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WHAT DO BOSSSES DO?
The Origins and Functions of Hierarchy
in Capitalist Production*

I. Introduction: Does Technology Shape Social and Economic Organization or Does Social and Economic Organization Shape Technology?

Is it possible for work to contribute positively to individual development in a complex industrial society, or is alienating work the price that must be paid for material prosperity? Discussions of the possibilities for meaningful revolution generally come down, sooner or later, to this question. If hierarchical authority is essential to high productivity, then self-expression in work must at best be a luxury reserved for the very few regardless of social and economic organization. And even the satisfactions of society's elite must be perverted by their dependence, with rare exception, on the denial of self-expression to others. But is work organization determined by technology or by society? Is hierarchical authority really necessary to high levels of production, or is material prosperity compatible with nonhierarchical organization of production?

Defenders of the capitalist faith are quite sure that hierarchy is inescapable. Indeed their ultimate line of defense is that the plurality of capitalist hierarchies is preferable to a single socialist hierarchy. To seal the argument the apologist may call on as unlikely a source of support as Friedrich Engels. Perhaps it was a momentary aberration, but at one point in his career at least Engels saw authority as technologically rather than socially determined:

If man, by dint of his knowledge and inventive genius, has subdued the forces of nature, the latter avenge themselves

*The research on which this paper reports is still in progress. It is published in its present form to stimulate discussion and comment. This paper represents my initial and in parts preliminary thinking on this subject, and no attempt has been made to reflect the many helpful criticisms and suggestions I have received. Copyright by Stephen Marglin, 1974.

upon him by subjecting him, in so far as he employs them, to a veritable despotism, independent of all social organization. Wanting to abolish authority in large-scale industry is tantamount to wanting to abolish industry itself, to destroy the power loom in order to return to the spinning wheel.¹

Going back to the spinning wheel is obviously absurd, and if the producer must typically take orders, it is difficult to see how work could in the main be anything but alienating.

Were the social sciences experimental, the methodology for deciding whether or not hierarchical work organization is inseparable from high material productivity would be obvious. One would design technologies appropriate to an egalitarian work organization, and test the designs in actual operation. Experience would tell whether or not egalitarian work organization is utopian. But social science is not experimental. None of us has the requisite knowledge of steel-making or cloth-making to design a new technology, much less to design one so radically different from the present norm as a serious attempt to change work organization would dictate. Besides in a society whose basic institutions--from schools to factories--are geared to hierarchy, the attempt to change one small component is probably doomed to failure. For all its shortcomings, neoclassical economics is undoubtedly right in emphasising general equilibrium over partial equilibrium.

Instead of seeking alternative designs, we must take a more round-about tack. In this paper it is asked why, in the course of capitalist development, the actual producer lost control of production. What circumstances gave rise to the boss-worker pyramid that characterizes capitalist production? And what social function does the capitalist hierarchy serve? If it turns out that the origin and function of capitalist hierarchy has relatively little to do with efficiency, then it becomes at least an open question whether or not hierarchical production is essential to a high material standard of living. And workers--manual, technical, and intellectual--may take the possibility of egalitarian work organization sufficiently seriously to examine their environment with a view to changing the economic, social, and political institutions that relegate all but a fortunate few to an existence in which work is the means to life, not part of life itself.

¹F. Engels, "On Authority," first published in Almenacco Repubblicano, 1894; English translation in Marx and Engels, Basic Writings in Politics and Philosophy, L. Feuer (ed.), Doubleday and Co., Garden City, New York, 1959, p. 483. Emphasis added.

It is the contention of this paper that neither of the two decisive steps in depriving the workers of control of product and process-- (1) the development of the minute division of labor that characterized the putting-out system and (2) the development of the centralized organization that characterizes the factory system--took place primarily for reasons of technical superiority. Rather than providing more output for the same inputs, these innovations in work organization were introduced so that the capitalist got himself a larger share of the pie at the expense of the worker, and it is only the subsequent growth in the size of the pie that has obscured the class interest which was at the root of these innovations. The social function of hierarchical work organization is not technical efficiency, but accumulation. By mediating between producer and consumer, the capitalist organization sets aside much more for expanding and improving plant and equipment than individuals would if they could control the pace of capital accumulation. These ideas, which are developed in the body of this paper, can be conveniently divided into four specific propositions.

I. The capitalist division of labor, typified by Adam Smith's famous example of pin manufacture, was the result of a search not for a technologically superior organization of work, but for an organization which guaranteed to the entrepreneur an essential role in the production process, as integrator of the separate efforts of his workers into a marketable product.

II. Likewise, the origin and success of the factory lay not in technological superiority, but in the substitution of the capitalist's for the worker's control of the work process and the quantity of output, in the change in the workman's choice from one of how much to work and produce, based on his relative preferences for leisure and goods, to one of whether or not to work at all, which of course is hardly much of a choice.

III. The social function of hierarchical control of production is to provide for the accumulation of capital. The individual, by and large and on the average, does not save by a conscious and deliberate choice. The pressures to spend are simply too great. Such individual (household) savings as do occur are the consequence of a lag in adjusting spending to a rise in income, for spending, like any other activity, must be learned, and learning takes time. Thus individual savings is the consequence of growth, and not an independent cause. Acquisitive societies--precapitalist, capitalist or socialist--develop institutions whereby collectivities determine the rate of accumulation. In modern capitalist society the pre-eminent collectivity for accumulation is the corporation. It is an essential social function of the corporation that its hierarchy mediate between the individual producer (and shareholder) and the market proceeds of the corporation's product, assigning a portion of these proceeds to enlarging the means of production. In the absence of hierarchical control of production, society would either

have to fashion egalitarian institutions for accumulating capital or content itself with the level of capital already accumulated.

IV. The emphasis on accumulation accounts in large part for the failure of Soviet-style socialism to "overtake and surpass" the capitalist world in developing egalitarian forms of work organization. In according first priority to the accumulation of capital, the Soviet Union repeated the history of capitalism, at least as regards the relationship of men and women to their work. Theirs has not been the failure described by Santayana of those who, not knowing history, unwittingly repeat it. The Soviets consciously and deliberately embraced the capitalist mode of production. And defenders of the Soviet path to economic development would offer no apology: after all, they would probably argue, egalitarian institutions and an egalitarian (and community oriented) man could not have been created over night, and the Soviet Union rightly felt itself too poor to contemplate an indefinite end to accumulation. Now, alas, the Soviets have the "catch-up-with-and-surpass-the-U.S.A." tiger by the tail, for it would probably take as much of a revolution to transform work organization in that society as in ours.

The following sections of this paper take these propositions one by one, in the hope of filling in sufficient detail to give them credibility.

II. Divide and Conquer

Hierarchy was of course not invented by capitalists. More to the point, neither was hierarchical production. In precapitalist societies, industrial production was organized according to a rigid master-journeyman-apprentice hierarchy, which survives today in anything like its pure form only in the graduate departments of our universities. What distinguished precapitalist from capitalist hierarchy was first that the man at the top was, like the man at the bottom, a producer. The master worked along with his apprentice rather than simply telling him what to do. Second, the hierarchy was linear rather than pyramidal. The apprentice would one day become a journeyman and likely a master. Under capitalism it is a rare worker who becomes even a foreman, not to mention independent entrepreneur or corporate president. Third, and perhaps most important, the guild workman had no intermediary between himself and the market. He generally sold a product, not his labor, and therefore controlled both product and work process.

Just as hierarchy did not originate with capitalism, neither did the division of labor. The social division of labor, the specialization of occupation and function, is a characteristic of all complex societies, rather than a peculiar feature of industrialized or economically advanced ones. Nothing, after all, could be more elaborate than

the caste division of labor and its accompanying hierarchy in traditional Hindu society. Nor is the technical division of labor peculiar to capitalism or modern industry. Cloth production, for example, even under the guild system was divided into separate tasks, each controlled by specialists. But, as we have said, the guild workman controlled product and process. What we have to account for is why the guild division of labor evolved into the capitalist division of labor, in which the workman's task typically became so specialized and minute that he had no product to sell, or at least none for which there was a wide market, and had therefore to make use of the capitalist as intermediary to integrate his labor with the labor of others and transform the whole into a marketable product.

Adam Smith argues that the capitalist division of labor came about because of its technological superiority; in his view, the superiority of dividing work into ever more minutely specialized tasks was limited only by the size of the market.² To understand the limitations of this explanation requires clarity and precision on the meaning of "technological superiority," and the related ideas of technological efficiency and inefficiency; indeed, these ideas are central to the whole story told in this paper. We shall say, in accordance with accepted usage, that a method of production is technologically superior to another if it produces more output with the same inputs. It is not enough that a new method of production yield more output per day to be technologically superior. Even if labor is the only input, a new method of production might require more hours of labor, or more intensive effort, or more unpleasant working conditions, in which case it would be providing more output for more input, not for the same amount. It will be argued here that--contrary to neoclassical logic--a new method of production does not have to be technologically superior to be adopted; innovation depends as much on economic and social institutions--on who is in control of production and under what constraints control is exercised.

The terms "technological efficiency" and "technological inefficiency," as used by economists, have meanings that are slightly at variance with the ordinary, every-day ideas of better and worse that

²The attribution of the division of labor to efficiency antedates Adam Smith by a least two millenia. Plato, indeed, argued for the political institutions of the Republic on the basis of an analogy with the virtue of specialization in the economic sphere. Smith's specific arguments were anticipated by Henry Martyn three quarters of a century before the publication of the Wealth of Nations. See Considerations Upon the East-India Trade (London, 1701).

they evoke. A method of production is technologically efficient if no technologically superior alternative exists. It is inefficient if a superior alternative does exist. Thus more than one method of production may be--and generally is--technologically efficient if one looks only at a single product. Wheat, for example, can be efficiently produced with a lot of land and relatively little fertilizer, as in Kansas, or with a lot of fertilizer and relatively little land, as in Holland.

But if one views technological superiority and efficiency from the point of view of the whole economy, these concepts reduce, under certain circumstances, to economic superiority and efficiency. Under text-book assumptions of perfect and universal competition, the technologically efficient method of production is the one that costs least, and cost reduction is an index of technological superiority.³ The relationship between minimum cost and technological efficiency is a purely logical one and does not depend at all on whether or not the world exhibits the assumptions of the model. On the other hand, the relevance of the identification of technological with economic efficiency depends absolutely on the applicability of the assumptions of the competitive model to the development of capitalism. In critical respects the development of capitalism necessarily required denial, not fulfillment, of the assumptions of perfect competition.

In a way it is surprising that the development of capitalist methods of work organization contradicts essential assumptions of perfect competition, since perfect competition has virtually nothing to say about the organization of production! Indeed, even the firm itself, a central economic institution under capitalism, plays no essential role in models of the competitive economy;⁴ it is merely a convenient abstraction for the household in its role as producer and does nothing that households could not equally well do for themselves. Defenders of the faith from Wicksell to Samuelson have grandly proclaimed the perfect neutrality of perfect competition--

³For a concise and elegant discussion of the relationship between technological efficiency and least-cost methods of production, see Tjalling Koopmans, Three Essays on the State of Economic Science, McGraw-Hill, New York, 1957, essay 1, especially pp. 66-126.

⁴At least in the constant-returns-to-scale version of the competitive economy. Any other version implies the existence of a factor of production (like 'entrepreneurial effort') that is not traded on the market, and with respect to which the model is therefore non-competitive.

as far as the model goes, workers could as well hire capital as capitalist workers!⁵ Alas, the failure of the competitive model to account for one of the most distinctive features of capitalism (and of socialism imitating capitalism)--the pyramidal work order--is for neoclassical economists a great virtue rather than a shortcoming; it is supposed to show the great generality of the theory. Generality indeed: neoclassical theory says only that hierarchy must be technologically efficient to persist, but denies the superiority of capitalist hierarchy (workers can just as well hire capital, remember!). This is to say very little, and that little, it will be argued, quite wrong.

To return to Adam Smith. The Wealth of Nations advances three arguments for the technological superiority of dividing labor as finely as the market will allow.

(This) great increase of the quantity of work, which, in consequence of the division of labor, the same number of people are capable of performing, is owing to three different circumstances; first, to the increase of dexterity in every particular workman; secondly, to the saving of the time which is commonly lost in passing from one species of work to another; and lastly, to the invention of a great number of machines which facilitate labor and abridge labor, and enable one man to do the work of many.⁶

Of the three arguments, one--the saving of time--is undoubtedly important. But this argument has little or nothing to do with the minute specialization that characterizes the capitalist division of labor. A peasant, for example, will generally plow a whole field before harrowing it rather than alternating plow and harrow, furrow by furrow--

⁵"We may, therefore, assume either that the landowner will hire laborers for a wage...or that the laborers will hire the land for rent." Knut Wicksell, Lectures on Political Economy (translated by E. Classen), Routledge & Kegan Paul, London, 1934, Volume I, p. 109.

