Towards a Marxist accounting history of the British Industrial Revolution: a review of evidence and suggestions for research*

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Abstract

Historians offer competing explanations of the origins and significance of the ‘British Industrial Revolution’ (BIR), the rapidly increasing use of factories and machines in key sectors of the economy from around the middle of the eighteenth century. Many attempt to avoid either economic or technological determinism by invoking the attitude of the ‘entrepreneur’, the ‘businessman’, or the ‘industrialist’ to explain the BIR, but without clearly defining what these terms mean. The paper uses accounting to explain and support Marx’s theory that underlying the BIR was the capitalist mentality that became dominant from the mid-eighteenth century. This mentality was revolutionary because it demanded control of the ‘valorization process’, that is, control of production to maximize the rate of return on capital employed. The paper argues that growing evidence of modern management accounting by many leading firms during the BIR is evidence of Marx’s capitalist revolution. It reinterprets the well-known case of Boulton and Watt (BW) to illustrate Marx’s theory and to challenge Fleischman, Hoskin and Macve’s (1995) view that its accounting shows that BW did not have the modern management mentality. It argues that the primary cause of variations in the modernity of accounting during the BIR was variations in Marx’s ‘social relations of production’, the degree to which labour had an independent means of subsistence and capitalists pooled their capital. The paper concludes that by testing Marx’s theory against the large archive of accounts and business records surviving from the eighteenth and nineteenth centuries, accounting historians can make an important contribution to the continuing debate on the BIR.

“Technology discloses man’s mode of dealing with Nature, the process of production by which he sustains his life, and thereby also lays bare the mode of formation of his social relations, and of the mental conceptions that flow from them” (Marx, 1996, p.375).

Between around the middle of the eighteenth century to around the middle of the nineteenth century Britain changed from still an essentially agricultural society to an industrial society serving large domestic and international markets. The British population grew rapidly from the beginning of the eighteenth century, but from 1800 to 1850 it doubled. Large-scale organisations appeared using machines in mining, iron, and textiles, and output soared. Coal output increased from 3 million tons in 1700 to 50 million tons in 1850. Cotton spindles in use rose from around 2 million in 1788 to 20 million in 1850. Blast furnaces increased from 17 in 1760 to 215 in 1806.¹ Labour productivity increased over the economy as a whole; in particular industries the increases were spectacular. Already well provided with ports, canals, and rivers, Britain’s transport system improved with sustained private investment in turnpikes, canals and other improvements, capped by railways from the 1830s, lowering costs and widening supply and final markets. The government raised unprecedented loans to finance and win its greatest ever war against the French. The question addressed by this paper from an accounting historians’ perspective is whether these (and many other

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¹ See Fleischman and Parker (1997, p.4) for the sources of these statistics.
related) changes are signs of an ‘industrial revolution’, a fundamental change in the nature of productive activity and society that led to the modern world of business?

Economic historians engaged in much soul-searching upon discovering that contrary to the conventional wisdom Britain probably did not achieve a particularly rapid increase in overall economic growth rates during the later eighteenth and early nineteenth centuries (Mokyr, 1999). Nevertheless, most continue to believe some kind of revolution occurred from around 1760 to 1830 that changed forever the trajectory of world economic growth. They often agree that the revolution began with seminal technological changes in a number of industries over this period. Unfortunately, they agree about little else. In particular, no-one has yet proposed a generally accepted explanation of the origins of Britain’s apparently unique abilities in continuous technological innovation. Conventional economic historians often rely heavily on technological determinism. This is the idea that “there is an inherent logic to technological change, which is governed by the law (condition) of minimization of inputs; or, conversely, of maximization of outputs” (Landes, 1986, p.620). However, as “[t]echnological determinism does not enjoy a great reputation among scholars”, we must formulate and test “reasonable hypotheses as to why and how...Britain...was a technologically creative society” (Mokyr, 1999, p.18). There are many reasonable hypotheses. Historians argue in effect that Britain had the ‘right kind’ of geography, history, science, society, government, foreign trade, industrial organisations, etc. After a lengthy debate all that seems clear is that “Britain taught Europe [sic] and Europe taught the world how the miracles of technological progress, free enterprise, and efficient management can break the shackles of poverty and want” (Mokyr, 1999, p.127). The question addressed here is not whether these ‘miracles’ happened, but the justification for calling the period from 1750 to 1850 an ‘industrial revolution’, an identifiable historical event equal in its impact and its irreversibility as, for example, the French Revolution? To answer this question the paper proposes a new reading of Marx’s theory of the industrial revolution and tests it using published evidence of the spread of modern industrial cost accounting. It argues that this evidence supports Marx’s view that the BIR was the product of a revolutionary new mentality - the modern capitalist mentality - that was both a product and a motor of history.

Historians often say that Marx has had a profound influence on the study of history (e.g., Hobsbawm, 1997; Rigby, 1998), but even his supporters rarely follow his advice to start their history from a clear understanding of capitalism. Marx based his history on the principle that “Capital...the all-dominating economic power of bourgeois society...must form the starting point as well as the finishing point” (1973, p.105). Historians often do press the “capitalist” into service to explain industrial change (e.g., Pollard, 1965; Marglin, 1976; Landes, 1986; Berg, 1990), but most prefer to write of the “businessman”, “industrialists” or “entrepreneurs” (Mathias, 1969; Crouzet, 1985). Regardless of the words they choose, historians never clearly define what they mean by a “capitalist”, a “businessman”, etc., or what it means to have a “businesslike (etc) attitude”. They usually say it is a “money-making” or “commercial” attitude, a “responsiveness” to the market. These inherently vague and potentially misleading views reveal that what is missing from their intellectual toolkit is any deep understanding of accounting or its history (Parker, 1987, Hudson, 1977, Edwards, 1987).
Accounting is a hallmark of capitalism. It is central to understanding Marx’s labour theory of value, his analyses of the circuits of industrial capitalism and his theory of the transition to capitalism (Bryer, 1999a; 1999b; 2000a, 2000b, 2002). It is central to Weber’s sociology of the ‘spirit’ of capitalism. We can use it to precisely define ‘the capitalist’ and to test Marx’s theory of the BIR.3 That is, we can explain the BIR by reconstructing the calculative mentalities of farmers, landlords, merchants, manufacturers and industrialists - their ideas of the ends and means of economic activity - by analysing changes in the ways they kept and used accounts in the context of changing social relations.

Part one of the paper explains Marx’s theory of the BIR as a history of calculative mentalities. It shows that for Marx the capitalist mentality was revolutionary because it demanded and took control of the process of producing surplus value - what he calls the ‘valorization process’ - by employing labour-saving factories and machines. Part one concludes, contrary to the views of prominent and otherwise sympathetic economic historians such as Berg (1994) and Marglin (1976), that Marx’s history of the manufacturing and industrial revolutions is neither economically nor technologically determinist, and that we can test it using accounts. In part two the paper reviews the growing evidence of modern management accounting by many leading firms and argues it supports Marx’s view that by the late eighteenth century the BIR was a deeply rooted capitalist revolution. In part three the paper re-analyses the well-known case of Boulton and Watt (BW). It reviews the Foucauldian conclusion of Fleischman, Hoskin and Macve (1995) that BW’s mentality was pre-modern because its accounts did not exert a continuous ‘disciplinary gaze’ on labour. It argues that the published accounting evidence supports Roll’s (1930) conclusion that at the end of the eighteenth century BW’s management of its Soho factory was fully modern; in Marx’s terms, that BW’s mentality was fully capitalist. Part four tackles the question of explaining variation in the modernity of accounts during the BIR and suggests avenues for research to fully test Marx’s theory. It reviews the accounts of the New Mills (Haddingtonshire, formed in 1681), The New Lanark Cotton Factory (1800 to 1812), and the Carron Company (formed in 1759). It argues that these cases illustrate how we can explain variations in the sophistication of accounts by variations in the social relations of production. The paper concludes that we can, therefore, use accounting history to test Marx’s theory that the BIR was the victory of the capitalist mentality in shaping production to its vision. It follows that accounting historians can make an important contribution to the debate on the origins and significance of the BIR.4

Part one: Marx’s history of the capitalist mentality and the BIR

Marx argued that modern industrial society emerged from a transition from the feudal to the capitalist mode of production. A society’s mode of production combines its ‘forces of production’ - the material and human means of production available - and its ‘social relations of production’. The social relations of production are the relations of economic superiority and subordination; the way the owner of the means of production

3 When Marx writes of ‘the capitalist’ he refers not to individuals but to representatives of the social capital, the capitalist class. The paper talks of ‘the capitalist’ in this sense.

4 Only such ambitions justify the title ‘accounting history’ to set our discipline alongside economic history or political history, etc., rather than the ‘history of accounting’, that could imply only a concern with the history of ideas.
extracts surplus value from labour. This makes accounting central to understanding and testing Marx’s theory because underlying each way of extracting surplus is a particular calculative mentality and mode of accountability (Bryer, 2000a). The feudal mentality pursued the direct appropriation of surplus labour (labour itself, commodities or cash) and feudal landlords and merchants kept income and expenditure accounts that reproduced this social reality. The capitalist mentality pursues the rate of return on capital employed by extracting surplus value from the sale of commodities or services produced by wage labour, and the capitalist keeps balance sheets and profit and loss accounts. We can use this correspondence to explain and test Marx’s theory of the BIR. First, therefore, we must explain his theory as a history of the capitalist mentality - as a testable accounting history.

Marx’s theory is a two-step transition from the feudal to the capitalist mentality that we can observe as the transition from the feudal to the capitalist mode of accounting. Step one is from the feudal to a transitional, ‘semi-capitalist’ mentality and mode of accounting. Step two is from the semi-capitalist to the modern capitalist mentality and accounting. Figure 1 summarises the accounting signatures we should see according to Marx:

<table>
<thead>
<tr>
<th>Calculative Mentality</th>
<th>Feudal</th>
<th>Semi-capitalist</th>
<th>Capitalist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting Signature</td>
<td>Consumable Surplus (CS)</td>
<td>CS --------------- Opening Capital</td>
<td>Profit --------------- Capital Employed</td>
</tr>
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Marx’s capitalist epoch begins in the mid-sixteenth century when some farmers undertake enclosures, employ wage labour and thereby become semi-capitalists. They were semi-capitalists because although like modern capitalists these farmers focused on the exploitation of labour in production, they also continued to maximize feudal surplus - the excess of income over expenditure. Marx says these farmers were only “formally” capitalists because they made no attempt to change the mode of production. Semi-capitalists also appear in trade with the first joint stock companies. These enterprises are the first to pursue a rate of return on capital. However, they are also only semi-capitalists because they do not pursue the rate of return on capital employed in production - in Marx’s theory, the accounting signature of the modern capitalist mentality. These semi-capitalist merchants pursued the feudal rate of return, feudal surplus (the consumable surplus of commodities or cash) divided by the initial capital advanced.

The modern capitalist mentality is the product of the different semi-capitalist mentalities that emerged in agriculture and trade. In agriculture, the mentality of the feudal and semi-capitalist landlord and farmer focused on the exploitation of labour in production. In trade, the semi-capitalist merchant focused on the feudal rate of return on capital. The fusion of these mentalities starts from the middle of the sixteenth

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5 Always remembering that, as Marx put it, “epochs in the history of society are no more separated from each other by hard and fast lines of demarcation, than are geological epochs” (1996, p.374).
century as landed and mercantile interests pool their wealth in privateering ventures, for exploration and international trade. Marx says that for the capitalist mentality to appear in production the peasants had to become “free” wage labourers and face “free” or socialised capital. Peasants were ‘freed’ from their land by enclosures that, with parliamentary backing, reach a new intensity in the second half of the eighteenth century, completing a process that began in the sixteenth century. Marx argues that a ‘bourgeois revolution’ in the mid-seventeenth century freed overseas merchant capital from feudal control by a few big magnates into the hands of socialised capital. Capital from the land flowed into trade and capital from trade flowed back onto the land bringing with it the rate of return mentality. Harnessing the merchant’s rate of return mentality to the landlord’s and farmer’s mentality of exploiting labour in production gave us the modern capitalist mentality of seeking the rate of return on capital employed. Marx says the modern capitalist mentality was revolutionary because it drove farmers, landlords, manufacturing entrepreneurs and ultimately, from the early nineteenth century, managers, to constantly ‘improve’ the process of production; to continuously increase labour productivity. Uniquely, Marx says, modern capitalists preoccupy themselves with the ‘real subsumption’ of labour, that is, with controlling and changing the process of production to increase the return on capital employed. Marx thought that a significant class of modern capitalist farmers appeared between the last third of the seventeenth century and the first half of the eighteenth century. Joining them in increasing numbers from the mid-eighteenth century were capitalist landlords who take up and promote capitalist farming among their tenants, some becoming involved in various industrial enterprises, particularly mining. Marx’s history of the BIR, therefore, begins with capitalist farmers, landlords and trade:

“The history of landed property, which would demonstrate the gradual transformation of the feudal landlord into the landowner, of the hereditary, semi-tributary and often unfree tenant for life into the modern farmer, and of the resident serfs, bondsmen and villeins who belonged to the property into day labourers, would indeed be the history of the formation of modern capital. It would include within it the connection with urban capital, trade, etc.” (Marx, 1973, pp.252-253).

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6 The terms socialised and social capital describe an empirical continuum of the social nature of capital from recognisably social to fully social, what Marx called ‘total social capital’. Socialised and social capital are both pooled. Socialised capital involves pooling across a limited number of investors for limited purposes. This capital becomes social by losing its identity with its owner, but with socialised capital there are restrictions on who can invest in the capital and its purposes - on the transferability and the uses of capital. For example, a partnership where entry of a new partner requires the agreement of the other partners. By contrast, at its upper limit fully social capital involves pooling across all investors and all investments. All members of an investing society can participate in a social capital; the capital is freely usable for any lawful business and is freely transferable - for example, marketable government debt and listed shares. Here the identity of the owner with the functioning of capital disappears and the social restrictions are minimal.

7 Bryer (2000b, pp.342-369) provides a detailed analysis of the accounting history of the English East India Company that provides evidence consistent with Marx’s bourgeois revolution.

8 In the eighteenth century the word improvement meant investment (usually in agriculture) for profit. In 1750 to ‘improve’ meant ‘To enhance in monetary value’ (Shorter Oxford English Dictionary on Historical Principles, 1973). As Mingay says, “when landlords spoke of ‘improvement’, it was usually an ‘improved rental’ they had in mind” (1963, p.172).
All this history is a prelude to Marx’s ‘industrial revolution’. In particular, he clearly thought that the BIR would not have happened if English landlords had not become capitalists:

> “Although capital can develop itself completely as commercial capital without th[e] transformation of landed property it cannot do so as industrial capital” (Marx, 1981, p.277).

He gives two reasons. First, capitalist landlords led in the creation of wage labour. As he put it, “There can be no doubt that wage labour in its classic form, as something permeating the entire expanse of society, which has replaced the very earth as the ground on which society stands, is initially created only by landed property, i.e., by landed property as value created by capital itself” (Marx, 1981, pp.276-277). By ‘value created by capital itself’, Marx means that capitalist farmers created capitalist landlords (Bryer, 2001). As he puts it, “the farmer turns capitalist before capitalists become farmers” (Marx, 1969, p.17) - ordinary farmers become capitalists before merchants and landlords become capitalist farmers. Second, the conversion of landlords to capitalism was a precondition for the wholesale conversion of farmers and industrialists to the capitalist mentality. To become a capitalist the landlord “needs only to transform his workers into wage workers and to produce for profit instead of for revenue”, that is, change his mentality to produce for capitalist profit instead of feudal rent. Through an accelerated programme of enclosures and other measures, capitalist landlords (both as individuals and as the government) actively turned sporadic and isolated appearances of wage labour and capitalist attitudes into wage labour as the common form of work and widespread acceptance of the capitalist mentality (Bryer, 2000d). With the capitalist mentality embraced by the highest reaches of society, the process of subjecting all production to its mentality could begin in earnest. As the capitalist control of production gave an economic advantage, once the industrial revolution began it quickly spread:

> “capitalist production has a tendency to take over all branches of industry not yet acquired and where only formal subsumption obtains. Once it has appropriated agriculture and mining, the manufacture of the principal textiles, etc., it moves on to other sectors” (Marx, 1976b, p.1036).

