency.

[1] For discussion of the economies of rationalisation in the inter-war years, see Shove (1930).

The roots of the endemic inefficiencies of the British iron and steel industry, therefore, lay in the competitive structuring of industry supported by the power advantages employers had in the labour market which enabled them to adjust labour costs to their individual abilities to pay. Moreover, there are no grounds for believing that trade unions in the iron and steel industry did anything other than improve efficiency. However, this effect could have been considerably greater if the union had been better disposed towards equalising wages across plants so as to impose a greater degree of wage discipline on inefficient producers. But this was ruled out by the sectionalism of the union. A more egalitarian wage policy would have led to the closure of less efficient plants, an increase in the profitability of the most efficient, a consequent increase in the competitiveness of the British industry and a faster rate of growth. But fragmented bargaining structures meant that the unemployment costs of this would have fallen exclusively on the union work groups in the least efficient plants while constraining the earning capabilities of union members in the most productive. In the absence of any way by which the improved performance of the industry could be translated into general benefits for union members, pressure to end sectionalism could not be expected.

But greater obstacles than sectional trade unionism stood in the way of the rationalisation of the British iron and steel industry. The investment boom following the First World War left the firms in the industry heavily indebted to the banks. However, the banks neither attempted industrial restructuring in the interest of reactivating their frozen assets nor foreclosed on their defaulting debtors. The latter were simply kept afloat in the hope that their debts would be repayed. In fact, the Bank of England seemed more concerned to prevent the government from intervening effectively than restructuring the industry (Tolliday, 1986). Moreover, when the iron and steel industry was given protection against competition in 1931, first by the abandonment of the gold standard and then by tariffs, the industry evaded its commitment to the government to rationalise itself. In the interest of its fragmented memberships, the British Iron and Steel Federation negotiated schemes to subsidise materials to even out costs between plants; these, and average cost pricing policies, allowed even the highest cost plants to make profits (Tolliday, 1986; Burn, 1940). Thus the interests of the small-scale, imperfectly competitive firms became firmly embedded in British industrial policy in steel; the industry successfully resisted rationalisation; and allocative and dynamic inefficiencies persisted.

This outcome can be usefully contrasted with what happened in Sweden in the 1920s and 1930s where the banking system was committed to industrial rationalisation to protect its assets and the government had an effective industrial policy. At the same time the union movement was strong, militant and committed to a policy of high and equal wages. And, although organised labour supported technical progress, exploitative forms of work organisation were stoutly resisted. By these means the trade unions prevented the Swedish industry from passing on the cost of restructuring to its workforce and by doing so made a major contribution to the process of modernisation. As a result, unlike Britain, the iron and steel industry in Sweden played a leading role in that county's competitive revival of the 1930s (Wright, 1991).

Perhaps the metaphor of the rolling mill itself is appropriate in this discussion of the role of trade unions in generating efficiency. In Sweden the hard upper roll of

financial restructuring and government industrial policy and the hard lower roll of egalitarian labour standards pursued by strong trade unions forcibly pressed the Swedish steel industry into efficient shape. By contrast in the British case the upper and lower rolls were softened by vested interests inherent in the industry's structure and as a result the industry passed through with its inefficiencies intact.

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