"Remember that in a perfectly competitive market it really doesn't matter who hires whom; so have labor hire 'capital' "..., Paul Samuelson, "Wage and Interest: A Modern Dissection of Marxian Economic Models," American Economic Review, December, 1957.

⁶A. Smith, The Wealth of Nations (Cannan edition), Random House, New York, 1937, p. 7.

in order to economize on the set-up time. But peasant agriculture is the antithesis of capitalist specialization; the individual peasant normally undertakes all the activities necessary to bring a crop from seed to marketable product. In respect of set-up time, there is nothing to differentiate agriculture from industry. To save "the time that is commonly lost in passing from one species of work to another" it is necessary only to continue in a single activity long enough that the set-up time becomes an insignificant proportion of total work time. The saving of time would require at most only that each worker continue in a single activity for days at a time, not for a whole life time. Saving of time implies separation of tasks and duration of activity, not specialization.

Smith's third argument--the propensity to invention--is not terribly persuasive. Indeed, the most devastating criticism was voiced by Smith himself in a later chapter of The Wealth of Nations:

In the progress of the division of labor, the employment of the far greater part of those who have by labor, that is, of the great body of the people, come to be confined to a few very simple operations, frequently to one or two. But the understandings of the greater part of men are formed by their ordinary employments. The man whose life is spent in performing a few simple operations, of which the effects too are, perhaps, always the same, or very nearly the same, has no occasion to exert his understanding, or to exercise his invention in finding out expedients for difficulties which never occur. He naturally loses, therefore, the habit of such exertion and generally becomes as stupid and ignorant as it is possible for a human creature to become...

It is otherwise in the barbarous societies, as they are commonly called, of hunters, of shepherds, and even of husbandman in that crude state of husbandry which precedes the improvement of manufactures. In such societies the varied occupations of every man oblige every man to exert his capacity, and to invent expedients for removing difficulties which are continually occurring. Invention is kept alive, and the mind is not suffered to fall into that drowsy stupidity, which, in a civilized society, seems to benumb the understanding of almost all the inferior ranks of people.⁷

The choice does not, however, seem really to lie between stupidity and barbarity, but between the workman whose span of control is wide enough that he sees how each operation fits into the whole and the workman confined to a small number of repetitive tasks. It would be surprising indeed if the workman's propensity to invent has not been diminished

⁷Smith, op. cit., pp. 734-35.

by the extreme specialization that characterizes the capitalist division of labor.

This leaves "the increase of dexterity in every particular workman" as the basis of carrying specialization to the limits permitted by the size of the market. Now if Adam Smith were talking about musicians or dancers or surgeons, or even if he were speaking of the division of labor between pin-making and cloth-making, his argument would be difficult to counter. But he is speaking not of esoteric specializations, nor of the social division of labor, but of the minute division of ordinary, run-of-the-mill, industrial activities into separate skills. Take his favorite example of pin manufacture:

...in the way in which this business is now carried on, not only the whole work is a peculiar trade, but it is divided into a number of branches, of which the greater part are likewise peculiar trades. One man draws out the wire, another straightens it, a third cuts it, a fourth points it, a fifth grinds it at the top for receiving the head; to make the head requires two or three distinct operations; to put it on, is a peculiar business, to whiten the pins is another; it is even a trade by itself to put them into the paper; and the important business of making a pin is, in this manner, divided into about eighteen distinct operations, which in some manufactories, are all performed by distinct hands, though in others the same man will sometimes perform two or three of them. I have seen a small manufactory of this kind where ten men only were employed, and where some of them consequently performed two or three distinct operations. But though they were very poor, and therefore but indifferently accommodated with the necessary equipment, they could, when they exerted themselves, make among them about twelve pounds of pins in a day. There are in a pound upwards of four thousand pins of a middling size. Those ten persons, therefore could make among them upwards of forty-eight thousand pins in a day. Each person, therefore, making a tenth part of forty-eight thousand pins, might be considered as making four thousand eight hundred pins in a day. But if they had all wrought separately and independently, and without any of them having been educated to this peculiar business, they certainly could not each of them have made twenty, perhaps not one pin in a day...⁸

To the extent that the skills at issue are difficult to acquire, specialization is essential to the division of production into separate operations. But, judging from the earnings of the various specialists

⁸Smith, op. cit., pp. 4-5

engaged in pin-making, these were no special skills. At least there were none that commanded premium wages. In a pin manufactory for which fairly detailed records survive from the early part of the nineteenth century, T. S. Ashton reported wages for adult males of approximately 20 shillings per week, irrespective of the particular branch in which they were engaged.⁹ Women and children, as was customary, earned less, but again there appear to be no great discrepancies among the various branches of pin production. It would appear to be the case that the mysteries of pin-making were relatively quickly learned, and that the potential increase in dexterity afforded by minute division of tasks was quickly exhausted. Certainly it is hard to make a case for specialization of workmen to particular tasks on the basis of the pin industry.¹⁰

⁹T.S. Ashton, "The Records of a Pin Manufactory - 1814-21", Economica, November, 1925, pp. 281-292.

¹⁰For another example, cotton handloom weaving, though described by J. L. and Barbara Hammond in a volume entitled The Skilled Laborer (Longmans Green, London, 1919), was apparently a skill quickly learned (p. 70). A British manufacturer testified before a parliamentary committee that "a lad of fourteen may acquire a sufficient knowledge of it in six weeks." Duncan Bythell's The Handloom Weavers, (Cambridge University Press, Cambridge, England, 1969), which is my immediate source for the manufacturer's testimony, is quite explicit: "Cotton handloom weaving, from its earliest days, was an unskilled, casual occupation which provided a domestic by-trade for thousands of women and children..." (p. 270)

The apparent ease with which, according to the Hammonds, women replaced male woolen weavers gone off to fight Napoleon suggests that woolen weaving too was not such a difficult skill to acquire (op. cit., pp. 60-162). Indeed the competition of women in some branches of the woolen trade was such that in at least one place the men felt obliged to bind themselves collectively "not to allow any women to learn the trade" (ibid., p. 162), an action that would hardly have been necessary if the requisite strength or skill had been beyond the power of women to acquire. The role of war-induced labor shortages in breaking down artificial sex barriers, and the subsequent difficulties in re-establishing these barriers in reminiscent of American experience in World War II.

The dichotomy between specialization and the separate crafting of each individual pin seems to be a false one. It appears to have been technologically possible to obtain the economics of reducing set-up time without specialization. A workman, with his wife and children, could have proceeded from task to task, first drawing out enough wire for hundreds or thousands of pins, then straightening it, then cutting it, and so on with each successive operation, thus realizing the advantages of dividing the overall production process into separate tasks.

Why, then, did the division of labor under the putting-out system entail specialization as well as separation of tasks? In my view the reason lies in the fact that without specialization, the capitalist had no essential role to play in the production process. If each producer could himself integrate the component tasks of pin manufacture into a marketable product, he would soon discover that he had no need to deal with the market for pins through the intermediation of the putter-outer. He could sell directly and appropriate to himself the profit that the capitalist derived from mediating between the producer and the market. Separating the tasks assigned to each workman was the sole means by which the capitalist could, in the days preceding costly machinery, ensure that he would remain essential to the production process as integrator of these separate operations into a product for which a wide market existed; and specialization of men to tasks at the sub-product level was the hall mark of the putting-out system.

The capitalist division of labor, as developed under the putting-out system, embodied the same principle that "successful" imperial powers have utilized to rule their colonies: divide and conquer. Exploiting differences between Hindu and Muslim in India--if not actually creating them--the British could claim to be essential to the stability of the sub-continent. And they could, sometimes with ill-concealed satisfaction, point to the millions of deaths that followed Partition as proof of their necessity to stability. But this tragedy proved only that the British had made themselves essential as mediators, not that there was any inherent need for British mediation of communal differences.

Similarly, the development of an industrial system dependent on capitalist integration does not prove that the capitalist division of labor was technologically superior to integration by the producer himself. The putter-outer's peculiar contribution to production was handsomely rewarded not because of any genuine scarcity of the ability to integrate separate functions; rather the scarcity was artificially created to preserve the capitalist's role.

How could the capitalist withstand competition if his role was an artificial one? What prevented each producer from integrating his own work, and thereby coming directly into contact with a wide market?

The capitalist putter-outer, who, by hypothesis, was technologically superfluous, would have been eliminated by such competition; for integrated producers would have produced pins and cloth and pottery more cheaply. Why didn't some enterprising and talented fellow organize producers to eliminate the capitalist putter-outer? The answer is that there was no profit in such a line of endeavor. If the organizer became a producer himself, he would have had to settle for a producer's wage. His co-workers might have subscribed a dinner or gold watch in his honor, but it is doubtful that their gratitude would have led them to do much more. To glean rewards from organizing, one had to become a capitalist putter-outer! The point is that no collusion was necessary between the men of talent, enterprise, and means that formed the capitalist class of putting-out days. It was in the interest of each as well as in the interest of all to maintain the system of allocating separate tasks to separate workmen. Not much wit was required to see that their prosperity, as well as their survival as mediators, depended on this system.¹¹

The advantages to the mediator of standing between the producer and a wide market were apparently obvious for some time before capitalist manufacture succeeded guild manufacture. George Unwin's studies of sixteenth and seventeenth century industry suggested to him that "the various crafts were, in fact, engaged in a constant struggle as to which of them should secure the economic advantage of standing between the rest and the market."¹² And Unwin notes--but unfortunately does not elaborate the point--that "by this interlacing of the interests of dealer and craftsman the way was gradually prepared for a new form of organization, embracing both classes, which naturally sought to extend its authority as widely over the manufacture as possible."¹³

¹¹This is not to say that the putter-outer, or "master manufacturer" never contributed anything of technological importance to the production process. But where the capitalist did contribute a useful technological innovation, he could effectively appropriate to himself the gains (of what in economic terms is a "public good") by preventing others, particularly his workers, from learning and imitating his trade secrets. What better way to achieve secrecy than to insist that each worker know only a part of the whole? The patent system was notoriously ineffective, and the benefactions of a grateful nation all too haphazard to rely upon, especially for the marginal improvements that are the most all but a handful of innovators could possibly achieve.

¹²George Unwin, Industrial Organization in the Sixteenth and Seventeenth Centuries, first published by the Clarendon Press, Oxford, England, 1904 and republished by Cass, London, 1957, p. 96.

¹³Ibid., p. 96.

Hard evidence that "divide and conquer" rather than efficiency was at the root of the capitalist division of labor is, naturally enough, not easy to come by. One cannot really expect the capitalist, or anybody else with an interest in preserving hierarchy and authority, to proclaim publicly that production was organized to exploit the worker. And the worker who was sufficiently acute to appreciate this could, in the relatively mobile societies in which the industrial revolution first took root, join the ranks of the exploiters.

Nevertheless, an occasional glimmer of recognition does exist. One, although from a slightly later epoch, supports the divide-and-conquer view of specialization better than any forgery could. Henry Ashworth, Jr., managing partner of one of the Ashworth cotton enterprises, noted approvingly in his diary that a competitor did not allow any of his employees, not even his manager, to mix cotton, adding

...his manager Henry Hargreaves knows nothing about the mixing or costs of cotton so that he can never take his business away from him--all his Overlookers business are quite separate from each other and then no one knows what is going on but himself.¹⁴

This story has a recent parallel. I know a man who was for a time a sandal maker. To learn the trade, he went to work for a 'master' sandal maker. This worthy systematically taught him all there was to know about making sandals--except how to buy the leather. My friend could have learned this vital aspect of the trade on his own by the familiar and time-honored method of trial and error--if he had had \$1000 or so to set aside for the mistakes inherent in the learning process. Lacking the capital, his boss's unwillingness to share one particular skill effectively obliged him to remain a worker as long as he remained in the trade.

One other nineteenth century comment suggests that those closer to the beginnings of industrial capitalism than ourselves were not blind to the role of division of labor in supporting a hierarchical society. The Spectator approved of cooperation between master and men, so long as it did not threaten capitalism. Indeed, as long as cooperation was limited to profit-sharing and the like, it might strengthen capitalism for profit sharing in no way meant an end to hierarchy. By contrast, workers' cooperatives were perceived as a distinct threat, one The Spectator thought it necessary to exorcise before extolling the virtues of profit sharing:

¹⁴ Quoted in Rhodes Boyson, The Ashworth Cotton Enterprise, Oxford University Press, Oxford, England, 1970, p. 52.