Figure 2 summarises Marx’s history:
Marx’s manufacturing and industrial revolutions

As the capitalist mentality spreads in farming it also spreads in industry because farmers were the first ‘industrialists’. “Originally, agricultural labour and industrial labour are not separate: the second is an appendage of the first” (Marx, 1981, pp.770-771). Entwined in the appearance of capitalist agriculture, therefore, is Marx’s “manufacturing period” that runs from the middle of the sixteenth century to the last third of the eighteenth (Marx, 1976b, p.455). By manufacture Marx means both putting-out systems and handicraft manufacturing workshops. As in farming, capital in manufacture first appears “in its still undeveloped (medieval forms)” (1986, pp.432, 208). Although “capitalist production only...really begins...when each individual capital employs simultaneously a comparatively large number of labourers”, even large-scale manufacture in workshops “is hardly to be distinguished, in its earliest stages, from the handicraft trades of the guilds” (Marx, 1996, pp.326-327). At first, manufacturing capital only formally subsumes labour. Only as the modern capitalist mentality spreads in agriculture from the late seventeenth century does it invade putting-out and manufacture. Marx says that “[e]arly in the manufacturing period, the principle of lessening necessary labour time in the production of commodities, was accepted and formulated” (1996, p.353), but his authorities - Petty (1667, 1682, 1699), Bellers (1696) and Yarranton (1720) - are from the late seventeenth and early eighteenth centuries. Perhaps, therefore, from as early as the sixteenth century, but particularly during the later seventeenth century and for most of the eighteenth, capitalists develop the division of labour in putting out and in the manufactory workshop. In the sixteenth and early seventeenth centuries capitalist manufacturers reap only the benefits of ‘simple co-operation’, the increased productiveness of the collective worker, “the socially productive power of labour as a free gift to capital” (Marx, 1976b, p.451). Before long, however, the capitalist mentality seeks to turn traditional production systems into methodical means of generating profit:
“Co-operation based on the division of labour, in other words, manufacture, commences as a spontaneous formation. So soon as it attains some consistence and extension, it becomes the recognised, methodical and systematic form of capitalist production” (Marx, 1996, pp.368-369).

“In its specific capitalist form - and, under the given conditions, it could not develop in any other form than a capitalistic one - the division of labour in manufacture is merely a particular method of begetting relative surplus value” (1996, p.369).

The ‘given conditions’ are increasing numbers of wage workers and the increasing socialisation of capital in the late seventeenth century. Relative surplus value - the ratio of surplus value to wages - underlies the accounting rate of return on capital and is for Marx the defining element of the modern capitalist mentality (Bryer, 2000a; 2002).9

Marx argued that the capitalist labour process has a “twofold form” involving not only use-values and exchange values, but ‘capital’. All production is the physical production of use-values by use-values, “concrete labour in the use-values of commodities” (Marx, 1976, p.992). However, as production is primarily a social activity - in capitalism the production and realisation of “socially necessary labour as calculated in exchange value” (Marx, 1976, p.992) - we must understand the labour process as the unity of “the material [or technical] elements of the labour process” and the “valorization process” whereby capital controls labour to produce and realise surplus value:

“The production process, considered as a unity of the labour process and the process of creating value, is the process of production of commodities; considered as the unity of the labour process and the process of valorization, it is the capitalist process of production, or the capitalist form of the production of commodities” (Marx, 1976, p.304).

At first, although manufacturing capital circumvents the guilds and expands and refines the age-old system of putting-out, this only allows it to control the product of labour - the commodity - and not the valorization process. This is what Marx means when he says that at first capitalists only formally subsume labour:

“The simplest form, and the one most independent of the division of labour, is that in which capital employs a number of hand-weavers, spinners, etc., independent of and living separately from one another.... Therefore, at this

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9 According to the labour theory of value, “The rate of profit is...determined by two factors: the rate of surplus value and the value composition of the capital” (Marx, 1981, p.161). In symbols:

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\frac{p}{C} = \frac{\text{s}}{\text{v}}\times \frac{\text{v}}{\text{c+v}}
\]

p = profit = s = surplus value,
C = total capital employed (c + v),
c = constant capital, and
v = variable capital.
stage, the mode of production itself is not yet determined by capital, but is found by it already in existence. The unifying focus of these scattered workers is solely their mutual relation to capital, the fact that their product, and hence the surplus value they produce over and above their own income, are accumulated in the hands of capital. As associated labour, they exist only in themselves, in so far as each of them works for capital and thus possesses a centre in it, without really working together. Their association by capital is merely formal, and concerns only the product of labour, not labour itself. Instead of exchanging with many, they exchange with the one capitalist. Capital therefore effects a concentration of exchanges” (1986, p.506).

The capitalist putter-out develops the social and technical division of labour, but can never control the process of producing surplus value. Capitalist development of putting out, therefore, cannot be the revolutionary path forward:

“The transition from the feudal mode of production takes place in two different ways. The producer may become a merchant and capitalist…. This is the really revolutionary way. …The industrialist becomes a merchant and produces directly on a large scale for the market. …Alternatively, however, the merchant may take direct control of production himself… - for example the English clothier of the seventeenth century, who brought weavers who were formerly independent under his control, selling them their wool and buying up their cloth” (Marx, 1981, pp.452, 454).

The revolutionary change occurs when the producer collects workers together in a factory and sets out to produce a mass of commodities for the market. This way is revolutionary because the producer owns the means of production including the necessary labour power and can, therefore, use this foundation to seek to control the process of producing surplus value. The merchant putter-out can never control production and thus faces an insurmountable barrier to maximizing the return on the capital employed. Hence, Marx’s thought, “[p]roductive capital, or the mode of production corresponding to it, can only take two forms: manufacture or large-scale industry” (Marx, 1986, p.305). In the manufacturing workshop under formal subsumption the independent artisan controlled both the material and the valorisation processes of production. At first, therefore, only “[a]bsolute, not relative, surplus time predominates in manufacture” (Marx, 1986, p.508). Nevertheless, whereas in simple cooperation like putting out the capitalist “leaves the mode of the individual’s labour for the most part unchanged”, in the manufacturing workshop - through increasing the division of labour and eventually by using factories and machines - the capitalist “seizes labour power by its very roots” (Marx, 1996, p.365). Ultimately, that is, the capitalist seize control of the valorization process. Figure 3 below outlines Marx’s history of the labour process from classical antiquity to capitalism. The focus in this paper is the historical accounting correlate of Marx’s theory of the real subsumption of labour, of surplus value.
The essential difference between slavery and feudalism is that whereas the master must directly control all the slave’s labour to extract a surplus of use-values, the feudal landlord’s agents and peasants were accountable only for surplus labour, for various forms of feudal rent (Bryer, 1994b). The essential similarity was that both slave and serf were ultimately personally and if necessary physically accountable for their labour. In England, the landlord charged the steward personally with the incomes received, and discharged accountability for expenditures and disbursements judged by the lord and the auditors to be necessary. In capitalism by contrast the “*mode of compulsion* [is] not based on personal relations of domination and dependency, but simply on differing economic functions” (Marx, 1976, p.1021). Labour becomes controlled by means of “an *economic* relationship of supremacy and subordination, since the consumption of labour-power by the capitalist is naturally supervised and directed by him” (Marx, 1976, p.1026). The transition is in the mode of accountability for labour - from a directly coercive patriarchal, political or even a religious relationship, to “a *relationship of sale and purchase, a purely financial relationship*”. This relationship “is objective in nature, voluntary in appearance, *purely economic*” (Marx, 1976, pp.1027-1028). Their objective condition as free wage-labour in the labour market, free of all possessions except labour power to sustain itself, imposes economic control on workers because “[w]hat brings the seller into a relationship of dependency is solely the fact that the buyer is the owner of the conditions of labour”; “*capital*[i]s the monopoly…buyer of his labour power”(Marx, 1976, pp.1025-1026). The landlord sought direct control over his steward and peasants, but the worker is nominally a “free agent”, free to act in his or her own interests (for example, slacking). However, unlike the slave who has a master or the serf who has a lord to directly control their labour, the free worker “*learns to control himself*” (Marx, 1976, p.1033). With no other means of subsistence,

“The free worker…is impelled by his wants. The consciousness (or better: the idea) of free-self-determination, of liberty, makes a much better worker…, as does the related feeling (sense) of responsibility; since he, like any sellers of wares, is responsible for the goods he delivers and the quality which he must provide, he must strive to ensure he is not driven from the field by other sellers of the same type as himself. The continuity in the relations of slave and slave-owner is based on the fact that the slave is kept in his situation by direct compulsion. The free worker, however, must maintain his own position, since
his existence and that of his family depends on his ability continuously to renew the sale of his labour-power to the capitalist” (Marx, 1976, p.1031).

Labour under capitalism was only voluntary in appearance because behind the drive of economic necessity stood aggressive employers and a state willing to underpin their economic freedom. To E.P. Thompson this transition reveals

“something of the truly catastrophic nature of the Industrial Revolution, as well as some of the reasons why the English working class took form in these years. The people were subjected simultaneously to an intensification of two intolerable forms of relationship: those of economic exploitation and of political oppression. Relations between employer and labourer were becoming both harsher and less personal. …For most working people the crucial experience of the Industrial Revolution was felt in terms of changes in the nature and intensity of exploitation” (1968, pp.217-218).

Following the formal subordination of labour to the market, “[w]ithin the production process…two developments emerge” (Marx, 1976, p.1026). The first was that

“labour becomes far more continuous and intensive, and the conditions of labour are employed far more economically, since every effort is made to ensure that no more (or rather even less) socially necessary time is consumed in making the product - and this applies both to the living labour that is used to manufacture it and to the objectified labour which enters into it as an element in the means of production” (Marx, 1976, p.1026).¹⁰

In other words, these early capitalists worked their labour harder and more efficiently, but, initially, feudal accountability continued:

“As regard capital in the context of the formal mode of subsumption, its productivity consists in the first instance only in the compulsion to perform surplus labour. This compulsion is one which it shares with earlier modes of production, but in capitalism is more favourable to production” (1976, p.1054).

To get the workers to work harder the early capitalist continued to rely on the traditional compulsions - on authority and supervision - but now also drew upon the compulsion of the labour market. More fundamentally, Marx says that capitalism is also more favourable to production because the “material conditions of labour are not subject to the worker, but he to them. Capital employs labour” (Marx, 1976, p.1054).

Initially, the manufactory is “merely an enlargement of the workshop of the master craftsman of the guilds” (Marx, 1976b, p.439), but the vital difference is that the owner is now a capitalist. Even from the beginning, therefore, capitalist manufacturers seek relative surplus value and “within certain limits” they succeed (Marx, 1996, p.327). They economise on the means of production by using them collectively; they increase the productivity of labour and cheapen production by ever finer divisions of labour and

¹⁰ Bryer (2002) argues that this effort to ensure that commodities contain no more than their ‘socially necessary labour time’ is central to modern management accounting.
closer supervision of production. However, “During the manufacturing period proper, i.e. the period in which manufacture is the predominant form taken by capitalist production, many obstacles are opposed to the full development of the peculiar tendencies of manufacture” (Marx, 1996, p.372). In particular, “Since handicraft skill is the foundation of manufacture, and since the mechanism of manufacture as a whole possesses no framework apart from the labourers themselves, capital is constantly compelled to wrestle with the insubordination of the workmen” (Marx, 1996, pp.372-373). To provide the framework within which the capitalist could control the valorisation process, Marx argues capitalists wrestle with workers using factories and machines and by other means including, we suggest below, accounting.

The capitalist manufacturer initially increased absolute surplus value by lengthening and intensifying the working day and cutting wages and other costs, but had limited success in increasing relative surplus value, that is, decreasing the proportion of labour costs in the socially necessary cost of production. Marx says the technological breakthroughs of the second half of the eighteenth century removed the handicraft basis of production in key sectors fatally undermining worker resistance to capitalist control of the valorization process. The capitalist mentality told the manufacturer that the way forward was to

“assemble [workers]...in one place under its command, in one place of work, no longer letting them continue in the previously existing mode of production and establishing its power on that basis, but rather creating as basis a mode of production corresponding to itself. It posits the combination of workers in production, a combination which at first will be confined to a common place of work, under their direction of overseers, regimentation, greater discipline, consistency, and a posited dependence on capital in production itself” (1986, pp.506-507).

In reality, however,

“manufacture was unable, either to seize upon the production of society to its full extent, or to revolutionize that production to its very core. It towered up as an economic work of art, on the broad foundation of the town handicrafts and the rural domestic industries. At a given stage of its development, the narrow technical basis on which manufacturing rested came into contradiction with requirements of production that were created by manufacture itself” (Marx, 1996, p.373).

The catastrophic resolution of this contradiction for the English working class using factories and machines - one inherent in creating “a productive mechanism whose parts are human beings” - is Marx’s ‘industrial revolution’:

“Like every other instrument for increasing the productivity of labour, machinery is intended to cheapen commodities, and, by shortening that portion of the working day in which the labourer works for himself, to lengthen the portion that he gives, without equivalent, to the capitalist. In short, it is a means for producing surplus value. ...All fully developed machinery consists of three essentially different parts, the motor mechanism, the transmitting
mechanism and finally the tool or working machine. …[T]he working machine…seize[s] upon…the subject of labour and modifies it as desired. The tool or working machine is that part of the machinery with which the industrial revolution of the 18th century started” (Marx, 1996, pp.343, 374, 376).

Machines and factories have existed since at least Roman times, and their use increased during the seventeenth century (particularly, the mill). However, only during the last half of the eighteenth centuries do machines “sweep away handicraftsmen’s work as the regulating principle of social production” (Marx, 1996, pp.373-374). Machines and factories shift the balance of power in favour of the capitalist because they do not simply help labour, they replace it: “[w]hat was the living worker’s activity becomes the activity of the machine” (Marx, 1976b, p.704). Marx and modern management control theorists agree that the importance of machines is that, besides the huge increases in labour productivity they gave - by replacing labour they avoid the need to control it. As Emmanuel, Otley and Merchant put it, “[o]ne avoidance possibility is automation. Computers, robots and other means of automation reduce the organization’s exposure to control problems because machines can be set to perform more consistently than human beings” (1990, p.111). In engineering, iron making and textiles, technological breakthroughs provided the necessary framework for capitalists to take control of production and increase labour intensity and productivity. For Marx, therefore, the development of machines is not “accidental…but is rather the historical reshaping of the traditional, inherited means of labour into a form adequate for capital” (1973, p.694). That is, machines and factories were weapons in the capitalist’s struggles to take control of the valorization process. Machines and factories shifted the balance of power from workers to capitalists such that the regulating principle changed from worker direction of production to capitalist direction of production. Thus, “the worker’s struggle against machinery” (1973, p.704) because

“Every kind of capitalist production, in so far as it is not only a labour process, but also a process of creating surplus value, has this in common, that it is not the workman that employs the instruments of labour, but the instruments of labour that employ the workmen. But it is only in the factory system that this inversion for the first time acquires technical and palpable reality” (Marx, 1996, p.426).

The inversion is the shift from worker domination of production when the capitalist controls only the commodity and wages, to capitalist domination of the material process of production and control of the valorization process. Factories and machines increase capitalist control of production as they place limits on the workers’ activities. In the vernacular of management control theory, they impose ‘action controls’ (e.g., Emmanuel, Otley and Merchant, 1990). As Marx says, when the capitalist uses machines, “[t]he worker’s activity, reduced to a mere abstraction of activity, is determined and regulated on all sides by the movement of the machinery, and not the opposite” (1973, p.693). The worker becomes part of a production process dominated by the movement of machines. Machines and factories constrain the worker’s activity and this tips the balance of power in favour of capital to the point that “[t]he production process has ceased to be a labour process in the sense of a process dominated by labour as its governing unity” (Marx, 1973, p.693). Capital now rules production because the worker has become a physical and an economic subordinate:
“the living (active) machinery…confronts his individual, insignificant doings as a mighty organism. In machinery, objectified labour confronts living labour within the labour process itself as the power that rules it; a power which, as the appropriation of living labour, is in the form of capital” (Marx, 1973, p.693).

Factories and machinery - objectified labour - confront the workers as use-values, as technical and palpable realities, and undermine their power. Objectified labour also confronts the worker as capital represented in accounts that provide the capitalist with an objective framework with which to control the valorization process (Bryer, 2002). Marx made clear his view that it was “pre-eminently in this sense - which pertains to the valorization process as the authentic aim of capitalist production - that capital as objectified labour (accumulated labour, pre-existent labour and so forth) may be said to confront living labour (immediate labour, etc.)” (1976b, p.994). The capitalist’s “aim is to produce not only a use-value, but a commodity; not only use-value, but value; and not just value, but also surplus value” (Marx, 1976b, p.293). Thus, when Marx says that under capitalism it is the ‘instruments of labour that employ the workmen’, he means their labour power is the property of capital, not that factories and machines directly control workers’ labour power. The workers control their labour power, the ability to do useful work, and capital must wrestle with them by using machines, factories and supervision to extract the “productive expenditure of human brains, muscles, nerves, hands, etc.” (Marx, 1976b, p.134), and shape it in its interests. Accounts, we argue in parts two and three, were central to this process. Under formal subsumption the workers become accountable to the capitalist, but only in its “simple form...[that] entails the personification of things and the reification...of persons” (Marx, 1976, p.1054). Here the capitalist does not hold workers accountable for capital in production, but only for the means of production and the production of commodities as ‘things’, that is, for use-values and exchange values. From this simple and transparent beginning, the accountability

“relationship becomes more complicated...and apparently more mysterious, with the emergence of the specifically capitalist mode of production. Here we find it is not only such things - the products of labour, both use-values and exchange values - that rise up on their hind legs and face the worker and confront him as ‘Capital’” (Marx, 1976, p.1054).

Under real subsumption the worker faces not only use-values and exchange values, but capital itself, that is, the management accounts (Bryer, 2002).

Capitalism is revolutionary because it seeks to increase labour productivity and labour intensity, but why does it do this continuously? Marx’s answer is that it does so because “the difference between absolute and relative surplus-value makes itself felt whenever there is a question of raising the rate of surplus value” (1976b, p.646). As markets become more competitive from the seventeenth century this question arises more often, and each time it does the “individual capitalist is spurred on to seize the initiative”:

“the capitalist who applies improved methods of production appropriates and devotes to surplus labour a greater portion of the working day than the other
capitalists in the same business. ...On the other hand, however, this extra surplus value vanishes as soon as the new method of production is generalized” (Marx, 1976b, pp.1023, 436).

By ‘extra surplus value’ Marx means positive residual income (Bryer, 2002). Although capitalists are tempted to raise surplus value by increasing absolute surplus value, “if the length of the working day is given, the rate of surplus value can be raised only...[by] a change in either the productivity or intensity of labour...[and] “industries already taken over continue to be revolutionized by changes in the methods of production” (Marx, 1976b, p.646). The purpose and result of capitalist control of production is the real subsumption of labour and with it come constant revolutions in the process of production:

“With the real subsumption of labour under capital a complete (and constantly repeated) revolution takes place in the mode of production, in the productivity of the workers and in the relations between workers and capitalists. ...The social forces of production of labour are now developed, and with large-scale production comes the direct application of science and technology” (Marx, 1976b, p.1035, see also, p.1021).

Understanding Marx’s history of the BIR as a history of the capitalist mentality undermines historians’ concerns with the supposed economic determinism of his ‘model of manufactures’ and the supposed technological determinism of his explanation of the triumph of the factory.

**Capitalist mentality or ‘model of manufacturers’?**

It is clearly wrong to say that “Marx’s model of ‘manufactures’ seems to have been a large workshop in the hands of a capitalist and organized on the basis of wage labour”, as he “clearly intended it to be an abstract model” (Berg, 1994, p.64). Berg is right that for Marx the manufacturing workshop “was not a descriptive category meant to encompass a stage in capitalist development, for such workshops were of minimal significance beside rural decentralized industry” (1994, p.64). However, she is wrong to conclude that “the processes Marx was concerned to highlight were hierarchy and the division of labour” (Berg, 1994, p.64). For Marx they are merely the tools historically at hand employed by the capitalist mentality:

“It must be kept in mind that the new productive forces and relations of production do not develop out of nothing,...but within and in contradiction to the existing development of production and inherited, traditional property relations” (1986, p.208).

Marx did not think that the manufacturing workshop was, as Berg puts it, a historical “break constituted by the minute division of labour...followed by a second step, the centralized organization of the factory system”. It is, therefore, wrong to say that Marx thought “The phase of ‘manufactures’ was thus an innovation in organization” (Berg, 1994, p.64) - that the “large, hierarchically-organized workshop was seen by Marx to be the most advanced form reached by manufacture before the limitations became
obvious” (1994, p.72). In other words, it is wrong to say that Marx’s theory of the BIR was that industrial capitalists emerged from manufacturing workshops that themselves emerged from putting-out.

As we have seen, for Marx the real innovation was the appearance of the capitalist mentality. He was well aware that workshops and even factories and machines were not new. What for him was new about the manufacturing workshops was not their system of organisation, but its use and development by the capitalist mentality. Thus, it is also wrong of Berg (and many others) to say that the “Marxist view of the system of manufactures is obviously ‘retrospective’, its vantage point progressive modern industry”, and that Marx therefore gives us an economically determined “linear framework” (Berg, 1994, p.65). That Marx gives us a “model” that “excluded the complications and variety of production processes...[by] failing to place...manufacture in its wider historical context” (Berg, 1994, p.65). What this fails to understand is that Marx gives us a historical analysis of the capitalist mentality in manufacturing and its consequences for the development of machines and factory production. He does not give us a detailed history of the industrial revolution, but gives us the theoretical tools to write one.

Marx does not say that the BIR was inevitable, or that all production must progress from independent crafts through putting out and manufacturing workshops to factories with machines. He says that given the historical circumstances the capitalist mentality produced the BIR. Marx is well aware that many traditional and transitional mentalities abounded during the industrial revolution, and that in different historical circumstances the capitalist (or any other) mentality produces different technical and social outcomes. The issue for Marx is not that the industrial revolution “abounded in ancient and transitional types of industrial organization” (Berg, 1994, p.72), but that it abounded in ancient, transitional and modern social relations and mentalities in sometimes similar, sometimes different, historical contexts. The issue for Marx is not the inherent economic virtues or disadvantages of artisan, putting-out, manufacturing workshops, factories or co-operatives as forms of industrial organisation, but the mentality that applied them in the circumstances. Thus his view that cooperation in all its forms is merely “a method employed by capital for the more profitable exploitation of labour, by increasing that labour’s productiveness” (Marx, 1996, p.340). Marx would not have been surprised that “innovation in industries organized on a small-scale basis was...widespread” (Berg, 1994, p.74) as these became sites of semi-capitalist and capitalist production. He was aware that “[p]easant agriculture on a small scale, and the carrying on of independent handicrafts, which together form the basis of the feudal mode of production, and after the dissolution of that system, continue side by side with the capitalist mode” (Marx, 1996, p.339, fn.3). Marx could thus easily agree that while “Profitability and labour costs were important determinants for the development of each structure..., in a transitional capitalist society they were not the only ones - custom, community and patriarchal discipline played at least as significant a role in artisan, co-operative and proto-factory alternatives to putting out” (Berg, 1994, p.75). However, he would want to know what ‘profitability’ meant in each case, that is, in

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11 This reading of Marx is widespread amongst economic historians. For example, Mokyr puts Marx into the “industrial organization school”, where “the emphasis is on the structure and scale of the firm” (1999, p.7).
what sense society was transitionally capitalist. Marx would certainly agree that “Industrialization, within the capitalist framework of eighteenth- and nineteenth century Europe, was a process of developing new techniques and new forms of work organization” (Berg, 1991, p.191), but this merely begs the question - what is the ‘capitalist framework’?

Many historians accept that “under the factory system, machine-based modern industry was more profitable” (Berg, 1994, p.65; see also Cohen, 1981; Landes, 1986), but do not explain why the world should have waited until the eighteenth century to discover this. They invariably fail to probe the meaning of ‘profit’. For example, Berg says that “what really mattered was that the capitalists were in it for the money” (1990, p.188). By contrast, Marx gives us a theory of the changing meaning of ‘profit’ - the outlines of a history of changing calculative mentalities. To understand and test this history we do not ask what historical circumstances made machines and factories ‘profitable’. Instead, as Mokyr puts it, we must ask why Britain had a unique “willingness and ability to recognize and then adopt inventions made elsewhere” (1999, p.18). In Marx’s terms, we must ask why and how in Britain there was the first flowering of the capitalist mentality - the ‘directing motive, the end and aim of capitalist production,…to extract the greatest possible amount of surplus value’ (1996, p.336). In Marx’s history it was this mentality that told British ‘bosses’ (capitalists and their managers) what to do - to erect factories using machines and take control of the valorization process.

What Bosses Do

In his widely discussed paper ‘What do bosses do?’ Marglin (1976) attacks the conventional view of economic historians that capitalists used factories and machines because they were technically more ‘efficient’. That is, that capitalists erected factories and installed machines to produce more output from the same input. Marglin levers open the contradiction in conventional economic history between control and efficiency. The contradiction is that on the one hand economic historians have “never...[had] any doubt that one objective of the large workshop or of the factory was indeed the control over labour” (Pollard, 1990, p.116). On the other hand, they accept that only in perfect markets does technical efficiency equal economic efficiency, that is, minimize costs and maximize profits. The problem Marglin highlights is that if capitalists erected factories and installed machines even in part to control labour we cannot necessarily equate technological change with either technical or economic efficiency (1976, p.29).

Marglin apparently follows Marx by arguing that the primary social function of factories and machines was to “substitut[e]…the capitalist’s for the worker’s control of the work process and the quantity of output” (1976, p.15). He argues that just as putting-out capitalists used the division of labour to ‘divide and conquer’ the workers to make themselves indispensable and thereby cream off a surplus, so factories and machines continued this strategy by allowing capitalists even greater control of

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12 Why, for example, “on the eve of the [French] Revolution did England have 20,000 jennies, 9,000 mules and 200 Arkwright type mills, while France had less than 900 jennies, most built in government manufactories, only eight water frames and no mules?” (Berg, 1990, p.187).
workers and therefore greater surpluses. Although subject to numerous historical criticisms (e.g., Landes, 1986; Berg, 1991), and derided as a “Marx-inspired conspiracy theor[y]” (Pollard, 1990, p.117), even Pollard accepts that in raising the question of control versus efficiency Marglin has “a serious purpose” and deals with “real issues” (1990, p.115).

Marglin’s work is “Marx-inspired”, but he is “deeply critical” (1991, p.225), writing Marx off as a technological determinist. He reverses part of Marx’s aphorism that “The hand-mill gives you society with the feudal lord; the steam mill, society with the industrial capitalist” (Marx, 1976a, p.166). Marglin says, “The steam mill didn’t give us the capitalist; the capitalist gave us the steam mill” (1976, p.41). If, however, we understand that at the core of Marx’s mode of production is a socially determined calculative mentality (Bryer, 2000a), for Marx the steam mill was the product of the capitalist mentality - which, in any event, came from agriculture and trade. In this reading, what Marx means by the ‘steam mill gave us society with the industrial capitalist’ is that having steam mills as the foundation of social production is only compatible with the organisation of society by industrial capitalists. Similarly, he clearly means that hand mills at the base of social production are only compatible with the organisation of society by feudal lords. Capitalists could not control feudal forces of production, and feudal lords could not control capitalist forces of production. Capitalist economic control presupposes that labour, the means of subsistence, and the means of production are all commodities on competitive markets - that there is general commodity production. Feudal control, based on direct coercion, presupposes self-sufficient peasants. Thus, Marx would have agreed with Marglin, who, for his sequel, does not reverse what Marx says about the hand-mill giving us society with the feudal lord. Rather, he says that “It was not the handmill that gave us feudalism, but the feudal lord that gave us the water mill” (Marglin, 1976, p.44). Marglin does not reverse Marx here because it would be nonsense for anyone to say that the feudal lord gave us the hand-mill, and Marx nowhere says any such thing. He would agree with Marglin’s view (based on Bloch, 1969) that the triumph of water-mills over hand mills resulted from the exertion of “feudal power” (1976, p.44). That is, “water mills enabled the feudal lord to extract dues that were unenforceable under a handmilling technology” (Marglin, 1976, p.41). However, Marx would make the point that this was the exertion of feudal power to control the valorization process of maximizing feudal rent. In precisely the same way, Marx argued that the erection of factories using machines was the exertion of capitalist power over the material process of production to allow it to take control of the valorization process.

Marglin gives us some of the history of the struggle over control of the valorization process in putting out - legislation allowing clothiers the right of search and entry on suspicion of embezzlement and the presumption of guilt; laws demanding the completion and return of work within specified times. However, neither Marglin nor his critics understand that in Marx’s history the key to the BIR is the capitalists’ struggle to take control of the valorization process.13 Marglin sees only the material process of production and, in Marx’s terms, sees the social function of factories and machines as the intensification of feudal exploitation! He says

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13 A characteristic they share with other participants in the ‘labour process debate’ that followed publication of Braverman’s ‘Labor and Monopoly Capital’ in 1974 (see Bryer, 2002).
“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” (Marglin, 1976, p.29).

Marglin sees factories as a “natural outgrowth of the putting-out system (the result, if you will, of its internal contradictions)” (1976, p.29) to encompass control over work:

“The minute specialization that was the hallmark of the putting-out system only wiped out one of the 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” (Marglin, 1976, p.28).

The workers’ ‘indiscipline’ that Marglin says the factory cured for the capitalist was, firstly, “more bluntly, their laziness”, their preference for leisure as wages rose, and, secondly, “dishonesty”, particularly embezzlement (Marglin, 1976, pp.34, 36). In this vision,

“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 workforce meant a larger output in return for a greater input of labour, not more output for the same input. Supervising - insofar as it meant something different from disciplining - the workforce simply reduced the real wage; an end to embezzlement and like deceits changed the division of the pie in favour of capitalists” (Marglin, 1976, p.36).

Marglin does not define the ‘pie’. He says “a lack of discipline and supervision could be disastrous for profits without being inefficient” (Marglin, 1976, p.34), but does not define ‘profits’. He says that “Capitalist production is centred around profit, and both efficiency and control are necessary for production to be profitable” (1990, p.249). However, what he says is consistent with capitalists using factories and machines to pursue Marx’s formal subsumption and absolute surplus value, i.e., the cash form of feudal surplus. Marglin effectively says that discipline and supervision make the workers work harder for less. He says that capitalist control of production cures ‘laziness’ and ‘dishonesty’, not that it strives to increase labour productivity and hence relative surplus value. Although capitalist exploitation always involves formal subsumption and pursuit of absolute surplus value, in Marx’s theory we must keep this separate from real subsumption where capitalists strive to reduce socially necessary labour, the cost of production, to maximize surplus labour. Under real subsumption, capitalists not only supervise and discipline workers to maximize absolute surplus value but, what is more important, they invest in factories and machines to maximize relative surplus value and the rate of return on capital. Discipline and supervision, therefore, had everything to do with the ‘efficiency’ of machines and factories for Marx the classical economist, just as it does for capitalists today.