Hitherto that principle (of cooperation) has been applied in England only by associations of workmen, but the Rochdale experiments, important and successful as they were, were on one or two points incomplete. They showed that associations of workmen could manage shops, mills, and all forms of industry with success, and they immensely improved the condition of the men, but then they did not leave a clear place for the masters. That was a defect, for three reasons. (Emphasis added)¹⁵

It is of some interest to examine these reasons:

Firstly, money in England is held in great masses in individual hands; secondly, there exists among us a vast mass of administrative or, as we call it, business ability, which is of the highest value in directing associated labor wisely, which can and does add infinitely to the value of that labor, and which is not willing to devote itself to labor in absolute or equal partnerships. It does not pay, say Mr. Brassey, to be anything but head. And lastly, cooperation among workmen is not so consonant to the national genius as cooperation between masters and men--limited monarchy having got into our bones--and a system which harmonizes with the national genius is accepted quickly, while one which does not, even if it is superior in itself advances slowly indeed.¹⁶

The first--that "money...is held in great masses...in individual hands"--is a reason for hierarchical organization only if one considers the wealth distribution inviolable. Indeed, the argument is usually put the other way around: that the superiority of hierarchical production requires great wealth inequalities! The second reason--that "administrative...ability...can and does add infinitely to the value of...labor" but "is not willing to devote itself to labor in absolute or equal partnership"--is contradicted by the very successes claimed for the Rochdale experiments. The third--"the natural genius" for "limited monarchy"--is the last refuge of scoundrels; if one took it seriously, one could never challenge the status-quo.

¹⁵The Spectator, London, May 26, 1866, p. 569.

¹⁶Ibid., p. 569.

Although the direct evidence for the divide-and-conquer view of the capitalist division of labor is not overwhelming, it is at least as impressive as the direct evidence for the efficiency view. And there is some indirect evidence too. If the specialization of workmen to tasks took place to ensure capitalist control, then where capitalist control was for other reasons beyond challenge, there is no basis, according to the divide-and-conquer hypothesis, to expect a minute specialization. And so it turns out, at least in the one case of which I have knowledge. The British coal industry offers an example of an industry in which the capitalist division of labor never took hold. Under hand-got methods, as primitive in technique as the putting-out system of manufacture, but surviving into the twentieth century, "responsibility for the complete coal-getting task rests squarely on the shoulders of a single small, face-to-face group which experiences the entire cycle of operations within the compass of its membership."¹⁷ This group contracted directly with the colliery management and "though the contract may have been in the name of the hewer, it was regarded as a joint undertaking. Leadership and 'supervision' were internal to the group, which had a quality of responsible autonomy."¹⁸ Furthermore, "each collier (was) an all-around workman, usually able to substitute for his mate...He had craft pride and artisan independence. These qualities obviated status difficulties and contributed to responsible autonomy."¹⁹ Presumably the mine owner felt no need to specialize men to tasks; the scarcity of coal seams and the institution of private property ensured that workers would not dispense with bosses.

But this is only the beginning of the story. Its most interesting chapter perhaps is the subsequent development of work organization under mechanized--longwall--conditions. As Trist and Bamforth tell the story, "need arose (with mechanization) for a unit more of the size and differentiated complexity of a small factory department."²⁰ On what model? "At the time the longwall method developed, there were no precedents for the adaptive underground application of machine technology.

¹⁷E. L. Trist and K. W. Bamforth, "Some Social and Psychological Consequences of the Longwall Method of Coal-Getting," Human Relations, Vol. IV, No. 1, 1951, p. 6.

¹⁸Ibid., p. 6.

¹⁹Trist and Bamforth, op. cit., p. 6.

²⁰Ibid., p. 9.

In the absence of relevant experience in the mining tradition itself, it was almost inevitable that heavy culture-borrowing (of specialization of men to tasks) should have taken place.²¹

The basic idea of the longwall system was the division of labor by shifts, each shift being responsible for a subset of the operations that move the coal from pit to ground.

The work is broken down into a standard series of component operations that follow each other in rigid succession over three shifts of seven and a half hours each, so that a total coal-getting cycle may be completed once in each twenty-four hours of the working week. The shift spread of the 40 workmen needed on an average face is: 10 each to the first ("cutting") and second ("ripping") shifts; 20 to the third ("filling") shift.²²

Mechanized methods did not, however, yield the fruits they seemed to promise. The problem lay in the supervision of groups of specialists each responsible for only one of the operations that constitute the whole.²³ And the solution lay in reconstituting work groups so that each shift was "responsible for task continuity rather than a specific set of tasks...with responsibility for coordination and control being primarily in the hands of the cycle group."²⁴ The distinctive features of the new system, called the "composite longwall system" were fourfold:

The Work Method

In accordance with the tradition of composite working which originated in the (hand got) system, the oncoming men on a shift were to take up the work of the cycle from the point at which it had been left by the previous shift group and continue with whatever tasks had next to be done. When the main task of a shift was completed the men were to redeploy to carry on with the next tasks whether they formed a part of the current cycle or commenced a new one.

²¹ Ibid., p. 23-24.

²² Ibid., p. 11

²³ As we shall see, supervision was a problem endemic to the specialization of men to tasks under the putting-out system. The factory system was a solution to this problem, one, it will be argued, that reflected capitalists' interests rather than a supposed technological superiority.

²⁴ Harvard Business School Case Study, "British Coal Industries (C)", prepared by Gene W. Dalton under the direction of Paul R. Lawrence, and based on E.L. Trist and H. Murray, "Work Organization at the Coal Face," No. 506, Tavistock Institute, London, England.

The Workmen

In order for this task continuity to be practiced, it was necessary for the cycle group to include men who were at least competent under supervision, if not always formally qualified, to undertake the necessary tasks as they arose. It was not essential that all members of the composite team be completely multi-skilled, but only that as a team they should have sufficient skill resources available on each shift to man the roles likely to arise.

The Work Groups

The team manning the composite longwall was to be a self-selected group. The cycle group was to accept responsibility for allocating its members to the various jobs that management specified to be filled. In order to regulate the deployment, the team was to develop and operate some system for the rotation of tasks and shifts among team members.

Method of Payment

As in (hand got) systems, there was to be a common pay-note in which all members of the team were to share equally, since all members were regarded as making an equivalent contribution to the completion of the cycle.²⁵

The British coal industry is one of the few places where direct comparisons of alternative methods of organizing work have been attempted. The tests are not absolutely conclusive, because the alternatives cannot be applied repeatedly to one and the same coal face. Nonetheless, the results are striking: the composite longwall method was found to produce 20 per cent more coal than the conventional longwall method.²⁶

Equally interesting for present purposes is the effect of reorganization on management:

The effects of self-regulation by the cycle group on the management of the seam of which the composite longwall was a part...was that the seam management structure was

²⁵Harvard Business School Case Study, "British Coal Industries (B)," prepared by Gene W. Dalton under the direction of Paul R. Lawrence, and based on E. L. Trist and H. Murray, "Work Organization at the Coal Face," Doc. No. 506, Tavistock Institute, London, England.

²⁶"British Coal Industries (C)," op. cit.

eventually simplified. One overman was withdrawn; it was found that there was no job for him.²⁷ (Emphasis added.)

It is not hard to imagine the difficulties reorganization would have encountered had it been in the hands of the redundant overman to decide its fate.

Essential to the willingness of the overman's superiors to allow the reintroduction into the mines of self-integrating, non-specialized, non-hierarchical work groups was the coupling of the physical scarcity of coal seams with the institution of property.²⁸ Had the miners been able to set up shop for themselves, management well might have found it necessary to rely, as did the capitalist putter-outer, on specialization of men to tasks as a means of keeping the worker in his "rightful" place--and thereby the boss in his.

The coal mine is to some extent typical of the stage in the development of industrial capitalism that followed the putting-out system, but it is, I think, wrong to ascribe primary importance to the growth in fixed capital, to the high cost of the means of production, in explaining the proletarianization of the work force. Property in machinery, like property in coal seams, was perhaps in mid-nineteenth century England as effective as specialization in insuring a role for the capitalist. Machinery was too costly for the individual workman, and the group was, for all intents and purposes, nonexistent. But before that time, machinery was not prohibitively expensive, and since then the union has become a force that might have offset the high cost of machinery--for the group if not for the individual. For some time preservation of the boss-worker hierarchy has required tacit acceptance by unions; present-day unions lack the will for change, not the strength. This is not to say that it is mere accident that unions have for the most part chosen to ignore hierarchy and its effects, and have concentrated instead on "bread-and-butter" issues. These have been the easiest to accommodate within the framework of a growing economy and agreement to limit conflict to these issues has been instrumental in muting the conflict between capitalists and workers. But the price of accommodation has

²⁸Nationalization did not change the concept of property; it merely transformed title of the mines to the state.

been steep; unions have become another cog in the hierarchy, not the workers' defense against it.²⁹ It is not, however, simply a matter of reorienting priorities within the traditional framework of union leadership. Once unions were to become interested in the relationship of men to their work, they would find themselves in conflict with the very principles of capitalist organization, not merely in conflict over the division, at the margin, of the capitalist pie. No longer could labor's spokesmen be pillars of the established order.

When the absolute scarcity of natural resources limits production to a few sites, the institution of property has itself sufficed to maintain the workers in a subordinate position. Thus it is that in an extractive industry like coal mining, specialization has proved necessary under neither a hand nor a machine technology. In manufacturing industry, where non-labor factors of production are themselves for the most part produced and, therefore, in principle accessible to groups of workers regardless of cost, specialization has continued to sustain the illusion that hierarchy is necessary for integrating the efforts of many into a marketable product.

²⁹Paul Jacobs' is a voice crying out in the wilderness:

If unions are going to survive and grow in the coming period, they have to break with their old patterns. First of all, they have to break with their pattern of not thinking about work, the nature of work, their relationship to work, and what they can do about work. What do we do about work now? Well, we say we're going to fix the wages, we're going to try to establish what we think ought to be minimal working conditions, we're going to slow down the line, we're going to argue about the speed of the line. But do we ever say: Hey, the whole concept of production of an automobile on a line stinks; the whole thing is wrong; what we ought to be doing is figuring out new ways of looking at the problem of work? No, these are questions from which every union withdraws.

I heard the vice-president of Kaiser explain their new agreement with the Steelworkers Union, and he was asked what the union would have to say about the nature of work processes in the plant. "Nothing," he said. "My goodness, the Steelworkers Union wouldn't ever dream of venturing into this area..."

(Center for the Study of Democratic Institutions, Labor Looks at Labor, Fund for the Republic, Santa Barbara, California, 1963, pp. 14-15).

But we get ahead of the story. At the present point in the argument, chronology suffices to refute the explanation of proletarianization of the producers by the high cost of machinery: the transformation of the independent producer to a wage laborer took place before machinery became expensive. It was a direct consequence of the specialization of men to component tasks that characterized the putting-out system. To be sure, capital played a role in the putting-out system; the putter-outer was after all a "capitalist." But machinery under the putting-out system was primitive; fixed capital was inconsequential. The capital provided by the putter-outer was predominantly working capital--stocks of good in process--and advances against future labor.

The role played by wage advances deserves more attention than it has received, for at least in some trades it appears to have been an important means by which the capitalist maintained his hegemony.³⁰ Wage advances were to the capitalist what free samples of heroin are to the pusher: a means of creating dependence. It is of little moment that one was a legal and the other a physiological dependence. Both represent an addiction from which only the exceptionally strong-willed and fortunate escape.³¹ The point for present purposes is that the practice of what was virtually indentured servitude (though for shorter periods of time than were customary in the British North American and African colonies) nicely complemented the specialization of men to tasks. Wage advances legally bound the worker to his master, and specialization of his activity to a small part of the whole helped to prevent the worker from circumventing his legal obligation to work for no one else (until his debt was discharged) by restricting the outlets for his production to intermediaries, a much smaller "market" than the market

³⁰ See T. S. Ashton, An Eighteenth Century Industrialist, Manchester University Press, Manchester, 1939, chapters 2-3, for an account of the importance of wage advances in the metal trades. Advances to weavers were common in the putting-out enterprise run by Samuel Oldknow. However, the amounts were relatively small, of the order of a week's wages. (G. Unwin and others, Samuel Oldknow and the Arkwrights, Manchester University Press, Manchester, 1924, p. 49.) If, in fact, wage advances were an important instrument of capitalist control only in the metal trades, it would be interesting to know why. George Unwin gives one instance of a debt-employment nexus in the cloth industry as early as the reign of Henry VIII. (Industrial Organization in the Sixteenth and Seventeenth Centuries, p. 52).