It is because Marglin has no place in his theory for the valorization process that he believes that “One cannot really expect the capitalist, or anyone else with an interest in
preserving hierarchy and authority, to proclaim publicly that production was organized
to exploit the worker” (1976, p.21). While not necessarily proclaimed to the public,
when the capitalist produces accounts this is precisely what he or she proclaims to the
Marxist accounting historian. Accounts also tell us in what way the capitalist is
exploiting the workers - whether formally or really. As we saw, in Marx’s history, so
long as workers dominated the material process of production, the capitalist could not
control the valorization process, and here we expect semi-capitalist accounts reporting
absolute surplus value or the feudal rate of return. When, through the introduction of
factories and machines, the workers cease to dominate the material process of
production and thereby lose control of the valorization process, we expect to see the
capitalist take control through the introduction and use of modern management
accounts.14

In search of industrial capitalism

To explain the BIR by the appearance and spread of the capitalist mentality we must
precisely define it and search for evidence. I argue in detail elsewhere that Marx’s
analysis of the circuit of capital underlies the fundamental rules of modern financial
and management accounting (Bryer, 1998, 1999a, 1999b, 2002). This correspondence
gives us the detailed definitions we need to search for the genesis of industrial
capitalism. Where we find full product costs, standard costs, accounting-based
performance evaluation, capital budgeting, marginal costing, etc., we have evidence of
the capitalist mentality and the real subsumption of labour. That is, we have evidence
of capitalist’s seeking control of the valorization process (Bryer, 2002). When we
search for the capitalist mentality in accounts it is of fundamental concern, therefore,
whether the full cost of production is “precisely calculated” (Marx, 1976b, p.952).
That is, whether the product’s calculated cost combines all “the element of
value…add[ed] to the product in one way or another” (Marx, 1976b, p.952), including
production overheads. As Fleischman and Parker say, although they do not explain
why, “[a] good measuring rod of the level of sophistication reflected by product
costings and production reports is the handling of overhead, both with regard to which
expense items rightly constitute overhead and the process by which overhead is
allocated to products and/or cost centres” (1997, p.90). Because of the importance of
fixed capital to the capitalist mentality - its role in increasing labour productivity - an
important production overhead to look for in early capitalist management accounting is
depreciation, “that portion of the constant capital which consists of the instruments of
labour, transfers to the product only a fraction of its value” (Marx, 1996, p.222).
However, the tell-tale accounting signature for real subsumption is accountability for
the rate of return on capital employed (Bryer, 2000a, 2000b). Present value
calculations *ex ante* and rate of return or residual income calculations *ex post* provide
evidence that management is accountable for the rate of return on capital (Bryer, 2002).

In Marx’s history the key transition to capitalism was from political accountability
under feudalism to economic accountability under capitalism (Bryer, 2000a).15 We can
test this against evidence of changes in the ways principals (feudal lords, capitalists,

14 We discuss the Boulton and Watt case in section four and New Mills and New Lanark in the
concluding comments, to illustrate this transition.
15 Bryer (2000b) provides evidence from the English East India Company from 1600 to 1657 consistent
with this prediction.
and their agents) used accounts. Under feudalism we observe landlords using accounts in processes of directly coercive accountability - for example, for extracting a calculated target surplus from a medieval estate whether the peasants produced it or not (Bryer, 1994a, Scorgie, 1997). Capitalists, however, use accounts in processes of economic accountability - for example, in disciplining production workers to achieve standard labour costs (e.g., Hopper and Armstrong, 1987). We should find evidence of increasing demands for economic accountability from the second half of the eighteenth century, that is, the appearance of modern management accounting systems. In short, we should find evidence of a transition from feudal accountability, through semi-capitalist manufacturing accounts, to modern systems that hold workers (including management) accountable for capital’s every movement. As we shall see, there is significant evidence consistent with this pattern of accounting change.

**Part two: Capitalist accounting during the BIR**

Economic historians regularly follow Pollard’s conclusion that “The practice of using accounts as direct aids to management was not one of the achievements of the British industrial revolution; in a sense, it does not belong to the later nineteenth century, but to the twentieth” (1965, p.248). For example, Crouzet says “there was a failure of capital accounting, so that no rational use of accounts was possible” (1985, p.10). Mokyr claims that “Often, serious, and costly managerial errors were made, especially due to primitive accounting” (1999, p.110). By contrast, accounting historians have become increasingly critical of Pollard’s view. Edwards and Newell, for example, conclude that he is “unduly pessimistic” (1991, p.36; see also, Fleischman and Parker, 1991, 1997; Boyns and Edwards, 1997a, 1997b; Oldroyd, 1999). Accounting historians are generally confident they have refuted Pollard’s dismissal of industrial revolution costing, but they tend to agree with him that the financial accounting of the day was “inadequate” (Fleischman and Parker, 1991, p.371).

What follows reviews the published evidence on late seventeenth and eighteenth century accounting. It adds to the criticism of Pollard’s view by questioning his understanding of accounting. It also questions the consensus among accounting historians that financial reporting was inadequate. First it shows that the limited evidence we currently have is consistent with Marx’s theory that in the late seventeenth century manufacturing accounting was only semi-capitalist. Second, it shows there is overwhelming accounting evidence that the capitalist mentality lay at the heart of the BIR from the mid-eighteenth century. A major source is Fleischman and Parker (1997) who examined the archives of 25 major industrial revolution enterprises operating during the eighteenth and early nineteenth centuries, searching for “sophisticated” (modern) management accounting in eight overlapping areas: expense control; responsibility management; product costing; overhead allocation; cost comparisons; costs for special decisions; budgets; forecasts, and standards; inventory control. They found “substantial activity in all the identified areas with a preponderance of the businesses practiseing expense control, product costing, and standard costing” (Fleischman and Parker, 1997, p.26). We draw on this and other work - including Pollard’s (1965) still unsurpassed survey of BIR accounts - to collect together evidence of the existence of the capitalist mentality at the heart of the BIR. In part three and four we turn to explaining the presence or absence of modern accounting and changes
in accounts and to how we could use accounting history to fully test Marx’s theory that the BIR was the victory of the capitalist mentality.

_Transitional manufacturing accounts_

Pollard says pre-BIR manufacturers and industrialists typically used the feudal method of charge and discharge accounting reporting only feudal surplus (1965, pp.210-211). The limited evidence we currently have of late seventeenth and early eighteenth century accounting is from a series of essentially merchant accounting textbooks from the late seventeenth century through the early eighteenth century dealing with manufacturing accounting. These suggest many semi-capitalist farmers, merchants and industrialists, some of whom the writers and publishers expected to buy and use them. According to these textbooks, although semi-capitalists incurred overheads, they did not account for them as integral elements of the cost of production. Instead, they accounted for feudal surplus as the increment to initial capital, that is, they accounted for the feudal rate of return on opening capital. In the idealypical world of the textbook, landlord, farmer, merchant, putter-out and manufacturer alike accounted for transactions with their customers, workers, suppliers, etc and established the profitability of various farms, crops, product lines, production processes and departments. A string of books from the late seventeenth century recommended “the maintenance of a continuing record of the quantity and value of materials on hand and in production”, and the production of departmental accounts (Well, 1978, pp.42, 45). One of the earliest, by Monteage (1675) “claimed the system he described was useful for farmers, retailers, handicraft men and merchants” (Wells, 1978, p.42). Monteage’s system calculates the feudal return on capital. He gives the following departmental account for a hypothetical Grange Farm, one of two farms operated for the benefit of an imaginary gentleman:

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Date</th>
<th>Description</th>
<th>L.</th>
<th>sh.</th>
<th>d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1675</td>
<td>Apr.</td>
<td>10</td>
<td>To stock, valued at my lease</td>
<td>1</td>
<td>300</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>To cash, pd for 60 load of manure</td>
<td>2</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21</td>
<td>To cash, pd for seed corn</td>
<td>2</td>
<td>24</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24</td>
<td>To cash, paid Besse Hobbes her wages</td>
<td>2</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28</td>
<td>To cash, pd Taxes</td>
<td>2</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>May</td>
<td>1</td>
<td>To John Broughton, Esq.; 6 Mo rent</td>
<td>16</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>1676</td>
<td>Apr.</td>
<td>9</td>
<td>To loss and gain profited</td>
<td>12</td>
<td>136</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Date</th>
<th>Description</th>
<th>L.</th>
<th>sh.</th>
<th>d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1675</td>
<td>Apr.</td>
<td>23</td>
<td>By cash, recd. for butter and cheese</td>
<td>22</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25</td>
<td>By 100 load hay, valued at 35s.</td>
<td>15</td>
<td>175</td>
<td>-</td>
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<tr>
<td></td>
<td>May</td>
<td>3</td>
<td>By calves No 16 valued at 17s. 6d. ps</td>
<td>11</td>
<td>14</td>
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<td>1676</td>
<td>Apr.</td>
<td>9</td>
<td>By balance which I value my lease</td>
<td>40</td>
<td>280</td>
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Wells says that during the eighteenth century the “use of departmental accounts in preindustrial England was widespread” (1978, p.48). Pollard gives several examples
from 1718, and Wells gives examples from textbooks of the same system for farmers, merchants and manufacturers. All start with an opening value of the capital ‘stock’ (for the farm, for the venture or for each product or process). All add to it the prime costs of production (materials and wages) and other directly associated expenses, deduct the cash received from sales or transfers of products and the closing value of the capital stock. In the case of Grange Farm, the value of the closing capital and capital realised during the year is £491, less the opening capital and other expenditure, gives a profit of £136 7s. These semi-capitalist departmental accounts, measuring feudal surplus as the realised and realisable consumable increment to the opening value of capital, are very different from modern departmental accounts or profit centres. In particular, these semi-capitalists charged overheads, such as rent and taxes (as in the case of Grange Farm), separately against revenue and did not allocate them to individual products or departments.

As the eighteenth century progresses there is some evidence of a growing awareness of the importance of overheads and of their increasing incorporation into calculations of product costs. Hamilton stressed the importance of overheads in the first edition of his *An Introduction to Merchandize* (1777/9). This advised would-be manufacturers that “although the wages payable to weavers employed in the manufacturer’s own workshop may well be less than the remuneration of outworkers for the same output, this benefit has to be balanced against the workshop expenses. He outlines a procedure for making such an evaluation” (Mepham, 1988, pp.58-59). In other words, when deciding whether to use a workshop the entrepreneur should compare the saving of wages with the increased overheads. The concern was not simply with cash savings. As Mepham says, Hamilton, who is likely to be describing the accounting systems he saw in operation in the Perth textile industry, also had “an interest in the evaluation of worker productivity” (1988, pp.57, 58). We find plentiful evidence of a growing interest in the joint product of labour productivity and overheads in the many full product costings that appeared from the middle of the eighteenth century.

**Full product costs**

Pollard found many examples of “partial” costings. He thought the “great difficulty...they [that is, early industrialists] remained unable to surmount, was the establishment of a reliable basis for total or overall calculations for the firm as a whole” (1965, p.220). However, it is now clear that “a number of firms operated ‘total cost’ accounting systems much earlier than he supposed, and...greater use was made of *ad hoc* costings and estimates in guiding management decisions before 1850 than he suggests” (Edwards and Newell, 1991, p.36). We might expect an element of disinterest in product costing according Pollard’s view that, as Jones puts it, “the major usefulness of accounting records lay in recording physical movements of cash and stores and acting as a check upon the honesty of the employees” (Jones, 1985, p.21). However, even from the early eighteenth century “the proprietors themselves seemed always concerned with ‘cost of production’” (Jones, 1985, p.21).

In part three we show that Marx would have agreed with Fleischman and Parker that a “spectacular example of product costing was Boulton & Watt’s engine books from the early nineteenth century” (1997, p.34), but would not have agreed that it was the “most” spectacular. Josiah Wedgewood’s 1772 cost calculations also “were
impressive when measured by the range of overhead items and period expenses figured into his reckoning - supplies, indirect labour, breakage, imperfect pieces, selling expenses, and freight” (Fleischman and Parker, 1997, p.34, referencing McKendrick, 1970). Pollard recognised these two firms as way ahead of the “ruck” (1990, p.102), but several other of their companies - among them Darby (1810), Crawshay (1822), Oldknow (1797) and Gott (1830) - produced sophisticated product costs:

“Such cost estimates were complex, containing line items for incidental supplies, indirect labour, selling expenses, depreciation, taxes, machinery and building repair, rubbish removal, reworking scrap, and interest on capital. …The Greg manuscript contains an 1831 calculation showing costs associated with producing 18,000 pounds of twist weekly. Included were an allocation to recover the initial outlay for the factory and machinery, raw materials, waste, wages, and an itemised ‘contingencies’ list” (Fleischman and Parker, 1997, p.35).

In 1798 Darby management analysed the relative profitability of various products and departments and recognised the problem of overhead allocation - the prices of many goods manufactured were not proportional to “additional charges incidental to production” (Fleischman and Parker, 1997, p.37). Further evidence consistent with the mentality of full cost, in 1814 William Crawshay did not want to close a blast furnace because this would increase the charge per unit and increase prices (Fleischman and Parker, 1997, p.37).

Related evidence of the capitalist mentality is industrialists distinguishing between productive and non-productive overheads. In Wales “[b]y the 1790’s it would appear that certain iron companies were distinguishing between overhead expenses which were of a general nature and those with a direct affinity with production activity” (Jones, 1985, p.103). At the Crawshay works at Cyfarthfa, the biggest iron works in the UK in the late eighteenth and early nineteenth century, there were “significant cost management beginnings in the 1790s…[and] the firm was in the vanguard with respect to overhead cost allocation” (Jones, 1985, p.109). Consistent with the capitalist mentality, as Jones puts it, “in the main, ‘works’ expenses appear to have been treated as direct costs and charged to the appropriate process of production” (1985, p.109). “The company distinguished overhead expenses directly related to production, which were allocated to 12 cost centres, from those incurred in non-productive functions, which appeared as sundry items in the profit and loss account” (Fleischman and Parker, 1997, p.53). Jones gives an illustration of the treatment of administration costs that is also consistent with the capitalist mentality. As he says, if it “reflects the general treatment...they were written off to a general profit and loss account” (Jones, 1985, p.109), that is, as period costs. Jones could not discover the basis of the apportionments, and found them “somewhat arbitrary and not consistent from year to year”. However, he accepted that “[n]evertheless, one is getting near to a concept of cost per ton of output which includes certain overheads, and this knowledge would have been required by Ironmasters of the day in deciding a price or quotation” (Jones, 1985, p.103). In Welsh industry by “1822 we are...seeing estimates of cost in which overheads are being related to time in the form of direct labour hours” (Jones, 1985, p.104).
In the textile industry “[v]arious archival collections feature product costings, many of which include a standard cost for waste” (Fleischman and Parker, 1997, p.83). Costs of spoilage are an inherent part of most production processes, for example, cotton spinning. As Marx put it, so long as the cotton waste is a “condition of production…the reduction to dust of a part of the cotton that does not go into the product…still carries its value over to it” (1978, p.202). Capitalists therefore include unavoidable or normal spoilage costs in the cost of production because they are necessary to produce use-values for sale. Likewise the capitalist does not capitalise abnormal waste through inefficient labour, faulty machinery, etc., is, but writes it off as a loss. “New Lanark had accounts which distinguished waste from ‘loss’ defined as raw material unaccounted for” (Fleischman and Parker, 1997, pp.84-85).

The rate of return on capital

Pollard claimed “contemporaries did not attempt any calculations of the profit rate on capital in the modern sense” (1965, p.235). To support his argument he points to Hamilton as the only writer of an accounting textbook in English to discuss the “relationship of profit to capital employed”. However, we have already seen evidence from Monteague this was not the case. Second, it would be surprising because “the regular calculation of annual profit was common in farm and estate accounting and, in the second half of the eighteenth century, agricultural writers did make estimates of rates of return” (Mepham, 1988, p.63). As Edwards and Newell say, “Pollard’s assertion that businessmen never used this measure is certainly wrong” (1991, p.51). The evidence is growing that rate of return calculations was common among eighteenth century industrialists. Jones, for example, shows its use in a copper smelting partnership in 1727 and by British Iron Co. in 1826 (1985, pp.20, 216). We must also be aware that there are other ways in which eighteenth century industrialists could calculate the rate of return on capital that Pollard misunderstands. As Mepham points out, “In that chapter [Hamilton] proposed an alternative to the rate of return calculation by suggesting that a period’s profit should be charged for the use of funds employed in earning it” (1988, p.63). Today we call this technique residual income accounting. Partnerships routinely did this because, holding each other accountable for their capital, “the deduction was designed principally to ensure that individuals were properly remunerated for different capital contributions” (Boyns and Edwards, 1997a, p.51). Stone (1973) shows the Charlton mills added a five per cent charge on the owner’s capital investment to the calculated cost of business operations from 1810 onwards, and almost certainly much earlier. The Mona Mine used 10 per cent on “average capital employed” for the seven years to 31 March 1800 (Boyns and Edwards, 1997a, p.52). We will see in part three that Boulton and Watt used residual income accounting.

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16 He notes but makes no attempt to deal with the “the contemporary economists’ view” that “the rate of profit…is always reckoned or estimated by the proportion or ratio which it bears to stock or capital from which it arises” (Pollard, 1965, p.235).


18 The company came into existence some time between 1765 and 1785, but no accounts survive before 1810 (Stone, 1973, p.71).
Pollard effectively says that the use of residual income shows how primitive industrialists were in the eighteenth century. It indicates, he claimed, that they thought of “capital as an auxiliary to entrepreneurship instead of the central motive force behind the firm” (1965, p.233). Pollard thought charging interest paid on money borrowed was “natural”, but he was scornful of the fact that “it was widespread also in other cases, and there is much evidence to show that ‘profits’ in common parlance was often understood to be the surplus after interest was paid. Conversely, earnings less than the expected interest rate were termed ‘losses’ - an echo of present practice relating to the nationalized industries” (1965, p.234).

In Pollard’s view “All these practices are linked by a common, though unspoken assumption…that profits are not directly related to the quantity of capital, and therefore are not payment for capital or created by capital” (1965, pp.234-235). In other words, he criticised these industrialists for not being neo-classical economists and thinking that the origin of profit was capital itself! In Pollard’s neo-classical mind, residual income embodies the primitive assumption that “Capital is adequately rewarded by interest at the current rate…[and] [p]rofits are distinct rewards of entrepreneurship per se, depending on skill, the concrete business situation or sheer luck” (1965, p.235). This, however, did not mean entrepreneurs had no interest in the rate of return on capital employed. Residual income measures the rate of return on capital as the excess or deficit after charging interest. Hamilton stresses residual income was an alternative way, that is, another way, of calculating the return on capital. If industrialists or farmers bother to calculate a notional interest charge on capital to measure the excess profit (or loss) it is precisely because the rate of profit on the capital matters to them.19

Pollard declares the eighteenth century terminology of accounting for capital and profit “confused”. His examples show it is consistent with modern accounting:

“Nothing, perhaps, shows up the resulting confusion in the notion of capital better than the terminology used. The Herculaneum Pottery, having found a ‘surplus of capital arising from profits, more than sufficient to meet the current exigences…for the current year’, turned it into a cash bonus, on top of the dividend. The Coalbrookdales Co. described as ‘profits’…the whole net surplus remaining after ‘dividends’…had been paid out, while in the next century William Matthews, the ironmaster, considered ‘the profits of the iron trade as part of the interest of capital’” (1965, p.237).

Within modern accounting, surpluses of capital do “arise from profits”, and an early industrial capitalist could pay them as a cash bonus on top of dividends without violating his notion of capital maintenance. Similarly, the whole of the net surplus remaining after dividends is retained profit, the retained increment to capital. Pollard’s final example of “confusion” is a quibble about the words rather than their meaning. A

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19 Robert Loder (whose accounts Pollard found “remarkable” (1965, p.316), but did not say why) calculated residual income. In 1765 a Romney Marsh Grazier deducted “1 yrs Interest on £560 money advanced on the stock @ 4 per cent” from his surplus (Reading University Library, KEN 19/1/1, p.5), as did Arthur Young’s farmer friend whose accounts he published in 1788 (Bryer, 2000b, pp.47, 51).
partnership that later became the Sheffield Smelting Co. called the closing capital value “gross profit”. Pollard comments that “here capital becomes part of gross profit”, but “From it was deducted the capital of the partners. The difference was then divided in the agreed proportions and entered as the net profit” (Pollard, 1965, p.237). The partners therefore clearly understood the meaning of net profit as the difference of capitals. Whether they were capitalists, however, depends on how they valued their assets. We consider this below. Pollard found that normally industrialists charged the interest on the original capital (1965, p.234), suggesting a predominantly semi-capitalist mentality with only or mainly the formal subsumption of capital in his sample. Some, he says, charged it on “current capital values” (Pollard, 1965, p.234). Whether these industrialists charged it on the “modern” idea of capital employed is unclear, as Pollard nowhere defines this. Thus, it is impossible to interrogate his claim that he found no examples of “any calculations of the profit rate on capital in the modern sense” (Pollard, 1965, p.235).

Evidence of present value calculations abounds in the extractive industry, for example, by Thomas Hall in the 1830s (Fleischman and Parker, 1997, p.130). Also, in a report for Ashington Coal Company of 1843 “a bottom line profit of £2,302 was reckoned, representing a 17 1/4% return on capital. Then a sensitivity analysis is done which indicated that had sales been £30,000…the return on capital would have been 20%” (Fleischman and Parker, 1997, p.139).

**Capital and revenue**

Pollard thought the failure of industrial entrepreneurs to calculate the rate of return on capital employed was their first heresy. “The second heresy was the confusion of capital and revenue” (1965, p.235). The confusions are Pollard’s. First, he confuses the method of bookkeeping with the substantive results. He says of the single-entry method of comparing opening and closing valuations of capital,

> “While this approach has a certain internal logic, it is very far removed from the modern concept of profit maximization as a driving force of capitalism: indeed, the notion of capital as a continuous, let alone autonomous, factor is virtually eliminated” (1965, p.236).

In the uncertain world of the early industrial entrepreneur there well might “develop bewildering fluctuations of the ‘capital’ of a company from year to year” (Pollard, 1965, p.236). Modern accountants call these fluctuations of capital profits and losses!

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20 Pollard shows he does not understand the modern meaning of capital employed. He says that one reason partners did not calculate the rate of return on capital was because they had little fixed capital “in relation to goods in process of production, stocks and debtors, and the fact that trade credits…formed a large share of the total capital of many firms. In many cases the two items of creditors and debtors exceeded the partners’ original capital several-fold, and since they tended to fluctuate wildly, they might leave the positive or negative residual of capital provided by the partners to fluctuate even more wildly. Clearly, in these circumstances, it would be meaningless to speak in terms of ‘capital employed’, or the rate of profit earned on it” (Pollard, 1965, p.235). Pollard seems unaware that the fluctuating balance of the owners’ capital is the residual after profit or loss that, no matter how “wildly” it fluctuates, always does so around a positive capital employed, that is, the sum of assets. Pollard assumes management is not accountable for all its assets and its debts, that is, here he defines capital employed as owner’s equity!
There is no notion in accounting that capital is “continuous” and “autonomous”, only in Pollard’s mind who equates capital with fixed capital. If early entrepreneurs calculate profit by comparing closing and opening capital, some notion of capital is in the forefront of their mind. And if they leave out “some assets that could not easily be valued” (Pollard, 1965, p.236), this might reflect particular relations of accountability. Perhaps these had changed when the accounts of the Mona Mine for 1782-9 complained that “What the Mine capital may be worth no idea can be found as no Balance appears to have been struck” (quoted in Pollard, 1965, p.236)? In other words, the person who had written this wanted a balance of “capital”.

Pollard claimed “most manufacturers of the industrial revolution were apt to confuse fixed investments [that is, assets] and current expenditure as frequently as they confused capital and profits” (1965, p.238). Certainly, we should expect these two accountings to correlate with each other where they exist as they provide evidence of the feudal mentality. In the feudal mentality there is no capital within which to distinguish fixed asset expenditure and current expenditure, just as there is no capital to confuse with profits (Bryer, 1994b). Thus, if we found “there was a common tendency to ignore the fixed equipment altogether”, or if we found that “any additions and improvements to the capital equipment were normally entered into the current accounts” (Pollard, 1965, p.238), it would tells us only that the mentality and accountability was to this extent feudal or semi-capitalist. However, Pollard’s examples show clear sensitivity to, and apparent accountability for, some notion of the underlying capital:

“[T]he Larwood colliery account for 1789, for example, included an expenditure of some £25 for sinking pits, £3 for boring to draw the water off sinkings, and £6 for 11,000 pit bricks, with the note:

N.B. These (3 items) are charg’d as the annual average expence, none of these expences having occurr’d in 1789.

As late as 1872, at the Dalcoath mine, employing 1,000 men, ‘invested capital is only nominal, outlay for machinery being paid for as a working expense’. The occasional fluctuations in the apparent annual costs of the enterprise, owing to such discontinuous investment, then required explanation:

The present Compt’g Ho., Carpt’res Shop & Storehouse was built in this quarter and a considerable part of the cost included [in this quarter’s current account]” (Pollard, 1965, p.239).

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21 For example, he concludes, “very few sets [of accounts] managed to deal adequately with the problems thrown up by fixed capital. …Yet as long as there was no purposeful capital accounting there could be no rational use of accounts for managerial guidance” (Pollard, 1965, p.245). Here he equates accounting for fixed capital with capital accounting.

22 Pollard claims that although they valued the whole firm de novo (he implies every year), “few firms seem to have made the comparison” (1965, p.236). In other words, few firms calculated profit. He refers to five larger firms that did make the comparison, and hints there are more. However, as Boyns and Edwards say, Pollard’s archival evidence was “limited” (1997, p.78).
The notes attached to these accounts and Pollard’s comment that these apparent deviations from some norm “required explanation”, suggest accountability for more than merely the cash balance. The first example implies at least some notion of capital maintenance to justify charging the profit and loss account with long-run average expenditures.\(^{23}\) The second sets the results in the context of “invested capital”. Jones also gives examples of notes to the accounts when the accountant charged fixed capital to revenue. For the year to June 1831 the Mona Mine’s profit and loss account noted the existence of 17 smelting furnaces at a (possibly nominal) valuation. The 1812 profit and loss for the Llanelly copper company notes “the profit would have been larger but for a considerable quantity of materials used in enlarging the Works which were charged as accrued items of expense” (Jones, 1985, p.167).\(^{24}\) Eighteenth century industrialist’s accounts measured more than an abstract economically rational result. For example, in eighteenth century Welsh industrial accounts “the inclusion of quantities as well as values in early accounts was a common feature as was the insertion, hither and thither, of explanatory memoranda” (Jones, 1985, p.8).

Jones says that for some firms “the Revaluation Method of depreciation was the order of the day” (1985, p.166), but it was a method of accounting recognising the existence and consumption of fixed capital. Perhaps only for the original capital (‘invested capital is only nominal’), and perhaps only for a target average consumable surplus, but before we judge particular accountings we must remember that accounting is socially contingent. As Jones says of some early eighteenth century rate of return on capital calculations by partnerships,

> “we ought not to rule out the possibility that assets were ‘depreciated’ in good years and no such allowance made in leaner years. The profit figure in effect was anything the partners cared to make it after allowing for all identifiable costs in production and marketing” (1985, p.20).

The accounts showed that the partners were accountable only to themselves, but also that by their deliberation and agreement about their flexible depreciation policy they held themselves socially accountable to each other for fixed capital and its consumption. We discuss depreciation accounting below.

When reading particular accounts we must also be aware that principals or agents may deliberately distort them to undermine accountability as well as to promote it. Capitalist or semi-capitalist firms or investors may also choose to deliberately understate their profits or overstate losses to fool labour or competitors or fellow investors about the true profitability (Bryer, 1993). For example, unaccountable capitalists can use renewals and replacement accounting in this way (Bryer, 1991), or it can signal the semi-capitalist mentality of maintaining the original capital. In the concluding part we use evidence of manipulations in the Carron Company’s accounts.

\(^{23}\) Suggesting some notion of an ‘infrastructure asset’ such as we find in the UK’s FRS15: Tangible fixed assets (Accounting Standards Board, February 1999).

\(^{24}\) As Edwards says, “It is...interesting to note that these two authors have very different views about the quality of accounting records in use even at a particular business, the Mona Mine Company” (1989, p.316). Whereas Pollard found the early ones “almost useless” and accepted the partners’ complaints of the later one’s “inadequacy”, Jones found numerous detailed costings, and concluded the company had “a system of book-keeping squarely based on double entry” (quoted in Edwards, 1989, p.316).
to mislead fellow partners and other cases to illustrate how we may explain changes in accounting by changing social relations of capital.

*Depreciation accounting*

In Pollard’s view, “The absence of reserve funds or depreciation charges was, in fact, typical of joint-stock firms at the end of the eighteenth century, a failing” (1965, p.240). Pollard claimed that “the concept of modern depreciation was only imperfectly comprehended and frequently ignored” (Allen, 1992, p.183). He says he found several examples of this sloppy “attitude to capital” (Pollard, 1965, p.238). “In some cases it was [only] to get tax allowances” (Pollard, 1965, p.241). His example of “irrational” depreciation is the order of William Crawshay in 1814 that “It is best to write off & not uphold all accounts of the sort I point out, more particularly when there is property tax to pay” (1965, p.242). In Marx’s theory the purpose of depreciation accounting is to hold management accountable for consuming the fixed capital it controls. Crawshay certainly used his accounts to hold his works management accountable for fixed assets and their write-down. Pondering a draft trial balance, in 1814 Crawshay writes to his partner listing the accounts he thinks “liable either to be wholly written off or in part to offer enquiry and investigation” (quoted in Jones, 1985, p.161). After listing the balances of concern, including some fixed assets, he notes: “Before I do anything in writing off or closing the balance I shall either see my son or go to the Works for full and compleat explanation of all the matters in question” (quoted in Jones, 1985, p.161).

Pollard finds little that is rational in eighteenth century depreciation accounting because his “modern” idea of depreciation is the neo-classical economists’ idea, that is, decline in economic value. Pollard says that “Even where the practice of depreciation had been introduced, it did not necessarily derive from a ‘rational’ view of capital” (1965, p.241). He uses the word depreciation to mean any write down of any asset. The nearest he gets to defining it is when he says eighteenth century *ex ante* accounts were more “refined” or “sophisticated” than *ex post* or actual accounts. His reason is that “they [the *ex ante* accounts] take account of capital costs...in the form of depreciation” (Pollard, 1965, p.220). Later he says “‘True’ percentage depreciation for the sake of valuation was rare” (Pollard, 1965, p.242). By ‘true depreciation’ for the sake of valuation he means economic valuations useful for economic decision-making. In capitalist accounting it is not necessary to charge depreciation as a percentage for it to be a rational charge for the consumption of fixed capital. Oldroyd, for example, shows that in their calculations of projected unit cost/profits for the Grand Allies collieries “Unit profit took depreciation into account...as the capital costs of the mine were apportioned in proportion to output over its estimated useful life” (1996, pp.7-8). In other words, the viewer’s used the modern unit-of-production method.

Jones finds evidence consistent with annual percentage depreciation in the records of the Stanley Smelting Company for 1788/89 and its use by Crawshay in the 1790s (Jones, 1985, p.159). Pollard acknowledges that “among the best known examples were Boulton & Fothergill, the Soho Foundry and the Carron Co., after Gascoigne’s reforms in 1769”, and references 17 examples from 1769 to 1830 (1965, p.244). The Darby ironworks produced a boiler plate production cost in 1810 including
“standard costs for depreciation (wear and tear), rubbish removal, and scrap reworking. Likewise, an 1813 calculation of savings from using boilers to conduct waste heat from the puddling furnaces included depreciation, a cost component infrequently found at such an early date in Industrial Revolution accounting” (Fleischman and Parker, 1997, p.56).25

Although Fleischman and Parker might be right that an identifiable charge for depreciation in product costs and cost saving calculations was relatively rare at the beginning of the nineteenth century, it was rapidly becoming less so as an idea permeating accounting thought and practice. “After 1800 the use of depreciation accounting becomes more common” (Edwards and Newell, 1991, p.52).