³¹ It is of equally little moment that the worker's dependence was "freely" entered into, any more than the pusher's enticement of the unwary is any less destructive because one has the right to refuse the come-on.

for a finished product. It was presumably much harder to dispose illegally of unwhitened pins than of whitened ones.³²

The use of wage advances to maintain worker dependence and hierarchical control of production, however widespread under the putting-out system it may or may not have been, was no isolated historical phenomenon. It has been an important feature in other kinds of market economies where alternative means for subordinating the worker have not been available. Perhaps the most relevant example in the American experience was the development of agricultural organization in the post-1865 South. The problem of the post-bellum American planter was in many respects similar to the problem of the pre-factory British putter-outer: how to ensure for himself an essential role in the production process. The ex-slave was no longer legally tied to the land, and the land, like the means of industrial production in pre-factory days, was not sufficiently scarce or costly to maintain the dependency of workers on capitalists.

The problem was solved by coupling the crop-lien system of credit to the share-cropping system of farming. The planter-capitalist typically advanced credit in kind for food and other necessities of life, as well as for seed, fertilizer, and implements. These advances were secured by a lien on present and future crops, and the cultivator was legally under his creditor's thrall until the debt was repaid, which could be never since the creditor kept the books. Under the share-cropping system, the land-owner, not the tenant, controls the choice of crops,

and he wants nothing grown except what he can sell. If the tenant takes time to keep a garden he does so at the neglect of his major interest, and, furthermore, he deprives the owner of the privilege of selling him additional groceries.³³

Even the nominal independence of land-ownership was rarely of any value to the ex-slave. Debt was not a business arrangement, but subjugation. And the crop lien gave the capitalist virtually the same

³²Though presumably not impossible. Embezzlement was a continuing problem under the putting-out system, and it will be argued presently that the chief advantage of the factory system in its early days was the ability to provide the supervision necessary to cure this and other ills.

³³Fred Shannon, The Farmer's Last Frontier, Holt, Rinehart and Winston, New York, 1945, p. 88.

control over the cropping pattern as did land ownership. "The cropper who dared to till a truck patch was quickly warned that he was lowering his credit."³⁴ The result was a ruinous monoculture.

In the greater part of the South the merchant demanded that cotton, more cotton, and almost cotton alone should be grown, because...the growers could neither eat it up behind his back nor slip it out for surreptitious sale.

...Any attempt to sequester any of the cotton for sale elsewhere, even if beyond the amount due the storekeeper, was visited with quick retribution. In South Carolina, if the lien-holder even suspected such intent, he could get an order from the clerk of the court to have the sheriff confiscate the whole crop for sale...³⁵

Generously assisted by the police power of the state, cotton enabled the capitalist to intervene between the producer and the market. Indeed, it is fair to conclude that cotton culture was to the capitalist planter what specialization was to the capitalist putter-outer: a choice dictated not by technological superiority but by his interest in interposing himself between the producer and the market.

III. The Rise of the Factory

The minute specialization that was the hallmark of the putting-out system only wiped out one of two aspects of workers' control of production: control over the product. Control of the work process, when and how much the worker would exert himself, remained with the worker--until the coming of the factory.

Economic historians customarily ascribe the growth of the factory to the technological superiority of large-scale machinery, which required concentration of productive effort around newly harnessed sources of energy--water and steam. The first factories, according to T. S. Ashton, arose in the beginning of the eighteenth century when "for technical reasons, small groups of men were brought together into workshops and little water-driven mills."³⁶ But the beginnings of the modern factory system are usually associated with Richard Arkwright, whose spinning mills displaced the domestic manufacture of cotton yarn.

³⁴ Ibid., p. 92.

³⁵ Ibid.

³⁶ T. S. Ashton, The Industrial Revolution 1760-1830, Oxford University Press, London, 1948, p. 33 (emphasis added).

Arkwright's "water frame," it is said, dictated the factory organization of spinning: "Unlike the jenny, the frame required, for its working, power greater than that of human muscles, and hence from the beginning the process was carried on in mills or factories."³⁷ Other authorities agree. Thus Paul Mantoux: "...the use of machines distinguishes the factory from (the putting-out system), and gives its special character to the new system as against all preceding ones..."³⁸ And, more recently, David Landes has written

The Industrial Revolution...required machines which not only replaced hand labor but compelled the concentration of production in factories--in other words machines whose appetite for energy was too large for domestic sources of power and whose mechanical superiority was sufficient to break down the resistance of the older forms of hand production.³⁹

These authorities, it should be said, recognize the other advantages the factory afforded, particularly a system of discipline and supervision that was impossible under the putting-out system. "It was", as Ashton says, 'the need for supervision of work that led Peter Stubbs to gather the scattered filemakers into his works at Warrington.'⁴⁰ Mantoux also notes the "obvious advantages from the point of view of organization and supervision"⁴¹ of bringing together many workers into a single workshop. According to Landes the need for discipline and supervision turned "the thoughts of employers...to workshops where the men would be brought together to labor under watchful overseers."⁴² And elsewhere

³⁷ Ibid., p. 72.

³⁸ P. Mantoux, The Industrial Revolution in the Eighteenth Century, Harper and Row, New York, 1962, p. 39. (First English edition published in 1928).

³⁹ D. S. Landes, The Unbound Prometheus, Cambridge University Press, Cambridge, England, 1969, p. 81.

⁴⁰ The Industrial Revolution, op. cit., p. 109. See also Ashton, An Eighteenth Century Industrialist, p. 26.

⁴¹ The Industrial Revolution in the Eighteenth Century, op. cit., p. 246.

⁴² Landes, op. cit., p. 60.

Landes is even more explicit. "The essence of the factory," he writes in an introduction to a volume of essays on the development of capitalism, "is discipline--the opportunity it affords for the direction of and coordination of labor."⁴³

Nevertheless, the advantages of discipline and supervision remain, in the conventional view, secondary considerations in accounting for the success of the factory system, if not for the motivation behind it. In the same breath as Mantoux notes the organizational advantages of the factory, he concludes that "the factory system...was the necessary outcome of the use of machinery."⁴⁴ Similarly, while identifying discipline as the essence of the factory, Landes attributes its success to technological factors: "the triumph of concentrated over dispersed manufacture was indeed made possible by the economic advantages of power-driven equipment. The factory had to beat cottage industry in the marketplace, and it was not an easy victory."⁴⁵

The model underlying this reasoning is easy to identify: the factory survived, therefore it must have been a less costly method of production than alternatives. And in the competitive market economy, only least-cost methods are technologically efficient, provided efficiency is defined in an economy-wide sense. Hence the factory must have been technologically superior to alternatives.

However, the very mention of supervision and discipline as motivations for the factory ought to put one on guard against a too-easy identification of cost-minimization with technological efficiency. In

⁴³D. S. Landes (editor), The Rise of Capitalism, Macmillan, New York, 1966, p. 14.

⁴⁴Mantoux, op. cit., p. 246.

⁴⁵Ibid., p. 14. Cf. Herbert Heaton, The Yorkshire Woolen and Worsted Industries, Oxford University Press, Oxford, 1920: "the major part of the economic advantage of the factory springs from the use of machinery capable of performing work quickly, and the use of power which can make the machinery go at high speed." p. 352.

the competitive model, there is no scope for supervision and discipline except for that imposed by the market mechanism.⁴⁶ Any recognition of the importance of supervision and discipline as motivating forces behind the establishment of factories is tantamount to admission of important violations of the assumptions of perfect competition, and it follows that cost minimization cannot be identified with technological efficiency. Thus, technological superiority becomes neither necessary nor sufficient for the rise and success of the factory.

It will be argued presently that the agglomeration of workers into factories was a natural outgrowth of the putting-out system (a result, if you will, of its internal contradictions) whose success had little or nothing to do with the technological superiority of large-scale machinery. The key to the success of the factory, as well as its inspiration, was the substitution of capitalists' for workers' control of the production process; discipline and supervision could and did reduce costs without being technologically superior.

That the triumph of the factory, as well as the motivation behind it, lay in discipline and supervision, was clear to at least one contemporary observer. The leading nineteenth century apologist for the factory system, Andrew Ure, quite explicitly attributed Arkwright's success to his administrative prowess:

The main difficulty (faced by Arkwright) did not, to my apprehension, lie so much in the invention of a proper self-acting mechanism for drawing out and twisting cotton into a continuous thread, as in...training human beings to renounce their desultory habits of work, and to identify themselves with the unvarying regularity of the complex automation. To devise and administer a successful code of factory discipline, suited to the necessities of factory diligence, was the Herculean enterprise, the noble achievement of Arkwright. Even at the present day, when the system

⁴⁶Ronald Coase appears to be unique in recognizing that the very existence of capitalist enterprise is incompatible with the reliance of perfect competition on the market mechanism for coordinating economic activity. Coase, however, sees the capitalist firm as the means not for subordinating workers but for saving the costs of the market transactions:

...a firm will tend to expand until the costs of organizing an extra transaction within the firm become equal to the costs on the open market or the costs of organizing in another firm. See "The Nature of the Firm," Economica vol. IV, 1937, pp. 386-405, reprinted in Stigler and Boulding (eds.), Readings in Price Theory, Irwin, Chicago, Illinois, 1952, pp. 331-351. The quotation is from p. 341 of Boulding and Stigler.

is perfectly organized, and its labor lightened to the utmost, it is found nearly impossible to convert persons past the age of puberty, whether drawn from rural or from handicraft occupations, into useful factory hands. After struggling for a while to conquer their listless or restive habits, they either renounce the employment spontaneously, or are dismissed by the overlookers on account of inattention.

If the factory Briareus could have been created by mechanical genius alone, it should have come into being thirty years sooner; for upwards of ninety years have now elapsed since John Wyatt, of Birmingham, not only invented the series of fluted rollers, (the spinning fingers usually ascribed to Arkwright), but obtained a patent for the invention, and erected "a spinning engine without hands" in his native town...Wyatt was a man of good education, in a respectable walk of life, much esteemed by his superiors, and therefore favorably placed, in a mechanical point of view, for maturing his admirable scheme. But he was of a gentle and passive spirit, little qualified to cope with the hardships of a new manufacturing enterprise. It required, in fact, a man of a Napoleon nerve and ambition, to subdue the refractory tempers of work-people accustomed to irregular paroxysms of diligence... Such was Arkwright.⁴⁷ (Emphasis added.)

Wyatt's efforts, and his ultimate failure, are shrouded in mystery. Indeed, it is impossible to sort out his contribution from the contribution of his collaborator, Lewis Paul. No model of the Wyatt-Paul machine survives, but Mantoux supports Ure's judgment that Wyatt and Paul anticipated Arkwright in all technical essentials. Arkwright's machine, according to Mantoux, "differs from that of Wyatt only in its details. These trifling differences cannot explain Arkwright's triumphal success."⁴⁸

⁴⁷A. Ure, The Philosophy of Manufacturers, Charles Knight, London, 1835, pp. 15-16. Military analogies abound in contemporary observations of the early factory. Boswell described Mathew Boulton, Watt's partner in the manufacture of steam engines, as "an iron captain in the midst of his troops" after a visit to the works in 1776. (Quoted in Mantoux, op. cit., p. 376).

⁴⁸Mantoux, op. cit., p. 223. Wadsworth and Mann differ. See Alfred P. Wadsworth and Julia DeLacy Mann, The Cotton Trade and Industrial Lancashire, Manchester University Press, Manchester England, 1931, pp. 482-483.

Contemporary evidence suggests that the problems of organizing the work force played a substantial part in the failure of the Wyatt-Paul enterprises. The correspondence between the principals and their officers suggest a continuing preoccupation with discipline. Edward Cave, a financial backer as well as a licensee, set up shop with hand-powered equipment in anticipation of finding a suitable water mill. Early on he wrote to Paul: "I have not half my people come to work today, and I have no great fascination in the prospect I have to put myself in the power of such people."⁴⁹ Discipline did not improve once the Cave factory became mechanized. When Wyatt visited the new spinning mill at Northampton in 1743 he found that "only four frames were regularly at work, since there were seldom hands enough for five."⁵⁰ The search for new methods of discipline continued. A month later, Cave's lieutenant wrote Wyatt:

I think they (the workers) have done as much in four days this week as they did in a week when you were here...There were not hands enough to work all five engines but four is worked complete which did about 100 skeins a day one with another, nay some did 130. One reason for this extra advance is Mr. Harrison (the mill manager) bought 4 handkerchers one for each machine value about 1/2d p. each and hung them over the engine as prizes for the girls that do most...⁵¹

These crude attempts to "subdue the refractory tempers of work-people" by judicious use of the carrot apparently came to nought. One of the few indisputable facts about the Wyatt-Paul attempts is that they failed. And between Wyatt and Arkwright no one managed to bring Wyatt's invention to a successful conclusion, a remarkable failure indeed if the defects of machine spinning were primarily technological in nature.