Fleischman and Parker say that the “track record in textiles for depreciation (‘wear and tear’) accounting was truly hopeless”, but they also say that “[m]ost firms were conscious of this cost factor...though ‘wear and tear’ was often amalgamated with interest on capital” (1997, pp.87, 91). They highlight “Horrocks, Crewdson & Co....[for] special mention as the architect of the most complex procedure for handling depreciation. Each year the current values of the firm’s identifiable assets were recalculated, and a predetermined proportion of depreciation was allocated to the productive departments” (1997, p.35). Other leading textile firms also used current costs and values in depreciating certain assets at certain times during the first half of the nineteenth century (Fleischman and Parker, 1997, p.92). In 1797 the Oldnow archive includes a statement for its Mellor plant including a standard cost for ‘wear and tear’ (Fleischman and Parker, 1997, p.88). In 1811-1814 McConnel & Kennedy introduced depreciation accounting, and it used different rates for different assets in 1817. In 1814 Cardell, Birley & Hornby introduced depreciation accounting, and Greg started in 1819 (Fleischman and Parker, 1997, pp.91-92). In 1830 Benjamin Gott “calculated the costs associated with converting £1,000 of raw wool...into saleable cloth...[including] duty, freight, taxes, interest on fixed and movable capital, depreciation, indirect materials, an allotment for repairs of machinery and buildings, and direct and indirect labour” (Fleischman and Parker, 1997, p.87). Messrs. Marshalls Flax Mills Leeds Yorkshire produced a 15-page report in 1846 “which contrasted profit/loss, the wear and tear allowance, and the profit per spindle (gross and net) for the 12 years past at Ashworth’s New Eagely and Egerton mills” (Fleischman and Parker, 1997, p.39). In 1849 Henry Ashworth calculated the ‘prime cost’ of cotton yarn including “both interest on capital and ‘wear and tear’ (depreciation)” (Fleischman and Parker, 1997, p.80). In the 1820s Stella Coal Company charged yearly depreciation on a waggonway (Fleischman and Parker, 1997, p.122).

Pollard thought that just as repair and replacement “were often confused, [so] were physical deterioration and technological obsolescence” (1965, pp.242-243). Again, the confusion was in Pollard’s mind. Pollard scorned

“Joshua Milne, for example, the well-known Oldham cotton-spinner, [who] justified his practice of depreciation by the need to provide for wear and tear, replacement, annual upkeep, the ‘fall in value’ and, in reply to a leading

25 Fleischman and Parker equate ‘wear and tear’ with depreciation but others do not, claiming that ‘wear and tear’ could include or meant only repairs. I discuss this below.
question, that without it he would soon have a ‘fictitious capital’, all at the same time. R.H. Gregg, another cotton-spinner more thoughtfully explained his depreciation on his ‘sunk’ capital, i.e. ‘the amount spent on buildings and machinery’, as ‘not only for actual wear and tear, but also for its deterioration arising out of new inventions’. The Albion Mill’s boilers were depreciated for ‘repair and fund for renewing’” (1965, p.243).

First, if Joshua Milne’s charges for depreciation included the charges for repairs (‘annual upkeep’), then, leaving this aside, his depreciation did charge for wear and tear, that is, for replacing the use-values consumed, which measures its “fall in value”. If he did not charge depreciation, Milne would soon have “fictitious capital” - judged by the capitalist mentality, he would overstate his profit and capital. If its charges for depreciation included repairs, the Albion Mills’ policy was likewise modern. R.H. Gregg put the modern view succinctly: depreciation allocates the cost of an asset over an economically useful life that, in part, anticipated technological (and market) obsolescence. As these economic lives may vary between assets, industries and firms, we expect depreciation rates to vary. Gregg made 5% and 2.5% semi-annual depreciation charges for machinery and buildings respectively (Fleischman and Parker, 1997, p.92). Thus, Pollard’s final comment that “perhaps the difference in actual rates of depreciation may also be taken as an indication of the uncertain philosophy behind them” (1965, p.244) again reveals the distance between his views and the realities of the industrial revolution and accounting.

Jones’ research into early Welsh industrial accounts shows “the word ‘depreciation’ is nowhere to be found, but the words ‘wear and tear’ are sometimes used to describe the sacrifice measured in using plant, utensils and similar assets” (1985, p.158). Pollard says charges for “‘wear and tear’ tended to mean repairs” (Pollard, 1965, p.243). Where charges are only for repairs and renewals, this is consistent with formal subsumption. However, repairs are only one part of the sacrifice from using fixed capital; the other part, the modern and capitalist concept of depreciation, is, as Marx says, the cost of the use-values consumed in production (Bryer, 1993, 1994b). That the user of a fixed asset should account for such a cost was evident from the accounting treatment for renting or leasing the same item. A rental or lease payment would include a charge for the ‘wear and tear’ over a charge for repairs (and other expenses and profit).26 And “Where an asset is rented or hired for the production period it would be natural to charge the rental or hiring fee as part of the cost of production for that period” (Jones, 1985, p.158). Thus, the purchaser of an asset should make the same charge. Jones gives an example from around 1740 where an industrial entrepreneur distinguished between repairs and other “sacrifices” from using fixed assets, even though no he made no charge for depreciation. In an analysis of the cost of production of copper at Neath he quotes the following comment:

“The last Article of 4 Pounds a week for Wear and Tear is no doubt lyable to more uncertainty, than any of the rest;...it must be supposed that little else but Repairs of Furnaces, Tools etc. is included in this and that they are all once

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26 Marx used the analogy of accounting for rent to work out his ideas on the capitalists’ depreciation of fixed capital. See Bryer 1994b.
fixed in good Order, and by this allowance to be kept so, and I believe it would be very sufficient for that purpose” (Jones, 1985, p.30).

If the compiler of these cost estimates included “little-else” but repairs, or nothing for anything else, this implies the charge for “wear and tear” might have included something else, something other than repairs. In English, to ‘repair’ something means to ‘make good’ or ‘restore’ the thing to its original condition. The charge for wear and tear in modern accounting is for the things that the owner cannot make good - for example, irreparable structural decay; technological and market obsolescence. As Jones says, there is yet little direct evidence of how the early eighteenth century industrialist calculated “wear and tear” charges. Nevertheless, he only allows that these “costs seem to refer to repair costs incurred in maintaining tools, etc., for the production process” (1985, p.75, emphasis added).

It would be surprising if many late eighteenth century industrialists did not understand or care about the distinction between repairs and depreciation because according to Arthur Young’s writing farmers certainly did. In 1788 Young published a farmer’s accounts for four years that included a charge for “deadstock...[that] are no more by estimate” (1788, p.236-238). It is unlikely this is for repairs as it includes the decline in value of the “manure &c. in the land” (Young, 1788, p.237). There is no heading for repairs that would be mostly labour costs. In an annualised profit and loss account at standard crop mix and yield Young charges for “wear and tear” (1788, p.238), possibly including both repairs and deadstock that ‘is no more’. Young also distinguishes repairs in his costing of the daily output of a threshing machine in 1793 where he charges repairs separately from a charge for the “Price of the machine £120: interest at 6 per cent £6, share of that say...6[s.]...for a day” (Mingay, 1975, pp.97-98). The 6 shillings charge for one day’s “Price of the machine” appears to be for depreciation, either 6% reducing balance or straight-line. Young appears to restrict his use of the term ‘wear’ to items that only depreciate. For example, in 1768 he says “marl begins to wear out” (Mingay, 1975, p.61; see also, p.63), that is, to depreciate. Robert Loder said he charged for the “wearing out of the said horse”, presumably that part of the horse he could not repair, separately accounting for other costs of maintenance (Bryer, 2000b, pp.369-378). In a detailed costing for the period 1790-1795 “[a]n interesting feature was the use of the word ‘decay’ to connote depreciation of horses”; in an 1821 costing of the expense of a pit horse “[t]he analysis included depreciation of the stock (called wear and tear) at a rate of £3/8/0 annually for pit horses and £5/10/0 for waggon horses” (Fleischman and Parker, 1997, pp.132, 138). George Washington included a charge for “depreciation” in his calculation of the annual cost of a slave. Mingay summarises a letter from Washington to Young in 1801: “A Negro slave, wrote Washington, cost £75 at twenty-five years of age, had an expected life of thirty years, and cost £12 5s. a year to keep, including interest and depreciation on his capital cost” (1975, p.9).

By the early part of the nineteenth century the words wear and tear “become more familiar as terms in accounting records” (Jones, 1985, p.165). Babbage stated in 1835 that it was of “great importance to know the precise expense of every process, as well of the wear and tear of machinery which is due to it” (1835, p.203). The reason was “The great competition introduced by machinery and the subdivision of labour [that] render[s] it necessary for each producer to be continually on the watch, to discover
improved methods by which the cost of the article he manufactures may be reduced” (1835, p.203). In short, the “evil of not assigning fairly to each tool, or article produced, its proportionate value”, including the charge for the wear and tear of machines, was that it shirked the real subsumption of labour (Babbage, 1835, p.289). From the mid-nineteenth century the charge for wear and tear meant the cost of recovering irreparable use-values consumed in production (Bryer, 1991, 1993, 1998).

Certainly, as Jones says, “Accounting thought, in terms of profit measurement, reflects depreciation as a cost but it seems to have not been generally applied” (1985, p.166). From Marx’s viewpoint, economic and institutional developments were necessary in the later nineteenth century, before the law and the accounting profession demanded systematic depreciation accounting (Bryer, 1993).

Standard costs and the integration of financial accounting and cost accounting

The arrival of standard costs and the apparently widespread integration of cost and financial records to provide routine data for performance assessment and control suggests the capitalist revolution in full swing in the 1790s. As Edwards and Newell say,

“the integration of cost and financial records to provide routine data for the purposes of transfer-pricing, performance assessment and control in large companies dates from the 1790s, and perhaps earlier; whilst the roots of standard costing can be perceived in the accounting practices employed during the second half of the eighteenth and the early nineteenth century” (1991, p.53).

Full modern accountability arrives with integrated financial and management accounts based on standard costs that reach down to the shop floor (Edwards and Newell, 1991, p.41).

“In 1768, a report was prepared [for the Carron Co.] on the extraction and profitability of Kinnaird coal, which included time-and motion studies on the mining process and laid the foundation for the establishment of standards and transfer prices” (Fleischman and Parker, 1997, p.41).

“Evidence of [large] Industrial Revolution firms employing production and costing standards is plentiful” (Fleischman and Parker, 1997, p.42).

“In the 1820s, a bounty system was established [by the Darby ironworks] which specified…the standard furnace make per week, with bonuses added and abatements subtracted for deviation. Likewise puddlers were bound by standards to a given yield. In this way as well, the accounting system was used to evaluate worker performance and to allow for the promotion of the more talented” (Fleischman and Parker, 1997, p.55).

By the mid-nineteenth century many leading coal, iron and steel industries have capitalist systems of accountability as comprehensive as relations with labour allowed. Boyns and Edwards report “clear evidence…of the widespread integration of cost and financial accounting systems within a double entry framework prior to the so-called costing renaissance of the 1870s. In the case of Stavely ironworks from as early as
1690” (1997a, p.80). It is possible “that integrated systems were ‘universally adopted’ circa 1860” (Boyns and Edwards, 1997a, p.83). If so, this signals the ‘universal’ existence of the capitalist mentality after a revolution lasting some 200 years.

A Foucauldian challenge?

In contrast to Marx’s theory where the capitalist mentality progressively but contingently takes control of production, Foucauldian accounting historians such as Hoskin and Macve argue that meticulous attention to ideal labour standards is the *sine qua non* of modern management accounting. What for Marx is an important stage in the development of capitalism and capitalist management accounting is for Hoskin and Macve a ‘discontinuity’. Although they see this historical break as the product of “a whole mosaic of events…over a long period of time” (Fleischman, Hoskin and Macve, 1995, p.164, fn.5), on one side of their discontinuity management and accounting are pre-modern; on the other side they are fully modern.27

“From the Foucauldian perspective, while development of ‘physical’ standards, based primarily on engineering data and used to control ‘physical’ operations such as materials usage and the efficiency of machines, is relatively (although not wholly) unproblematic, the transfer of such performance measurement to human behaviour, to generate norms and standards of human performance, was a development of a different order. There was an intellectual, social and organisational leap when accounting measurement was first applied to creating labour standards” (Fleischman, Hoskin and Macve, 1995, pp.163-164).

Ideal labour standards are implicit in the capitalist mentality. The task of the Marxist accounting historian, therefore, is not simply to identify the modern mentality, but to study and explain its history. We must explain the history of its emergence and the battles, the successes and the failures, in overcoming the many obstacles that prevented it immediately and effortlessly changing the world into its own perfect image.

A case in point is the long struggle of Boulton & Watt (hereafter, BW) to profit from Watt’s steam-engine patent and Boulton’s capital, business acumen, knowledge, and manufactory. Fleischman, Hoskin and Macve argue that following the introduction of experimentally determined piece rates at BW’s newly built engine factory, “there does not appear to be any evidence of meticulous control over…[labour] productivity” (Fleischman, Hoskin and Macve, 1995, p.171). This, they say is evidence of a “constant and long-standing absence of a concern with tracking and shaping labour time”. In the Foucauldian view this means that BW adopted an “…‘unmanagerial’ approach to labour cost control” (Fleischman, Hoskin and Macve, 1995, p.169). From the Foucauldian perspective the mentality of BW’s management was ‘pre-modern’, missing an essential element in the intellectual weaponry of the modern manager. By contrast, from Marx’s perspective BW’s mentality is fully modern and it made huge strides towards realising its capitalist ambitions. Certainly, semi-capitalist social relations of production prevalent during the late eighteenth and early nineteenth

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27 The research and paper resulted from a collaboration between Fleischman, an avowed economic rationalist, and Hoskin and Macve, avowed Foucauldians. References to Fleischman, Hoskin and Macve should in this context be read as references to Hoskin and Macve.
centuries - the absence of fully free wage labour and free capital - limited the full implementation of the capitalist mentality, but increasingly often this mentality was fully modern. From the Foucauldian perspective the “crucial question...is the extent to which the company set, appraised, and controlled labour standards of human performance” (Fleischman, Hoskin and Macve, 1995, p.166). Fleischman, Hoskin and Macve admit that for Foucauldians “[n]either the evidence nor the interpretation of these activities is straightforward” (1995, p.166). By contrast, we argue that the accounting and historical evidence clearly shows BW to have had the modern capitalist mentality from the beginning of the partnership in 1775, and that developments in its accounting system precisely mapped the interactions between this mentality and the evolving social relations of production that it faced.

Part three: the case of Boulton & Watt - a Foucauldian crux?

In this part we use accounting evidence to support Roll’s conclusion that BW’s “experiments in scientific management shows that these are not exclusively a product of the era of mass production but were apparent from the very beginning in the machine industry” (1930, p.271). From Marx’s perspective, the period of Watt’s patent from 1775 to 1800 provides a classic case-study of transitions in the social relations of production wrought by the capitalist mentality - from initially feudal relations of production, through formal subsumption of labour, to the real subsumption of labour in production. For the Foucauldians, it was the absence of the discourse on ideal labour standards that limited BW’s modernity. However, from Marx’s viewpoint BW were modern capitalists operating in the social, economic and technical conditions of the eighteenth and early nineteenth centuries that they and many others were busily attempting to change, and were succeeding (Thompson, 1968).

The accounting evidence shows that the BW partnership was a capitalist enterprise from the beginning - that both Boulton and Watt had the capitalist mentality. However, faced with semi-capitalist and often feudal relations of production, they at first operate as feudal consultants engineers - designing an engine and selling the right to use the patent by having others build the engine and taking a rental on their use. In the next phase starting in 1782 with the development and patenting of the rotative engine, BW produce more of the engine components and engage in finishing, fitting and assembly using the old artisan system at its Engine Manufactory located within Boulton’s Soho works. In the final phase, from 1795, Boulton and Watt’s sons join the partnership. BW takes a long-deferred decision to build an engine works and erect a new Soho Foundry on a nearby site at Smethwick alongside the Birmingham and Wolverhampton canal, and extended, rebuilt and reorganised its Soho Engine Manufactory starting factory production of substantially the whole engines.

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28 As Armstrong says, “Given the widespread use of unfree labour in 18th century England, it can scarcely be argued that the general notion of a disciplinary regime, and with it the idea of the ‘governable person’, was novel at the time” (1994).
29 As we shall see Roll closely follows the outlines of Marx’s analysis of machinofacture even though he only references Marx in a few places. Berg references Roll to support the statement that “[t]he Boulton and Watt works in 1790 [sic] seemed the epitome of the order, regularity, and systematic layout emphasized by Marx (1994, p.64).
Matthew Boulton was the son of a silver stamper and piercer from Birmingham. He inherited a large fortune, married into a bigger one and spent it and more on developing his internationally renowned Soho works, where he collected skilled artisans and a large collection of tools and machinery to manufacture a wide and ever-increasing range of high-quality, artistic and fashionable consumer hardwares, ‘toys’ for the rich. In pursuing this business Boulton behaved like the still essentially feudal merchants who diversified their products through the putting out system into numerous petty workshops and who continue to dominate the hardware trades (Thompson, 1968, p.265). However, unlike these merchants, Boulton had a large manufactory, “a unique exception at the time in the hardware industry of the Midlands” (Roll, 1930, p.9), and his mentality is distinctly capitalist. Matthew Boulton (with James Watt) is an example of Marx’s revolutionary capitalist manufacturer who is also his own merchant. As a capitalist Boulton’s continual problem was finding a product with a wide enough market to justify his capital investment. He stamped this perspective on his partnership with Watt from the beginning. In 1769, during his negotiations with Watt and Roebuck (then Watt’s partner and supporter) Boulton wrote to Watt responding to a proposal from Roebuck to limit his involvement to manufacturing engines for three counties of England:

“I was excited by two motives to offer you my assistance which were love of you and love of a money-getting ingenious project. I presumed that your engine would require money, very accurate workmanship and extensive correspondence to make it turn out to the best advantage and that the best means of keeping up the reputation and doing the invention justice would be to keep the executive part out of the hands of the multitude of empirical engineers, who from ignorance, want of experience and want of necessary convenience, would be very liable to produce bad and inaccurate workmanship; all of which deficiencies would affect the reputation of the invention. To remedy which and produce the most profit, my idea was to settle a manufactory near to my own by the side of the canal where I would erect all the convenience necessary for the completion of engines, and from which manufactory we would serve all the world with engines of all sizes. By these means and your assistance we could engage and instruct some excellent workmen (with more excellent tools than would be worth an man’s while to procure for one single engine) could execute the invention 20 per cent. cheaper than it would otherwise be executed…. It would not be worth my while to make for three counties only, but I find it very well worth my while to make for all the world” (quoted in Dickinson, 1936, pp.53-54).

Boulton’s capitalist intent - to take control of production to cheapen its cost and make the maximum profit - and Watt’s acceptance of it in 1775, underlay their informal partnership agreement that Watt summarised in a letter to Boulton. Having assigned Boulton two thirds of the property of the patent and required Boulton to pay all the expenses to prove and secure the patent, the agreement went on to require

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30 Boulton’s Soho Manufactory cost £20,000 and could employ 1,000 men (Rolt, 1962, p.45).
“3. You [i.e., Boulton] to advance stock-in-trade bearing interest,…the stock itself to be your property and security.
4. I [i.e., Watt] draw one-third of profits so soon as any arise from the business, after paying the workmen’s wages and goods furnished, but abstract from the stock-in-trade excepting the interest thereof, which is to be deducted before a balance is struck” (quoted in Roll, 1930, p.19).

In short, Boulton provided the capital that he retained, and Watt took one third of the residual income, the hallmark of Marx’s capitalist mentality. As Rolt puts it, Boulton “foresaw that the development and commercial manufacture of the engine would involve, by the standards of those days, an extremely heavy capital investment and that many years might pass before the new business would yield an adequate return on that capital” (1962, p.58). This argument lay at the heart of BW’s case for extending the patent in 1775, that without it “the capital expenditure on the new plant [required] could not be justified” (Rolt, 1962, p.112).

Although James Watt professed a hatred of business and particularly keeping accounts,31 his background in socialised capital and production is consistent with him having a capitalist mentality even though he preferred the life of an artisan-scholar-inventor. His father involved himself in socialised capital and production. He was a general merchant and part owner of several ships, as well as being a builder, contractor, shipwright and undertaker - a person of substance who was Greenock’s chief magistrate.32 Watt’s father had groomed him to take over the business, but losses had forced Watt to learn a trade on his own account (Rolt, 1962, pp.12, 15, 16). Watt was himself no stranger to socialised capital and production. In 1759 he formed a partnership, employed several journeymen and apprentices. In 1763 he had sufficient surplus to acquire a large interest in the Delftfield Pottery Company. We shall see later that the accounting evidence suggests Roebuck, his first partner and a major investor in the Carron Company, was a capitalist. With a clear capitalist intent, BW turned to face the real world of existing production relations. As it was a world of only partly socialised capital and labour, it was to take many years for BW to realise its capitalist vision. Boulton financed Watt through his experiments to perfect his engine by borrowing and using up his capital.

BW’s first approach was to exploit the patent by acting as feudal consulting engineers who, after designing an engine for a capital-starved customer, received their rewards in the feudal fashion as a share of the cost-saving in fuel. Full exploitation of this strategy pushed BW to where coal was most expensive and the need for engines the greatest: in the Cornish mining industry that imported all the coal needed to work the growing numbers of Newcomen pumping engines. Initially, BW contracted out the production of almost all components to high-quality suppliers (in particular to John Wilkinson for the cylinders) and fully contracted out the erection. Boulton invested heavily in Cornish mines hoping to benefit himself and the engine business (Rolt, 1962, p.110), although he ultimately lost money on them. He knew that to turn his

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31 Watt wrote to a friend that he “would rather face a loaded cannon than settle an account or make a bargain” (quoted in Rolt, 1962, p.53).
32 At this time, as Rolt puts it, “the only portents of [Glasgow’s] future mercantile greatness were the produce trade with Ireland and the Virginian tobacco trade” (1962, p.14). Presumably Watt’s father invested in such ventures, the latter being a major source of merchant capitalists (Bryer, 2000b).
vision of using Watt’s patent as a ‘money-getting ingenious project’ he would have to charge not merely for the use of Watt’s engines but for their production. To do this required, first, the formal subsumption of labour in production, and then its real subsumption.

From formal to real subsumption

The idea underlying BW’s initial operation was that it would specify and order the components from outside suppliers, but that the customer would pay for them and their assembly into a working engine. The engines were at cost to the customer and BW made no profit from producing the engines, only from their use. From 1782 following the introduction of the rotative engine, BW produced many of the more specialised and technical components with the intention of making a profit. By 1790 Soho was producing more than half by value of the engines sold, and was fast becoming the production centre for engines (Roll, 1930, p.153; Tann, 1978). However, there was little division of labour, the smiths and engineers undertaking a wide variety of work. In short, at first BW only formally subsumed production. It made no attempt to take control of the valorization process.

From the end of the 1770s BW’s financial situation improved with substantial revenues from a large number of customers, many increasingly taken as lump sum equivalents. However, because before 1795 BW paid “little attention to the manufacturing side of the business” (Roll, 1930, p.121), its Soho engine manufactory made a loss in all but one of the years from 1782 to 1794 (Roll, 1930). BW revealed its real capitalist intent in the ‘Composite Trading Accounts’ for the manufactory summarised by Roll for 1787 to 1794 that charged “provision for interest at 5 per cent. per annum on the capital and for depreciation of buildings at the same rate” (Roll, 1930, p.123) - in other words, BW calculated residual income after charging depreciation on the most significant overhead, the manufactory’s buildings. Overlooking this, Fleischman and Parker claim:

“B&W did begin to depreciate its assets relatively early (1806), but in a confused fashion. In an inventory book..., buildings were depreciated at a rate of 10% straight-line, machines and fixture 15%, and tools/utensils 5%. Meanwhile, in a building and machinery account..., no depreciation was taken at all before 1815, and only 5% on buildings and 8% on machinery subsequently. The accounting staff became more co-ordinated in the 1820s when rates were standardised at 10% for buildings, 15% on machines and fixtures, 15% on patterns, and 10% on ‘research and development’ items” (Fleischman and Parker, 1997, pp.200-201).

First, it is hard to see how this accounting is ‘confused’. Accurate capitalist accounts should estimate depreciation rates for all separately identifiable fixed assets, and this does not rule out changing the estimates and deciding to estimate rates over classes of similar assets. Non-depreciation of the buildings and machinery in this account before 1815 appears to be a deviation from the capitalist mentality, but to understand it we need to know the details. Was it simply an error? Second, Fleischman, Hoskin and Macve overlook the trading accounts from 1787 which charge for “Decrease in the value of buildings (interest at 5 per cent. per annum)”. At this time B&W had little
machinery. From 1799, when it did have a significant amount, having now completed and equipped the Soho works, its trading accounts include a charge for “Wear and tear of machinery” (Roll, 1930, Appendices III and XXI). BW’s composite trading accounts for 1795 to 1801 of its Engine Manufactory show the results. Unlike those from 1787 to 1794 that show almost unrelieved losses, those from 1795 show growing profits. These accounts are also single entry ‘balance sheets’ of the form used by Robert Loder and advocated by Monteague, Young, and books on farm accounting that focus on profit as the increment to capital. Those of the second period, particularly from 1799, have more detail but continue with this system of capital accounting, evidence consistent with a continuing capitalist mentality. To turn this mentality into reality from 1795 BW began to really subsume its labour.

With five years to go before the expiry of the patent, the firm faced increasing problems with pirating and the appearance of other engine-building firms defying Watt’s patent. It suffered from poor performance by suppliers; the collapse of the Wilkinson partnership and the supply of bored cylinders and had continuing problems with labour. However, BW had growing demand for its engines and now had sufficient capital to achieve Boulton’s vision. In 1795 BW made their sons partners. The sons built and ran the factory of Boulton’s dreams having been groomed for this job with accounting, scientific and business educations (Fleischman, 1993). At the age of fifteen James Watt Jnr. spent a year at John Wilkinson’s ironworks at Bershamp and then had further education in Geneva. While at Wilkinson’s he did three hours carpentry a day and studied book-keeping, geometry and algebra (Dickinson, 1936, p.166). Young James returned to England in 1788. Boulton suggested Watt should send him to Messrs. Taylor & Maxwell, a firm of fustian manufacturers in Manchester, to work in its counting house “to learn book-keeping and commercial management for a period of two years” (Rolt, 1962, p.109). Matthew Robinson Boulton studied in Paris becoming competent in French, German and chemistry (Dickinson, 1936, p.165), all essential background skills for the late eighteenth century businessman-engineer. In 1795 BW embarked upon a “thorough and systematic internal reorganisation of plant, machinery, production processes, remuneration of labour and costing” (Roll, 1930, p.156). Only at this point did BW have the necessary capital and personnel to attempt to really subsume its labour - to produce cheaply for the world and earn an excess return on the capital employed. In 1795 BW turned its “attention to the organisation of a profitable ‘manufactory’” (Roll, 1930, p.121) - taking control of the valorization process - and, we shall see, within limits, it succeeded.

Roll says the Soho Foundry and the Engine Manufactory was “the first factory in the engineering industry of the world” (1930, p.156). He says the sons “brought to the task of organisation an entirely new outlook” (Roll, 1930, p.165). However, the accounting evidence suggests the fathers and sons had the same outlook. As we shall see, their ‘new outlook’ was identical to the capitalist outlook evident in other accounts of the period reviewed in part two. With the sons taking the lead, BW set about planning, building and organising a factory, spending over £21,000 building and equipping the Soho Foundry (Roll, 1930, p.164). They elaborated the division of labour “relieving the workman of a larger part of their independence and individual responsibility” (Roll, 1930, p.179). They implemented a new management accounting system. Fleischman, Hoskin and Macve question BW’s modernity because it did not continuously revise its labour standards and did not formally allocate its overheads to production departments.
The question for us is whether BW’s system carried the capitalist mentality to its modern conclusion.

**Accounting for productive labour**

The single most important problem Boulton had to overcome in implementing his vision was managing his labour power. First, getting enough skilled labour to erect the machines and later to make the components and, second, labour “steady enough for the growing factory routine” (Roll, 1930, p.60):

> “the problem of these large workforces...was not their size: it was their adaptation to the more rigorous, and often more alien, work system of factory and mill. ...They...were very volatile amongst both the skilled and unskilled. Various ways of combating this problem were tried. In the early years of factory management, many firms used long-term contracts. These were a hangover of pre-industrial bonds. ...Boulton at Soho...bound his men...for between three and five years” (Pawson, 1979, p.93).

In 1765 Boulton closed his Snow Hill manufactury precisely because having two sites “prevented adequate supervision, and in that year the construction was commenced of an enlarged factory at Soho to concentrate all activities there” (Cule, 1940, p.322). Nevertheless, from 1767 to 1772 Boulton & Fothergill lost over £7,000 and were heavily in debt (Cule, 1940, p.323).

33 Considering these results John Scale, his partner and manager at Soho, strongly advised Boulton to adopt capitalist methods, particularly tighter control of labour:

> “John Scale, the manager at Soho, indicated what in his opinion were the causes. Selling prices of the products were not fixed satisfactorily. Boulton was content to price any article in a haphazard way, ‘charging it according to what it might be got up for’. He condemned Boulton’s frequent absences from Soho, as well as his failure to close the accounts every year. The execution of orders lacked method and punctuality. The greatest abuse, however, in Scale’s judgement consisted in paying workpeople in the manufactory on time-rates rather than on piece rates. He calculated that during the previous four years £1,320 was lost in payments to workers for a good day’s work which had never been done” (Cule, 1940, p.323).

Cule treats Scale’s ‘Proposals to Boulton and Fothergill’ as criticisms of Boulton, claiming “[n]either Boulton nor Fothergill was able to explain this unfortunate state of affairs”. However, this reading takes no account of the practical difficulties facing Boulton, particularly those caused by his lack of capital. A more generous reading of his apparently haphazard pricing policy was that by marginal cost pricing he sustained the cash flow of the business. Boulton was frequently absent because he engaged himself in a continual battle to generate sales and capital and to fend off pirates, and this might also explain his failure to close the accounts on time. Watt was also

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33 A major source of his financial difficulties was his lavish expenditure on the new factory as Soho that cost him much more than he planned to spend, difficulties in collecting debts from foreign customers, and the high cost of servicing his debts (Cule, 1940, pp.322-323).
frequently absent, living in Cornwall for many of the early years. As Watt said of himself, although it was vastly more true of Boulton, “I fancy I must be cut in pieces and a portion sent to every tribe in Israel” (quoted in Rolt, 1962, p.99). Boulton well understood the importance of his presence at Soho. This was the reason in 1777 he was “convinced that we should avoid manufacturing as much as possible except the Brains, ye Heart & the lungs of our Engines” (Tann, 1981, p.171). The execution of orders was largely in the hands of others, and we have seen Boulton’s vision addressed this issue.

Finally, and crucially, Boulton faced artisan labour that he could not closely control and whose labour he therefore could not accurately cost. This was crucial because without accurate labour costs Boulton could not use piece rates. Without piece rates Boulton could not consistently price commodities to recover the capital required to produce them. As Marx said, “piece wage is the form of wages most in harmony with the capitalist mode of production” (Marx, 1996, p.555). Their attraction to the capitalist lies in the fact “[o]nly the working time which is embodies in a quantum of commodities determined beforehand and experimentally fixed, counts as socially necessary working time and is paid as such” (Marx, 1996, p.552). In other words, they are attractive if the capitalist has sufficient control of production to draw up standard labour costs. Then they become “the most fruitful source of reductions of wages and capitalistic cheating” (Marx, 1996, p.552).

Matthew Boulton was well aware that “the advantages of the factory system [w]as keeping workpeople ‘under our eyes and immediate management…everyday and almost every hour’….” (quoted in Pawson, 1979, p.92). In 1778 he raised with Watt the question of whether BW should use piece rates for a particular worker and told him he was negotiating with another to reduce labour cost “nearer what they should be than day work will make ‘em” (quoted in Roll, 1930, pp.191-192). Responding to another proposal from Boulton to pay erector’s piece rates

“Watt doubted how it could be done. The time basis necessary for the fixing of a piece-rate would be difficult to ascertain since the time of erection varied so much, and such variations were largely caused by external factors” (Roll, 1930, p.192).

At this time the introduction of piece-rates for erectors was not a high priority as BW’s customers hired them. Although the erectors “were a sore trial to Watt” and he often wished to dismiss them, Boulton took the more realistic long-term view: “our works must not be brought to a standstill because perfect men are not yet to be had. …We must take men as we find them and try to make the best of them” (quoted in Rolt, 1962, p.78). Making the best of BW’s labour power was to take massive capital investment and investment in accounting.