There is additional evidence for the assertion that factory spinning did not depend for its success on a superior machine technology. Factory spinning took hold in the woolen industry as well as in cotton, and its success in the wool trade could only have been for organizational reasons. The technology of wool-spinning for many years after the factory made its appearance was the same in factory as in cottage; in both the "spinning jenny" was the basic machine well into the nineteenth

⁴⁹Quoted in Julia DeLacy Mann, "The Transition to Machine-Spinning" in Wadsworth and Mann, op. cit., p. 433.

⁵⁰Ibid., p. 436.

⁵¹Ibid., p. 437.

century.⁵² The Hammonds suggest that factory spinning dominated by the beginning of the century:

By 1803 the transformation was practically complete. The clothiers had one by one introduced the system of "spinning houses" on their own premises, and the weavers were filled with apprehension lest they too should be forced to work under their employer's roof.⁵³

At some places water power may have been used for working the jennies,⁵⁴ but this does not appear to have been the general case. Benjamin Gott, called by Mantoux the "first of the great Yorkshire spinners"⁵⁵ never used power in his spinning (or weaving) rooms during his quarter-century career as factory master and nevertheless appears to have made a satisfactory profit.⁵⁶ Certainly Gott never abandoned spinning and weaving to domestic workshops, although these handpowered activities could have been carried on separately from the operations to which Gott applied steam power--scribbling and fulling. Indeed, the customary practice when Gott began his factory in 1793 was for scribbling and fulling to be a trade distinct from spinning and weaving.⁵⁷

In weaving the case is even clearer than in spinning. Gott's handloom weaving sheds were not unique. Long before the powerloom became practicable, handloom weavers were brought together into workshops to weave by the same techniques that were employed in cottage industry. Clearly, the handloom shops would not have persisted if it had not been profitable for the entrepreneur, and just as clearly the source of profits could not have been in a superior technology. There

⁵²"Up to the close of the period (1820), and probably until after 1830, when Crompton's mule had been made 'self-acting,' it made no headway in the woolen industry." W. B. Crump, The Leeds Woolen Industry 1780-1820, Thoresby Society, Leeds England, 1931, p. 25.

⁵³J. L. Hammond and Barbara Hammond, op. cit., p. 146.

⁵⁴Ibid., p. 148.

⁵⁵Mantoux, op. cit., p. 264.

⁵⁶Crump, op. cit., esp. pp. 24-25, 34.

⁵⁷Ibid., p. 24.

is no evidence that the handloom in the capitalist's factory was any different from the one in the weaver's house.

I have found no comprehensive quantitative estimates of the relative importance of handloom factories, and it would probably require a major research effort to make even a reasoned guess.⁵⁸ A recent study of the history of cotton handloom weaving concludes that "although (the handloom weaving shed) was never anything like the predominant form of organization in cotton weaving,"⁵⁹ it was not negligible, nor was it confined...to fancy goods only." The author of this study continues:

According to the historian of Rossendale, in the period 1815-1830, when 'the trade of cotton weaving on the handloom was at its briskest, there were at the lowest computation thirty weaving shops, apart from the looms in dwelling houses, in the forest of Rossendale.' The distinguishing feature of the sheds was that they employed a number of weavers on handlooms outside their own homes and families; they were substantially larger than the small shops of four or six (looms) run by a master weaver and apprentices in some of the more specialized lines at Bolton or Paisley. Isolated cases have been found with as many as 150 or 200 handlooms, quite a few with between 50 and 100, and a considerable number with 20 or more. Such sheds were to be found in town and country throughout the weaving area.

...For both employers and workers, the handloom shed represented a transitional stage in the organization of cotton weaving between the true domestic system and the power driven factory. It does not necessarily follow, however, that the handloom shed was a comparatively late development in cotton, or that it was a conscious imitation of the powerloom factory. With the coming of the dandyloom (an improved handloom) in the late 1820s, there was a probable increase in the number

⁵⁸Albert P. Usher, An Introduction to the Industrial History of England, Houghton Mifflin, Boston, 1920, reports some statistics for 1840, but does not give his source: "In the Coventry ribbon district, there were 545 handlooms in factories, 1264 handlooms employed by capitalists outside the factories, and 121 looms in the hands of independent masters. At Norwich 656 handlooms were in factories out of a total of 3398 for the district as a whole." (p. 353.)

⁵⁹D. Bythell, op. cit., p. 33.

of such sheds, but there is some evidence from notices in the local newspapers for their existence in the 1780s and 1790s.⁶⁰

Even as late as 1838, the weaver's animosity might, as in the case of Thomas Exell of Gloucestershire, be directed against the handloom shop and its owner, not against the powerloom. "Exell was," according to Wadsworth and Mann, "lamenting...the concentration of handlooms and jennies in the clothier's shop" when he wrote "They have driven us away from our houses and gardens to work as prisoners in their factories and their seminaries of vice."⁶¹

The early years of the nineteenth century saw the concentration of outworkers into workshops in other trades too. Supervision appears to have provided not only the motivation for "Peter Stubbs to gather the scattered filemakers into his works at Warrington," but a sufficient economic rationale for maintaining a factory-like organization in place of the putting-out system. Ashton's careful study of the Stubbs enterprise⁶² does not suggest any technological argument for bringing the filemakers together, at least none he considers to be compelling. Nor does Ashton suggest that the new method of organizing work was ever abandoned. On the contrary: some of the original workshops were still standing in his own day.⁶³

None of this is to deny the importance of the technological changes that have taken place since the eighteenth century. But these changes were not independent causes of the factory. On the contrary, the particular forms that technological change took were shaped and determined by factory organization. It is not accidental that technological change atrophied within the putting-out system after Hargreaves's jenny but flourished within the factory. On the demand side, the capitalist provided the market for inventions and improvements, and his interest lay--for reasons of supervision and discipline--with the factory. The supply side was only slightly more complex. In principle, an inventor might obtain a patent and license the use of his inventions to putter-outers or, indeed, to independent producers. In practice, as long as production took place in scattered cottages, it was difficult

⁶⁰ Ibid. pp. 33-34.

⁶¹ Wadsworth and Mann, op. cit., p. 393.

⁶² An Eighteenth Century Industrialist.

⁶³ Ibid., p. 26

if not impossible to detect and punish piracy of patent rights. It was much easier to enforce patent rights with production concentrated into factories, and this naturally channeled inventive activity into the more remunerative market. And of course many improvements were by their very nature nonpatentable, and their benefits were under capitalist economic organization capturable only by entrepreneurs.

This argument may be thought to imply a dynamic technological superiority for the factory system, for it may fairly be interpreted as suggesting that the factory provided a more congenial climate for technological change. A more congenial climate for innovation does not, however, imply technological superiority, dynamic or static. For the factory superiority in this domain rested in turn on a particular set of institutional arrangements, in particular the arrangements for rewarding inventors by legal monopolies vested in patents. An invention, like knowledge generally, is a "public good": the use of an idea by one person does not reduce the stock of knowledge in the way that consumption of a loaf of bread reduces the stock of wheat. It is well understood that public goods cannot be efficiently distributed through the market mechanism; so patents cannot be defended on efficiency grounds.

Indeed, the usual defense of patents is in terms of the incentives afforded for invention. But the argument is hardly compelling. There is no a priori reason why society might not reward inventors in other ways. In the eighteenth century, for example, Thomas Lombe was voted £14,000 in lieu of a renewal of his patent for silk-throwing machinery, a small amount in proportion to the £120,000 he earned during the fourteen year term of his patent, but a tidy sum nevertheless, presumably enough to coax out the secrets of all but the most diffident genius.⁶⁴ To be sure, as it was practiced in Great Britain at least, the public reward of inventors was a fitful and unreliable arrangement, but this does not mean that a way could not have been found to make the system workable had the will existed. Had the patent system not played into the hands of the more powerful capitalists, by favoring those with sufficient resources to pay for licenses (and incidentally contributing to the polarization of the producing classes into bosses and workers), the patent system need not have become the dominant institutional mode for rewarding inventors.

There remains one loose end in this account of the rise of the factory: why did the market mechanism, which has been supposed by its defenders from Adam Smith onwards to harness the self-interest of the producer to the public interest, fail to provide adequate supervision

⁶⁴ Mantoux, op. cit., pp. 195-196. In the case of Lombe and his brother, genius, apart from organizing talent, consisted in pirating an Italian invention.

and discipline under the putting-out system? Discipline and supervision, it must be understood, were inadequate only from the point of view of the capitalist, not from the point of view of the worker. And though it is true that in a sufficiently abstract model of perfect competition, profits are an index of the well-being of society as a whole as well as capitalists' well-being, this identity of interests does not characterize any real capitalist economy, no more the "competitive" capitalism of Adam Smith's day than the monopoly capitalism of our own. In the perfectly competitive model, there are no capitalists and no workers, there are only households that dispose of different bundles of resources, all of which--labor included--are traded on markets in which no one possesses any economic power. For this reason, laborers can equally well be thought to hire capital as capitalists labor, and the firm plays no significant role in the analysis. By contrast, the hallmark of the putting-out system was a specialization so minute that it denied to the worker the relatively wide (competitive!) market that existed for products, replacing the product market with a narrow market for a sub-product that, in a limited geographical area, a few putter-outers could dominate.⁶⁵ This perversion of the competitive principle, which lies at the heart of the capitalist division of labor, made discipline and supervision a class issue rather than an issue of technological efficiency; a lack of discipline and supervision could be disastrous for profits without being inefficient.

The indiscipline of the laboring classes, or more bluntly, their laziness, was widely noted by eighteenth century observers.

It is a fact well known (wrote a mid-century commentator) ...that scarcity, to a certain degree, promoted industry, and that the manufacturer (worker) who can subsist on three days work will be idle and drunken the remainder of the week...The poor in the manufacturing counties will never work any more time in general than is necessary just to

⁶⁵On the power of bosses over workers see, among others, Landes, op. cit., p. 56; E. P. Thompson, The Making of the English Working Class, Random House, New York, 1963, chapter 9, especially the quotations on pp. 280, 297. Adam Smith was quite explicit: "Masters are always and everywhere in a sort of tacit, but constant and uniform combination, not to raise the wages of labor above their actual rate. To violate this combination is everywhere a most unpopular action, and a sort of reproach to a master among his neighbors and equals. We seldom, indeed hear of this combination, because it is the usual, and one may say, the natural state of things which nobody hears of." The Wealth of Nations, op. cit., Book I, Chapter 8, pp. 66-67.

live and support their weekly debauches...We can fairly aver that a reduction of wages in the woolen manufacture would be a national blessing and advantage, and no real injury to the poor. By this means we might keep our trade, uphold our rents, and reform the people into the bargain.⁶⁶

Indiscipline, in other words, meant that as wages rose, workers chose to work less. In more neutral language, laziness was simply a preference for leisure! Far from being an "unreasonable inversion of the laws of sensible economic behavior,"⁶⁷ a backward bending labor-supply curve is a most natural phenomenon as long as the individual worker controls the supply of labor.

At least no devotee of the conventional indifference-curve approach to leisure-goods choices would dare argue that there is anything at all peculiar about a backward bending labor-supply curve.⁶⁸ Central to indifference-curve analysis of consumption choices is the separation of substitution and income effects. A rising wage makes leisure relatively more expensive to the worker, to be sure. But against this negative "substitution" effect must be considered the "income" effect; besides changing the terms of trade between leisure and goods, a rising wage is like a windfall that makes the worker able to afford more leisure. As long as leisure is a "normal" good (one for which the income effect is positive), substitution and income effects work in opposite directions. And the outcome is unpredictable; certainly no neoclassical economist worth his salt would argue that the substitution effect must be stronger than the income effect.⁶⁹

In a competitive market, however, the shape of the labor-supply curve in the aggregate is of little moment. By definition, any individual

⁶⁶J. Smith, Memoirs of Wool (1747); quoted in E. P. Thompson, op. cit., p. 277.

⁶⁷The characterization is Landes's, Unbound Prometheus, p. 59.

⁶⁸Contrary to Landes's implication, "a fairly rigid conception of what (is) felt to be a decent standard of living" (ibid., p. 59) is not required for a backward bending supply curve of a good or service that (like time) affords utility to the seller.

⁶⁹It may be slightly ironic that an important necessary condition for the indifference-curve model to be applicable to one of the most fundamental problems of economic choice is inconsistent with capitalism. For the indifference-curve model to be applicable to goods-leisure choices, control of the hours of work must rest with the worker. But this is inconsistent with capitalist control of the work process, and hence with capitalism itself.

capitalist can hire as many workers as he likes at the going wage. And the wage he pays is reflected in the market price of his product. He earns the competitive rate of profit, whether the going wage is low or high. But for the oligopsonistic putter-outers, the fact that higher wages led workers to choose more leisure was not only perverse, it was disastrous. In 1769, Arthur Young noted "the sentiment universal" among the cotton manufacturers of Manchester "that their best friend is high provisions."⁷⁰

Thus the very success of pre-factory capitalism contained within it the seeds of its own transformation. As Britain's internal commerce and its export trade expanded, wages rose and workers insisted in taking out a portion of their gains in the form of greater leisure. However sensible this response may have been from their own point of view, it was no way for an enterprising capitalist to get ahead. Nor did the capitalist meekly accept the workings of the invisible hand.

His first recourse was to the law. In the eighteenth century, Parliament twice enacted laws requiring domestic woolen workers to complete and return work within specified periods of time. In 1749 the period was fixed at twenty-one days, and in 1777 the period was reduced to eight days.⁷¹ But more direct action proved necessary. The capitalist's salvation lay in taking immediate control of the proportions of work and leisure. Capitalists' interests required that the worker's choice become one of whether or not to work at all--the only choice he was to have within the factory system.

To a great extent, supervision and discipline meant the same thing in the factory. Under the watchful eye of the foreman, the worker was no longer free to pace himself according to his own standards. But supervision was important for another reason: under the putting-out system materials inevitably came under the control of the workman during the process of manufacture. This created a variety of ways for the workman to augment his earnings; in the woolen trade a worker might exchange poor wool for good, or conceal imperfections in spinning, or wet the wool to make it seem heavier.⁷² Above all, there was the possibility of outright embezzlement. It seems likely that these possibilities

⁷⁰A. Young, Northern Tour; quoted in Wadsworth and Mann, op. cit., p. 389.

⁷¹Heaton, op. cit., p. 422. These laws had historic precedents. Unwin reports a municipal order dating from 1570 in Bury St. Edmunds requiring spinsters to work up six pounds of wool per week. Employers were to give notice to the constable in the event any one failed to obey the order (op. cit., p. 94).

⁷²Heaton, ibid., p. 418.

multiplied as trade developed and grew, for disposing of illegally-gotten goods would appear to have been easier as the channels of trade multiplied and expanded. In any event, capitalists increasingly utilized the legislative, police, and judicial powers of the state to prevent workers from eroding their profits during the course of the eighteenth century.⁷³ Indeed, even the traditional maxim of English justice--that a man was innocent until proven guilty--counted for little where such a clear and present danger to profits was concerned. A Parliamentary Act of 1777 allowed search of a workman's home on mere suspicion of embezzlement. If suspicious goods were found on his premises, it was up to the worker to prove his innocence. Otherwise he was assumed to be guilty --even if no proof were forthcoming.⁷⁴

The worker's "dishonesty", like his "laziness," could not be cured by recourse to the law, however diligently Parliament might try to serve the interests of the capitalist class. The local magistrates might not be sufficiently in tune with the needs of the master manufacturers,⁷⁵ particularly one would imagine, if they were members of the landed gentry. In any event, enforcement of the law must have been cumbersome at best, especially where manufacturing was dispersed over a relatively wide geographical area. It is no wonder that, as Landes says, "the thoughts of employers turned to workshops where the men would be brought together to labor under watchful overseers." As late as 1824, a correspondent of the Blackburn Mail specifically urged the factory system as a means of combatting embezzlement:

It is high time...that we should have a change either to powerlooms or to (hand) loom shops and factories, when at least one sixth part of the production of cotton goods is effected by (embezzlement).⁷⁶

It is important to emphasize that the discipline and supervision afforded by the factory had nothing to do with efficiency, at least as this term is used by economists. Disciplining the work force meant a larger output in return for a greater input of labor, not more output

⁷³See Heaton, ibid., pp. 418-437 for an account of the woolen industry, Wadsworth and Mann, op. cit., pp. 395-400 for the cotton industry.

⁷⁴Heaton, op. cit., p. 422.

⁷⁵Heaton, ibid., p. 428.

⁷⁶Quoted in Bythell, op. cit., p. 72.

*no innovation
required*

for the same input.⁷⁷ Supervising--insofar as it meant something different from disciplining--the work force simply reduced the real wage; an end to embezzlement and like deceipts changed the division of the pie in favor of capitalists. In the competitive model, innovation to improve the position of one individual or group at the expense of another may not be feasible. But the history of employer-worker relations under the putting-out system belies the competitive model. Embezzlement and other forms of deceit were exercises in "countervailing power," and pitifully weak ones at that.⁷⁸ The factory effectively put an end both to "dishonesty" and "laziness."

The factory system, then, was not technologically superior to the putting-out system, at least not until technological change was channeled exclusively into this mould. But was it in any event efficient? Was it not better than available alternatives not only for the capitalist, but for the factory worker as well, however severe the consequences (mere "pecuniary diseconomies" in technical language) for those who persisted in cottage industry? After all, nobody was legally compelled to work in a factory. The worker, no less than the capitalist, "revealed" by the very act of entering the factory a "preference" for factory organization, or at least for the combination of factory organization and factory pay⁷⁹--or so neoclassical logic goes.

How applicable is this logic in fact? First of all, it is a strange logic of choice that places its entire emphasis on the absence of legal compulsion. Judging from the sources from which factory labor was originally drawn, the workers had relatively little effective choice. According to Mantoux

In the early days factory labor consisted of the most ill-assorted elements: country people driven from their villages

⁷⁷In technical terms, the shift from workers' control of goods-leisure choices to capitalists' control meant a shift along a given production function not a shift in the function itself.

⁷⁸Any comment on the alleged immorality of these defenses is probably superfluous. This was after all an era in which unions were illegal "combinations," proscribed under common law of conspiracy (and later, by statute).

⁷⁹Factory wages for handloom weaving were higher than wages earned for the same work performed in the worker's cottage--presumably the reward both for longer hours and for submitting to the factory supervision and discipline. See Bythell, op. cit., p. 134.

by the growth of large estates (that is, by the enclosure movement), disbanded soldiers, paupers, the scum of every class and of every occupation.⁸⁰

The question is not so much whether or not factory employment was better for workers than starving--let us grant that it was--but whether or not it was better than alternative forces of productive organization that would have allowed the worker a measure of control of product and process, even at the cost of a lower level of output and earnings.⁸¹ But to grow and develop in nineteenth century Britain (or in twentieth century America) such alternatives would have had to have been profitable for the organizer of production. Since worker control of product and process ultimately leaves no place for the capitalist, it is hardly surprising that the development of capitalism, while extending the sway of the market in labor as well as goods, and extending the range of occupations, did not create a long list of employment opportunities in which workers displaced from the traditional occupations of their parents could control product and process.

Where alternatives to factory employment were available, there is evidence that workers flocked to them. Cottage weaving was one of the few, perhaps the only important, ready alternative to factory work for those lacking special skills. And despite the abysmally low level to which wages fell, a force of domestic cotton weavers numbering some 250,000 survived well into the nineteenth century. The maintenance of

⁸⁰Mantoux, op. cit., p. 375.

⁸¹"Better" is used here in a broader sense than it is conventionally used by economists when comparing different bundles of commodities even when they bother to count leisure as one of the goods. Integrity--personal and cultural--can hardly be represented on an indifference curve. For a discussion of the effects of economic change on cultural integrity, see Karl Polanyi, "Class Interest and Social Change" originally published in The Great Transformation, Rinehard, New York, 1944; reprinted in Primitive, Archaic and Modern Economies, edited by George Dalton, Doubleday, Garden City, New York, 1968, pp. 38-58.

the weavers' numbers is, in the light of attrition caused by death and emigration, convincing evidence of persistent new entry into the field.⁸² However, the bias of technological change towards improvements consistent with factory organization sooner or later took its toll of alternatives, weaving included.⁸³ The putting-out system, with its pitiful vestiges of worker control, virtually disappeared in Great Britain by mid-century. And weaving was about the last important hold-out of cottage industry. Where this alternative was not available, the worker's freedom to refuse factory employment was the freedom to starve.

⁸²On the size of the labor force in domestic cotton weaving, see Landes, op. cit., pp. 86-87; Bythell, op. cit., pp. 54-57. On wages, see Bythell, ibid., chapter 6 and appendices; Sydney J. Chapman, Lancashire Cotton Industry, Manchester University Press, Manchester, England, 1904, pp. 43-44.

⁸³The amazing thing is that the cottage weavers held out as long as they did, testimony as Landes says, "to the obstinacy and tenacity of men who were unwilling to trade their independence for the better-paid discipline of the factory." (Unbound Prometheus, p. 86).

The reluctance of cottage weavers to submit to factory discipline was widely commented upon by contemporaries. As late as 1836, a noted critic of the factory, John Fielden, wrote "they will neither go into (the factories) nor suffer their children to go." (Quoted in Bythell, op. cit., p. 252). Another critic testified to a Select Committee of Parliament that a cottage weaver would not seek factory employment because "he would be subject to a discipline that a handloom weaver can never submit to." (Select Committee on Handloom Weavers' Petitions, 1834; quoted in E. P. Thompson, op. cit., p. 307.)

Whether the cottage weavers' inadaptability to the factory was a matter of taste or of the lack of psychological attitudes essential to factory discipline is a question of present as well as historical significance. (Ure, for what his opinion is worth, clearly sides with the view that the cottage weaver could not adapt as opposed to the view that he would not.) For the argument that the role of schools is precisely to inculcate attitudes conducive to labor discipline see Herbert Gintis, "Education, Technology, and the Characteristics of Worker Productivity," American Economic Review, May, 1971.

And even where the adult male had a real choice, so that the logic of "revealed preference" is conceivably more than formally applicable,⁸⁴ his wife and children had no such prerogatives. Women and children, who by all accounts constituted the overwhelming majority of factory workers in the early days,⁸⁵ were there not because they chose to be but because their husbands and fathers told them to be. The application of revealed preference to their presence in the factory requires a rather elastic view of the concept of individual choice.

In the case of pauper children, no amount of stretching of the logic of revealed preference will do. Sold by parish authorities as "factory apprentices" for terms of service up to ten or more years in order to save the local taxpayer the cost of food, clothing, and shelter, these poor unfortunates had no choice whatsoever, legal or otherwise. Apprenticeship itself was nothing new, nor was the binding over of pauper children to masters by parish authorities. But by the end of the eighteenth century, the institution of apprenticeship was no longer a means of limiting entry into the various crafts and trades and of ensuring the maintenance of quality standards. It had become, in accordance with

⁸⁴For men, factory employment could be quite attractive. Agglomeration of workers did not by this one fell swoop solve all problems of discipline. In spinning mills, for example, adult males formed a corps of non-commissioned officers; women and children were the soldiers of the line. And factory employment was relatively attractive for these "labor aristocrats." To quote Ure,

The political economist may naturally ask how...the wages of the fine spinners can be maintained at their present high pitch. To this question one of the best informed manufacturers made me this reply: "We find a moderate saving in the wages to be of little consequence in comparison of contentment, and we therefore keep them as high as we can possibly afford, in order to be entitled to the best quality of work. A spinner reckons the charge of a pair of mules in our factory a fortune for life, he will therefore do his utmost to retain his situation, and to uphold the high character of our yarn."

Ure, op. cit., p. 366.

⁸⁵For example, in the Oldknow spinning mill at Mellor, only ten percent of the workers were male heads of families, even excluding child apprentices. G. Unwin and others, Samuel Oldknow and the Arkwrights, Manchester University Press, Manchester, England, 1924, p. 167.

the exigencies of capitalist enterprise, a system of indentured servitude.⁸⁶ As factories became prominent features of the industrial landscape, an enterprising capitalist might seize upon an advertisement like this one:

To Let, The Labor of 260 Children

With Rooms and Every Convenience for carrying on the Cotton Business. For particulars, enquire of Mr. Richard Clough, Common Street, Manchester.⁸⁷

Mantoux goes so far as to claim that in the factory's early days, no parents would allow their own children inside, so that pauper apprentices were "the only children employed in the factories."⁸⁸ But despite the contemporary evidence Mantoux cites to support his claim, it may be a bit exaggerated. The Oldknow mill at Mellor appears to have relied primarily upon family groups (mothers as well as children), and Unwin suggests that the provision of employment to fathers of these families--outside the mill in general--was a continuing concern of Samuel Oldknow. But pauper apprentices were nevertheless a significant part of the work force at Mellor, reaching a maximum of perhaps twenty-five percent at the end of the eighteenth century.⁸⁹

It is not directly relevant to the purposes of this paper to enter into a moral discussion of child labor generally or pauper apprenticeship in particular.⁹⁰ Given the factory, child labor was very likely a necessary evil, at least in the early days. As Ure wrote,

⁸⁶See Ashton, An Eighteenth Century Industrialist, p. 28 who cites as his authority O. J. Dunlop, English Apprenticeship and Child Labor, p. 196. See also Bythell, op. cit., p. 52; Wadsworth and Mann, op. cit., pp. 407-408.

⁸⁷Wheeler's Manchester Chronicle, August 7, 1784. Quoted in Wadsworth and Mann, op. cit., p. 408. If inclined to business on a more modest scale, one might be tempted by a package offer of a factory of sixteen looms and the labor of twelve apprentices. Manchester Mercury, December 1, 1789. Quoted in Bythell, op. cit., p. 52.

⁸⁸Mantoux, op. cit., p. 411.

⁸⁹G. Unwin and others, Samuel Oldknow and the Arkwrights, pp. 166-175.

⁹⁰The evils speak for themselves, and it will suffice perhaps to note that a man like Unwin reveals more than anything else the poverty of his own imagination when, in bending over backwards to be fair and objective, he defends the system (ibid., pp. 170-175) on the grounds that it was superior to the alternative of the workhouse.

...it is found nearly impossible to convert persons past the age of puberty, whether drawn from rural or from handicraft occupations, into useful factory hands. After struggling for a while to conquer their listless or restive habits, they either renounce the employment spontaneously, or are dismissed by the overlookers on account of inattention.

This was not, as history has shown, to remain a permanent state of affairs: the factory did, after all, survive the abolition of child labor. Not surprisingly, recruiting the first generation of factory workers was the key problem. For this generation's progeny the factory was part of the natural order, perhaps the only natural order. Once grown to maturity, fortified by the discipline of church and school, the next generation could be recruited to the factory with probably no greater difficulty than the sons of colliers are recruited to the mines or the sons of career soldiers to the army.

The recruitment of the first generation of workers willing and able to submit to an externally determined discipline has been a continuing obstacle to the expansion of the factory system. Even mid-twentieth century America has had to face the problem, and here too the lack of alternatives has had an important role to play in aiding the market mechanism. Just after World War II, General Motors introduced machine-paced discipline to Framingham, Massachusetts, in the form of an automobile assembly plant. Over eighty-five percent of a sample⁹¹ of workers interviewed by a team of sociologists under the direction of Charles Walker and Robert Guest had previously worked on jobs where they themselves had determined their own work pace. When interviewed by the Walker-Guest team in 1949, half the sample cited the lack of alternatives --termination of previous jobs or lack of steady work--as the reason for joining GM. And about a quarter said that they would be willing to take a cut in pay, if they could only find another job.⁹² Said one:

⁹¹The sample was just over one-fifth of all the production workers.

⁹²Charles R. Walker and Robert H. Guest, The Man on the Assembly Line, Harvard University Press, Cambridge, Mass., 1952, chapter 6. A follow-up survey of worker attitudes would be fascinating: To what extent did those who initially resisted and resented the dehumanizing aspects of assembly-line work come to accept them--in return for relatively high pay and job security? What was the process by which workers' values and tastes changed in response to their employment at GM? To what extent did they eventually seek more congenial work?

I'd take almost any job to get away from there. A body can't stand it there. My health counts most. What's the use of money if you ruin your health?93

If the problems of discipline and supervision--not the lack of a suitable technology--were the obstacles to the agglomeration of workers, why did the factory system emerge only at the end of the eighteenth century? In fact, the factory system goes back much farther, at least to Roman times. The factory, according to Tenny Frank, was the dominant means of organizing the manufacture of at least two commodities, bricks and red-glazed pottery.⁹⁴ Interestingly for our purposes, Roman factories appear to have been manned almost exclusively by workers who had the same degree of choice as pauper children in eighteenth century England--that is to say, by slaves. By contrast, factories were exceptional in manufactures dominated by freedmen. Frank lists several--clay-lamps, metal wares, jewelry, and water pipes--in which slaves were relatively uncommon; all were organized along small-scale craft lines.⁹⁵ This dualism is not so surprising after all. Independent craftsmen producing directly for the market offer no scope for supervision, whereas slave labor is obviously difficult to mobilize without supervision. The factory offered the ancient as well as the modern world an organization conducive to strict supervision.⁹⁶

⁹³ Ibid., p. 88. Sometimes, it would appear, the problem of recruiting a suitable labor force is resolved in ways that inhibit rather than foster the work attitudes necessary for expansion of industrial capitalism. The abundance of unemployed and underemployed workers in India, for example, appears to have permitted foreign and Indian entrepreneurs to graft an alien factory system into indigenous society without developing the discipline characteristic of Western factory labor. Indian workers are much freer than their Western counterparts to come and go as they please, for a contingent of substitute workers stands ready to fill in as needed. See A. K. Rice, Productivity and Organization: The Ahmedabad Experiment, Tavistock, London, 1958, pp. 79, 118 for incidental support of this hypothesis.

⁹⁴ Tenney Frank, An Economic History of Rome, Second Revised Edition, Johns Hopkins University Press, Baltimore, 1927, chapter 14.

⁹⁵ Ibid., chapter 14.

⁹⁶ Freedmen, it should be noted, did apparently work for wages, though not in factories. The existence of a proletariat seems beyond dispute. Ibid., pp. 269-270 and chapter 17.

The surviving facts may be too scanty to prove anything, but they strongly suggest that whether work was organized along factory or craft lines was in Roman times determined, not by technological considerations, but by the relative power of the two producing classes. Freedmen and citizens had sufficient power to maintain a guild organization. Slaves had no power--and ended up in factories.

This reasoning bears on the development of capitalism in modern times. Guild organization of production and distribution eventually gave way to the putting-out system for two reasons: it was more profitable to the class that was able to interpose itself between the producer and the market, and, equally important, profits provided the nascent capitalist class with the political power to break down the institutional arrangements of guild organization--strict rules of apprenticeship, strict association of production with marketing, and the like--and replace them with institutional arrangements favorable to the putting-out system--the free market in labor as well as commodities, buttressed by strict rules of industrial discipline, with harsh penalties for embezzlement and other infractions. Until the political power of the small master and journeyman was broken, the putting-out system could not flourish, for the division of labor that formed the essence of the putting-out system denied both the orderly progression of apprentice to master and the union of producer and merchant in the same person.

At the same time, the putting-out system was necessarily transitional. Once a free market in labor was brought into existence, it was only a matter of time until the employer took to the factory as a means of curbing those aspects of freedom that depressed profits. Legal arrangements carefully set up to buttress the employer against the worker's "laziness" and "dishonesty" were, as we have seen, never enforceable to the capitalist's satisfaction.

The factory likely would have made its appearance much sooner than it in fact did if the small master and journeyman, fighting the battle of the guild against capitalism, had not been able for a time to use for their own ends the strategy of divide and conquer. Taking advantage of divisions between more powerful classes, the small master and journeyman were able to forge temporary alliances that for a time at least were successful in stalling the advent of the factory. For example, the alliance of the small cloth-making master with the large merchant not engaged in production maintained strict controls on apprenticeship well into the seventeenth century.⁹⁷

⁹⁷Unwin, Industrial Organization in the Sixteenth and Seventeenth Centuries, p. 199.

A more striking, perhaps the most striking, example of successful alliance with more powerful interests had as outcome a Parliamentary prohibition against the loom shop. Thus runs the Weavers' Act of 1555, two hundred years before Arkwright:

Forasmuch as the weavers of this realm have, as well at the present Parliament as at divers others times, complained that the rich and wealthy clothiers do in many ways oppress them, some by setting up and keeping in their houses divers looms, and keeping and maintaining them by journeymen and persons unskillful, to the decay of a great number of artificers who were brought up in the said art of weaving...it is therefore, for remedy of the premises and for the averting of a great number of inconveniences which may grow if in time it be not foreseen, ordained and enacted by authority of this present Parliament, that no person using the mystery of cloth-making, and dwelling out of a city, borough, market town, or incorporate town, shall keep, or return, or have in his or their houses or possession more than one woolen loom at a time...⁹⁸

The main purpose of this Act may have been, as Unwin suggests, "to keep control of the industry in the hands of the town employers (who were exempted from its coverage) by checking the growth of a class of country capitalists."⁹⁹ It was precisely by riding the coattails of more powerful interests that the small master and journeyman were able to hold their own as long as they did.

Indeed, the important thing about the 1555 Act is not the precise alignment of the forces for and against, but its very existence at such an early date. Where there was so much smoke there must have been some fire, and some powerful motivation to the agglomeration of workers--long before steam or even water power could possibly have been the stimulus. Witch hunts apart, important legislative bodies are not in the habit of enacting laws against imaginary evils. To be the occasion of parliamentary repression, the loom shop must have been a real economic threat to the independent weavers even in the sixteenth century. By the same token, there must have been a class that stood to profit from the expansion of factory organization. The difference between the sixteenth and later centuries was in the relative power of this class and the classes that opposed the development of capitalist enterprise.

⁹⁸ 3 & 4 Philip and Mary, c.11. Quoted in Mantoux, op. cit., pp. 34-35.

⁹⁹ Unwin, Industrial Organization in the Sixteenth and Seventeenth Centuries, p. 93.

Industrial capitalism did not gain power suddenly; rather it was a fitful and gradual process, as a history like Unwin's makes clear.¹⁰⁰ But by the end of the eighteenth century the process was pretty well complete. The outright repeal of statutes limiting apprenticeship or otherwise regulating capitalists only reflected the new realities. By this time the process of innovation towards the form of work organization most congenial to the interests of the capitalist class was in full sway.

The steam mill didn't give us the capitalist; the capitalist gave us the steam mill.

IV. Variations on a Theme

The resort of economically and politically powerful classes to innovation in order to change the distribution of income in their favor (rather than to increase its size) was not unique to the industrial revolution. Marc Bloch's "Advent and Triumph of the Water Mill" tells a fascinating story of a similar phenomenon in feudal times.¹⁰¹ The dominance of water-powered flour mills may reasonably be thought to be a consequence of their technological superiority over handmills. But Bloch's article suggests another explanation: water mills enabled the feudal lord to extract dues that were unenforceable under a handmilling technology.

What is the evidence for the assertion that the water mill was inspired by distributional rather than technological considerations? First grinding at the lord's mill was obligatory, and the milling tolls varied inversely with the status of the owner of the grain. Justice Fitzherbert's Boke of Surveying (1538) noted the systematic variations:

There be many divers grants made by the lord: some men to be ground to the twentieth part (a toll in kind of 1/20 of the quantity ground) and some to the twenty-fourth part; tenants-at-will to the sixteenth part; and bondsmen to the twelfth part.¹⁰²

In extreme cases, the toll on grain grown on the lord's manor was as high as one-third,¹⁰³ which suggests that the obligation to grind at the lord's

¹⁰⁰Ibid.

¹⁰¹ Reprinted in Marc Bloch, Land and Work in Medieval Europe, (translated by J. E. Anderson), Harper & Row, New York, 1969, pp. 136-168.

¹⁰² Quoted in Richard Bennett and John Elton, History of Corn Milling, vol. III, Simpkin, Marshall and Company, London, 1900, p. 155.

¹⁰³Ibid., pp. 221, 253.

mill (the milling "soke") was in the extreme merely a device for ensuring that the peasant not evade what was actually a payment for the use of the lord's land, by secretly harvesting and sequestering grain due the lord. The close relationship in the minds of contemporaries between the milling soke and land rent is indicated by an extensive controversy over the application of the milling soke to bought grain.¹⁰⁴ Despite the obvious possibilities for evasion of dues on home-grown grain that an exemption for purchased grain would have provided, Justice Fitzherbert came down firmly for limiting the soke:

To the corn mills, to the most part of them, belongeth Socone (soke)--that is to say, the custom of the tenants is to grind their corn at the lord's mill; and that is, me-seemeth, all such corn as groweth upon the lord's ground, and that he (the tenant) spendeth in his house. But if he buy his corn in the market or other place, he is then at liberty to grind where he may be best served.¹⁰⁵

Whether the obligation to grind grain at the lord's mill (coupled with confiscatory tolls) was a more enforceable version of a land rent, or whether it was an additional device for enriching the landlord at the expense of the tenant may not be terribly important for present purposes. Both hypotheses are consistent with the proposition that distributional rather than technological considerations dominated the choice of milling technique. In arguing for this proposition Bloch finds it significant that "All the (water) mills whose history we can more or less follow were in fact seigniorial in origin."¹⁰⁶

...where--as in Frisia--the community was exceptional in managing to avoid being stifled by seigniorial authority, the peasants only took advantage of their liberty to remain obstinately faithful to their own individual mills. They were not prepared to come to a friendly agreement with one another and adapt technical progress to their own requirements.¹⁰⁷

¹⁰⁴ Ibid., chapter 9.

¹⁰⁵ Quoted in Bennett and Elton, op. cit., p. 242. By the time of Henry VIII, feudal institutions had begun to decay and it is hard to decide between the hypothesis that the learned justice's remarks reflects this decay and the hypothesis that the milling soke was bound up with land rent.

¹⁰⁶ Bloch, op. cit., p. 151.

¹⁰⁷ Ibid., p. 151.

Presumably the lord, as he gained power, would have been content to allow peasants to continue with their handmills if he could have extracted milling dues independently of milling technique. Thus, at certain places and times, the lords "did not so much claim to suppress (handmills) as to make the use of them subject to the payment of a due."¹⁰⁸ But enforcement must have posed the same problems it later did for the putting-out master. It must have been extremely difficult to prevent the peasant from "embezzling" the lord's "rightful" portion of grain if the milling operation took place within the peasant's own house. Bloch mentions the "lawsuits which grimly pursued their endless and fruitless course, leaving the tenants always the losers"¹⁰⁹--but at great expense of time, effort, and money to the lord as well. Moreover,

In the countryside, seignorial authority, harassing though it was, was very poorly served. It was therefore often incapable of acting with that continuity which alone would have made it possible to reduce the peasants, past masters in the art of passive resistance, to complete submission.¹¹⁰

Just as later the master manufacturer's "thoughts turned to workshops where the men could be brought together to labor under the eyes of watchful overseers," so must the feudal lord's thoughts have turned to a centralized water mill where grain would be ground under the watchful eyes of his bailiffs. Essential therefore to the triumph of the water mill was not only a monopoly of the sources of water power, but an absolute prohibition against the use of hand mills--the establishment of the soke.

A very great piece of luck enables us to see the monks of Jumièges, in an agreement dated 1207, breaking up any handmills that might still exist on the lands of Viville. The reason is no doubt that this little fief, carved out of a monastic estate for the benefit of some high-ranking sergent of the abbot, had in fact escaped for a long period the payment of seignorial dues. The scenes that took place in this corner of the Norman countryside under Philip Augustus must have had many precedents in the days of the last Carolingians or the first Capetians. But they escape the meshes of the historian's net.¹¹¹

¹⁰⁸ Bloch, op. cit., p. 156.

¹⁰⁹ Bloch, op. cit., p. 157.

¹¹⁰ Ibid., p. 155.

¹¹¹ Ibid., p. 154.

At about the same time the milling soke was being explicitly incorporated into English milling rights. "'The men shall not be allowed to possess any handmills'--such was the clause inserted by the canons of Embsay in Yorkshire between 1120 and 1151, in a charter in which a noble lady made over to them a certain water mill."¹¹²

The struggle between the lord and peasant was hardly an equal one, and the history of grain-milling reflects this asymmetry: the handmill gradually disappeared from the scene. But when the peasant temporarily gained the upper hand, one of the first casualties was the lord's monopoly on grain-milling--and maybe the lord and the water mill for good measure. After recounting a half century of intermittent struggle between the people of St. Albans and the abbot who was their lord, Bloch nears the end of what he calls, without exaggeration a "veritable milling epic":¹¹³

...when in 1381 the great insurrection of the common people broke out in England and Wat Tyler and John Ball emerged as leaders, the people of St. Albans were infected by the same fever and attacked the abbey...The deed of liberation which they extorted from the monks recognized their freedom to maintain "hand-mills" in every home. The insurrection however proved to be like a blaze of straw that soon burns itself out. When it had collapsed all over England, the charter of St. Albans and all the other extorted privileges were annulled by royal statute. But was this the end of a struggle that had lasted over a century? Far from it. The (monastic) chronicler, as he draws to the close of his story, has to admit that for malting at any rate the detestable hand-mills have come into action again and have been again forbidden.¹¹⁴

What lessons do we draw from Bloch's account of the conflict between alternative milling techniques? Most important, it was not technological superiority, but the nature of feudal power and the requisites of enforcing that power that determined the replacement of handmills by water mills. It was not the handmill that gave us feudalism, but the feudal lord that gave us the water mill.

A model of feudalism that assumes a given distribution of power between master and man would naturally suggest that milling techniques should have been chosen on the basis of technological efficiency. But

¹¹²Bloch, op. cit., p. 157. Bennett and Elton denote a whole chapter to the institution of soke. Op. cit., chapter 8.

¹¹³Bloch, op. cit., p. 157.

¹¹⁴Ibid., p. 158.

such a model implicitly ignores the dynamic conflict between classes and the need of the controlling class to choose technologies that facilitate the exercise of its power. A static analysis of the choice between handmill and water mill, or of feudalism generally, is as far off the mark as an analysis of the choice between domestic and factory production or of capitalism generally, based on the neoclassical model of perfect competition. The key roles played by supervision and discipline--or, more generally, the exercise of power--in the determination of technology require models that are grounded in the challenge-response mechanism of class conflict, models at once dynamic and dialectic.

The collectivization of Soviet agriculture makes clear that efficiency is not necessarily the determinant of technology under socialism any more than under feudalism or capitalism. Stalin's arguments, to be sure, stressed the technological superiority of collective farming:

The way out (of the difficulties of the twenties) is to turn the small scattered peasant farms into large united farms based on the common cultivation of the soil, to introduce collective cultivation of the soil on the basis of new and higher technique. The way out is to unite the small and dwarf peasant farms gradually and surely, not by pressure but by example and persuasion, into large farms based on common cooperative cultivation of the soil, with the use of agricultural machines and tractors and scientific methods of intensive agriculture.¹¹⁵

A different rationale emerges from the account of even the most sympathetic of outside observers--for example, Maurice Dobb.¹¹⁶ The difficulty from which a way out was most urgently needed was not low agricultural output, but the mobilization of enough surplus grain to permit the Government both to maintain the level of real wage rates in industry and at the same time to launch an ambitious program of capital accumulation, which would require both exports to pay for imported machinery and expansion of employment in capital-goods producing industries. Under the New Economic Policy of the twenties, the Soviet Government's ability to impose on the peasants its own conception of the size of the agricultural surplus was limited to its control over the terms on which grain would be exchanged for industrial products.

¹¹⁵ Report to the Fifteenth Congress of the Communist Party of the Soviet Union, December 1927. Quoted in Maurice Dobb, Soviet Economic Development Since 1917, Fifth Edition, Routledge and Kegan Paul, London, 1960, p. 222.

¹¹⁶ Ibid., especially chapter 9.

Inadvertently, the Revolution had exacerbated the problem of mobilizing the agricultural surplus. In sharp contrast with the methods followed in reorganizing large-scale industry, the Revolution broke up large landholdings and maintained the principle of private property in agriculture.¹¹⁷ Until the collectivization drive at the end of the 1920's, grain production was overwhelmingly in the hands of kulaks, sredniaks, and bedniaks--rich, middle, and poor peasants. So when the dislocations of civil war were surmounted and production restored to pre-war levels, peasant producers controlled the allocation of grain between on-farm consumption and market sales. And just as the British workman of the eighteenth century wanted to take a significant portion of any increase in real income in the form of leisure, so the Russian peasant of the twentieth chose to eat better as he became the master of the grain formerly due the landlord. However desirable this was for the peasant, the results were disastrous for the rest of the economy. Grain production "was (in 1925-26) nearly nine-tenths of 1913; but the marketed surplus was less than one-half of the pre-war amount."¹¹⁸

Of course, the Soviet Government could and did levy taxes upon the peasant, but there remained the age-old problem of enforcement. Moreover the civil war had made the peasant-worker alliance politically essential, which, as Lenin told the Tenth Party Congress in 1921, posed certain constraints on agricultural policy:

The interests of these classes do not coincide: the small farmer does not desire what the worker is striving for. Nevertheless, only by coming to an agreement with the peasants can we save the socialist revolution. We must either satisfy the middle peasant economically and restore the free market, or else we shall be unable to maintain the power of the working class.¹¹⁹

As long as the market remained the principal means of mobilizing an agricultural surplus out of the countryside, the Government could do little more than manipulate the terms of trade. The debate that ensued

¹¹⁷According to official Soviet figures, less than two percent of total grain production was accounted for by state and collective farms in 1926-27, ibid., p. 217.

¹¹⁸Ibid., p. 214.

¹¹⁹Quoted in Dobb, ibid., p. 130.

between the proponents of high prices for agricultural goods (to coax out the surplus) and those who favored low prices (to minimize the costs in terms of industrial goods of mobilizing the surplus) was, alas, largely beside the point. Against the argument for high prices was first of all the possibility that no price policy would have coaxed out enough grain both to maintain the urban real wage and to launch an ambitious program of capital accumulation. The supply curve for grain under small-holder agriculture could, like the supply curve of labor under the putting-out system, have both forward-sloping and backward-bending ranges; there may simply have been no terms of trade at which the peasant would have freely parted with enough grain to allow the Government both to pay for imports and to feed a work force swelled by the addition of workers building machines and factories, dams and highways--without sharply reducing the real wages of all workers. But even if sufficiently high relative prices would have coaxed out adequate supplies of grain, the cost in terms of industrial consumer goods, domestic or imported, would probably have made capital accumulation all but impossible--save by a reduction in the real wage. Low agricultural prices were no solution, however. For, beyond a certain point at least, lower prices would simply encourage peasants to eat more and sell less.

Faced with this dilemma, the Soviet authorities could have sacrificed either capital accumulation or the real wage. But in the twenties, at least, the Revolution was not sufficiently secure to permit a conscious policy of reducing real wages, whatever the convictions of the leaders.¹²⁰ As a result, capital accumulation suffered. Thus it was that

the apparent gap in urban consumption which (the) shortage of marketed grain supplies occasioned was met by reducing the export of grain, which even in the peak year of the post-war period did not exceed a third of its pre-war quantity.¹²¹

And thus it was that "in the middle and late '20's, unemployment (skilled and unskilled) was large and was tending to increase."¹²²

¹²⁰Abram Bergson quotes a study based on Soviet statistics to the effect that real wages rose by eleven percent between 1913 and 1928. The Structure of Soviet Wages, Harvard University Press, Cambridge, 1944, p. 203.

¹²¹Dobb, op. cit., p. 214.

¹²²Ibid., p. 189.

The decision, towards the end of the decade, to double or triple the rate of capital accumulation over a period of five years--the goal of the "minimal" and "optimal" variants of the First Five Year Plan¹²³--required either a policy aimed at reducing the industrial wage rate (though not the wage bill) or a policy designed to reduce total consumption in the countryside.¹²⁴ To reduce industrial wages would have undermined the support of the most revolutionary class--the proletariat. Besides, such a policy would surely have made it more difficult to recruit new entrants to the industrial labor force once the initial backlog of unemployment had been overcome.¹²⁵ This left no choice but to break the peasants' control over the disposition of agricultural production. It is hard not to agree with Dobb's conclusion: "Collective farming was (an) expedient for solving the difficulty of supplying agricultural produce to an expanding (industrial) population."¹²⁶ With collectivization, the Government at last determined not only the terms of trade, but the quantities of agricultural and industrial products flowing between the countryside and the city.

The economic problem posed by peasant ownership of land was, in short, not one of insufficient production, and not necessarily one of a surplus insufficient for feeding the nonagricultural population. It was rather that land ownership gave the peasants too strong a voice in determining the rate of capital accumulation. "New and higher technique" was no more the basis of collective farming than it was, centuries earlier, of the water mill. Had technological superiority rather than control of the surplus really been the basis of collectivization, the

¹²³Ibid., p. 236.

¹²⁴It was not necessary to reduce the average standard of living, as the Plan's provision for increased total consumption makes clear. That part of the labor force that was unemployed or underemployed in the twenties would receive employment and wages as a result of the expansion envisioned in the Plan, and the improvement in their standard of living could more than make up for the deterioration of the standard of living imposed on everybody else, both in terms of distributive justice and statistical averages.

¹²⁵Whatever reductions in real wages accompanied the First Five Year Plan were probably, as Dobb says, the unforeseen result of the resistance of peasants to collectivization and the consequent reduction in agricultural output. Ibid., p. 237.

¹²⁶Dobb, op. cit., p. 225.

Soviet Government would have had no more reason to renege on Stalin's promise to rely on "example and persuasion" to bring the peasants aboard¹²⁷ than the feudal lord had to outlaw the handmill in order to ensure the success of the water mill.

A due regard for the role of economic power and the institutional constraints on the use of power are as important to understanding socialist economic development as to understanding the development of earlier economic systems. Under socialism (at least in its Soviet strain), no less than under feudalism and capitalism, the primary determinant of basic choices with respect to the organization of production has not been technology--exogenous and inexorable--but the exercise of power--endogenous and resistible.

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¹²⁷Compare Dobb, ibid., pp. 228-229.