In 1781, following the introduction of the rotative engine, Boulton authorised an extension of the engine shop to handle the increased production of components and finishing, fitting and assembly at Soho. In 1786 Watt proposed “methodizing” or standardising production of components “so as to get on with them at greater pace” (quoted in Roll, 1930, p.267; Pollard, 1965, p.265). However, only from 1795 following the building of the Soho Foundry and the introduction of machinery and
organisational and technical improvements did the standardisation of production make
significant progress and the proportion of workers on piece wages sharply increase.
BW preceded each new piece rate by experiments to establish a profitable standard

“In order to arrive a profitable piecework rates a detailed study of output,
materials’ prices and previous wage rates had to be made and, where possible,
compared with those of other founders. The manufacture of almost every
component of a steam engine was studied before any offers were made to the
foremen and once piecework was introduced, output and wage bills were
closely monitored for several months” (Tann, 1981, p.13).

Fleischman, Hoskin and Macve brand BW’s labour standards pre-modern because BW
did not appear to update them regularly and meticulously.34

“B & W’s labour standards represent only a limited development. In particular,
while there was an incredible burst of calculating activity in the 1801-1802
period, there was considerably reduced attention thereafter” (Fleischman, et al,

The evidence suggests BW did not continuously revise its labour standards, but this
does not necessarily mean considerably reduced attention thereafter. First, as
Fleischman, Hoskin and Macve appear to accept, we must recognise that the tightness
of BW’s labour standards was

“limited by many technical imperfections; but [that] its motives and the
calculations which led to it are surprisingly in advance of the age, for it must be
remembered that machine production was then in its infancy. It cannot,
therefore, be called a rough and ready one” (Roll, 1930, p.210).

Fleischman, Hoskin and Macve accept that there is “some evidence that this apparent
laxness resulted not from a lack of care or concern, but from the intrusion of factors
that made it functionally impossible to assign accurate time estimates” (1995, p.171).
However, they also think that, “[a]t the same time, such factors seem inadequate to
explain the constant and long-standing absence of a concern with tracking and shaping
labour time” (Fleischman, et al, 1995, p.171). They say that BW did not have the
modern concern in 1801-1802 even though “there is clear evidence of the application
of a set of normalising practices to ‘rate-setting’ in the time-studies of 1801-1802”
(Fleischman, Hoskin and Macve, 1995, p.174). Their reason is that BW only
subsequently revised its labour rates in 1808 and 1814. From the Foucauldian
perspective, BW’s piece rate system did not engage in the critical discourse of
modernity, “it did not represent a continuous disciplinary gaze” (Fleischman, Hoskin
and Macve, 1995, p.171). If so, Boulton failed to fulfil his vision in which his factory
would keep “workpeople ‘under our eyes and immediate management...everyday and
almost every hour’.

34 Fleischman, Hoskin and Macve also criticise the ‘crudity’ of BW’s labour standards because they
worked only in quarter day units of measurement. However, this is merely an aspect of their charge of
‘non-normative’ standards and we shall not consider it separately.
From Marx’s perspective, however, Boulton did realise his vision. The burst of calculating activity in 1801-1802, the subsequent ‘inattention’ to piece rates and BW’s use of its accounting system to manage the factory, are all consistent with a constant and long-standing concern with shaping labour time to earn a satisfactory rate of return on capital. As Roll says, and Fleischman, Hoskin and Macve accept, “[t]hat the system was intended as an incentive to increase the output there can be no doubt” (Roll, 1930, p.211). And that it signalled a “complete change in the attitude to labour” (Roll, 1930, p.220) there is also no doubt, as the simultaneous developments in BW’s management accounting system attest.

As Roll says, BW’s “wage memoranda, price lists and calculations show…labour was already well on the way of becoming, as it is today, nothing more than one of the factors to be calculated in the costs of production and to be used in a manner most satisfactory to the employer” (Roll, 1930, p.225). Although BW did not revise piece rates until 1808, in ‘neglecting’ them in a period of inflation, high demand for labour and high labour unrest, BW continued treating its workers as commodities because leaving its piece rates alone meant its real labour costs did not increase. The real wages of London artisans were higher in 1808 than 1801 (Gayer, Rostow and Schwartz, 1953, pp.81, 108). By contrast, BW held its rates even though artisans in Northern and Midland centres of industry also increased their real wages from 1790 (Thompson, 1968, pp.267-268). Perhaps, therefore, BW ‘neglected’ its labour standards because it feared provoking demands for substantial increases in piece rates. As Armstrong says,

“In the early 19th century the skilled trades of the metal working industry had scarcely begun to congeal. Engine-wrights and other proto-craftsmen were an independent breed. …To speak of the possibility of setting up a disciplinary regime in such circumstances seems fanciful… Since the company had already succeeded in more-or-less halving unit labour costs during the standard-setting of 1800-02, I can see little incentive in stirring up problems of this kind” (1994).

Not surprisingly, according to this interpretation, BW relaxed its labour standards in 1808, and its normally placid workforce forced the upward revision of 1814 by the threat of a strike. Although BW did not change rates between these revisions, they were ‘settled’ with the workforce annually according to Watt Jnr. who said, in response to the strike threat that “settlement of piecework has for several years been made annually at periods when it was convenient to me” (Tann, 1981, p.12). Fleischman, Hoskin and Macve make no allowance for the fact the early nineteenth century was a period of considerable labour unrest with “positive action by working-class combinations designed to raise wages” (Gayer, Rostow and Schwartz, 1953, p.81), particularly in 1809-1810. Furthermore, they make no allowance for the fact that the “issues which provoked the most intensity of feeling were very often ones in which such values as traditional customs, ‘justice’, ‘independence’, security or family-

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35 Fleischman, Hoskin and Macve call Watt’s statement ‘cavalier’ because BW did not revise its labour standards each year, but standards and agreed prices, i.e., piece-rates, are different things.
economy were at stake” (Thompson, 1968, p.222). That is, issues concerned with the control of valorization.

With limited technical control of production and prevailing labour traditions, BW had limited control of the valorization process. In 1802 the Soho Foundry had 54 labourers, 20 working for day wages providing the central services - tending air furnaces, loam mixing, smithing and scrap picking - and 34 casters organised into nine teams supervised by 11 foremen/internal contractors who received piece-rates. In the engine manufactory BW paid piece rates mostly in fitting (Tann, 1981, p.13). This system of employment, where the foreman gets paid by the piece and then pays his labourers a weekly wage and pockets the difference he can get them to earn him by speeding up production, is a variant of the traditional “butty system...no different from the vast majority of coal and iron works in the West Midlands at the time” (Tann, 1981, pp.12-13). Fleischman, Hoskin and Macve accept that BW did not face free wage labour. In their view, “[w]hile the introduction of piece rates itself appears to have achieved a dramatic improvement in productivity, the exercise was a ‘one-off’ to establish a new system of ‘fair’ prices” (1995, p.171). However, it is important to add that this new system imposed the capitalist notion of ‘fairness’. BW made necessary concessions to its workers. Nevertheless it continuously sought to ‘shape’, that is, to profitably exploit their labour. This aim lay behind the new method of calculating its selling prices introduced from 1796. This method defined the cost of production as “[m]aterial cost, plus direct wages, plus indirect wages, plus general charges” (Roll, 1930, p.245). To this BW added a return on capital employed. This hallmark of the capitalist mentality had not changed since the birth of the firm in 1775.

Contemplating the ending of the patent BW realised it could no longer charge rentals based on horse-power, but must calculate its prices according the prevailing norm of ‘fairness’, i.e., the capitalist notion of the cost of production plus the required rate of return on capital employed. Driving its price calculations was a concern with the public perception that their machines were too expensive. James Watt wrote to Matthew Boulton of “the report generally prevalent & generally accredited of the enormity of our profits on Rotative Engines”, and of the need to “carry on the business with a reasonable profit after the expiration of the patent”(quoted by Williams, 1999, pp.74-75). To meet this need BW fixed its labour standards and then calculated prices as the full cost of production plus a percentage for a reasonable return. For example, when it signed the contract with Harrison in 1801 for a piece rate of £20 per engine for fitting, it calculated the charge to the customer for fitting and testing an engine using the standard costs of a completed engine as data:

\[ \text{Cost of Production} + \text{Percentage for Profit} = \text{Price} \]

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36 James Watt senior wrote BW’s first correspondence on the subject in 1796 (Williams, 1999, p.73).
37 The percentage fell through time and BW eventually dropped a higher rate for customers in London (Roll, 1930; Williams, 1999).
38 Williams (1999) gives examples from 1796, 1798 and 1801 of the full-cost pricing of engines and an example of the full-cost pricing of parts in 1802.
In a letter to Watt Jnr in 1801, M.R. Boulton explained the principles of this method of calculating the price. He said it included “[a]n allowance made in the fitting for hemp, tallow, oil, candles, Coals and Interest of Capital expended in the shed and machinery and for trying the machinery” (Tan, 1981, p.246). In other words, the price included the labour of fitting, erection and testing. It also included depreciation charges on the machines and tools. The 40% mark-up included “a liberal allowance for indirect material and labour costs as well as for other overhead charges” (Roll, 1930, p.248). The 40% also included ‘Interest of Capital expended in the shed and machinery’, i.e., profit on the capital employed in the fitting shed and its machines. Possibly as early as 1795 BW produced a table comparing the prices of each machine using their existing system of cost plus five years’ rental depending on the horse-power and calculating them using the new system of cost plus the return on capital. The table showed that BW would have to progressively reduce the relative prices of the larger machines that did not consume capital in proportion to their horse-power (Roll, 1930, Appendix XIX), but would have to raise the price of the smallest, for reasons we consider in the following section.

Williams (1999) provides evidence that supports Roll’s view that BW designed their accounting system to ensure the realisation of planned profits:

“There were a number of very elaborate records for the purpose of calculating the actual profit realised on each engine. The books…give the cost of materials and the direct labour cost; while for recording the other indirect charge, such as fuel and lighting, other books were kept. …Owing to the methods of departmental bookkeeping the consumption of raw materials and the outlay on wages and general charges for each department could have been ascertained quite easily. The output of each department was also recorded” (Roll, 1930, pp, 249, 256).

39 BW reduced Harrison’s price to £17 if he declined to complete assembly and to test the engines.
BW expected each operating department to make a profit. Transfer prices between them included a mark-up for profit and BW produced departmental profit and loss accounts (Williams, 1999, p.74). We will see below that BW had a management accounting system covering both prime costs and overheads and that there is some evidence that BW used it to control production to realise the profit BW thought fair. Fleischman, Hoskin and Macve think, on the contrary, that BW’s accounting for overheads was not very sophisticated:

“the absence of a high level of sophistication in allocating overhead, and the lack of any direct evidence of whether and how comparisons between individual manager’s performance might have been made suggests that the purpose of the records was primarily for expenditure control rather than to support a system of devolved management” (1995, p.166).

Although there is no evidence that BW used a cost-allocation formula to hold its managers accountable for overheads, there is some that it used ‘activity-based cost management’ (ABCM) and used the ABC idea for pricing. In short, a closer look suggests BW’s management accounting system was as modern as ABCM is today.

**Accounting for overheads**

Roll shows that BW made profit calculations for the nine departments of the engine manufactory and appended them to the annual trading accounts, but he was unable to establish their basis (1930, pp.256-257). As there is no evidence of overhead allocation we may assume BW intended these calculations to hold the internal contractors accountable for their contribution to overheads and profit. Williams references a document that “compares the price with the actual cost of all engines built by the both the Foundry and the Manufactory during that period” (1999, p.82). There is again no evidence of use, but we should keep open the possibility that BW used it. First because “[o]wing to the methods of departmental bookkeeping the consumption of raw materials and the outlay on wages and general charges for each department could have been ascertained quite easily” (Roll, 1930, p.256). Furthermore, overhead could be calculated by unit of output if desired as BW also kept records of the output of each department (Roll, 1930, p.256). Second, in 1797 BW began producing a Fitting Department Book containing making all the appropriate capitalist distinctions:

“weekly expense reports for various departments exclusive of wage…separat[ing] expenses rightly chargeable to the owners’ capital accounts an aggregation of enterprises such as farming and workers’ housing, the utilisation of an ‘Establishment’ account for capital improvements, and an appropriate dichotomisation of raw materials and supplies charged to overhead. The reports maintained expense reports for individual shops of the same function (four lathing and two drilling rooms) that could have been used for comparative purposes” (Fleischman and Parker, 1997, p.200).

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40 Williams (1999) implies but does not show that the departmental profit and loss accounts included charges for overheads. He says of the comparison that showed profits less than expected, “Perhaps complete correspondence between estimates and actuals was an unreachable ideal because of the problems of estimating overhead” (1999, pp.82-83).
Although BW must have had some purpose in producing these reports, Fleischman, Hoskin and Macve can see none:

“Quite how these reports were used, however, remains uncertain. ...[I]t remains unclear to what extent if at all, they were used as a feature of day-to-day management since we could find no indication that managers were made answerable for their expense control” (Fleischman, et al, 1995, p.166, fn.8).

Not surprisingly, BW did not write down the details of its accountability process - the day-to-day or periodic judgements its managers made and the punishments and rewards they handed out - but the purpose of the reports is clear. To hold the workers and contractors accountable for the cost of production BW first separated the expenses chargeable to the owners’ capital accounts and on enterprises such as farming and workers’ housing, and to have an ‘Establishment’ account for capital improvements. It then separated raw materials and supplies charged to overhead. There is no direct evidence that BW held its internal subcontractors accountable for allocated production overheads, but there is some evidence that it used ‘activity-based-cost-management’ ABCM, or ‘activity-based management’ (ABM) for short.

Like ABC, ABM identifies an organisation’s major activities, assigns costs to cost centres for each activity, determines the cost driver, but “can omit the final stage of assigning activity costs to products” (Drury, 2000, p.897). In short, ABM “focuses on managing the business on the basis of the activities that make up the organization” (Drury, 2000, p.897). It suits relatively small concerns like BW where owners or senior managers actively involve themselves in production because it cannot fully standardise it. By modern standards BW was a small concern (Roll, 1930, p.162; Pollard, 1965, p.79). In 1802 it employed 54 in the Soho Foundry (Tann, 1981, p.12). The Soho Engine Manufactory, called the “Engine Yard”, was also small. In 1796 “the number of men employed ‘in the yard’ rises to fifty-five” (Roll, 1930, p.254). To manage these small concerns BW had M.R. Boulton, James Watt Jnr., and a “circle of experienced and reliable assistants...at their disposal” (Roll, 1930, p.260). These included Abraham Storey, three senior engineers (Southern, Lawson and Murdock) who received high fixed salaries and took a share of profits, two bookkeepers, one cashier and a number of clerks. In addition, there were eleven foremen contractors in the Foundry who took a share of profits, and foremen contractors in the Engine Manufactory who did likewise. William Murdock in particular was “a tower of strength, taking over the day-to-day technical direction of the works and playing a leading part in the very considerable extensions which were made in the engine shops in 1795-1796” (Rolt, 1962, p.111).

In March 1797 James Watt Jnr. wrote to G.A. Lee, a Manchester cotton spinner, for advice on accounting for the cost of production. Lee’s advice was, in effect, to use ABM:

“I wish I could communicate to you any Information respecting the mode of Keeping Manufacturing Books - in the construction of Machinery we never yet could reduce it to regular piece work or divide the Labour of Making and Repairing it in such a Manner as to determine the distinct cost of each - In the Manufactory I have attain’d rather more accuracy but yet far short of my hopes
& wishes...but the first Object appears to me to be close personal Inspection for which there is no Substitute & then a moderate Understanding will analyse & arrange with as much Accuracy as is usually necessary - you must therefore descend to Drudgery & you will infallibly succeed” (Tann, 1981, pp.240-241).

The sons had already immersed themselves in just this sort of accounting drudgery. In April 1797 M.R. Boulton wrote to his cousin apologising for a long silence:

“You will (not be a) little surprised to find that I am a very regular attendant in the counting house & immersed in business. Like a person hesitating on the brink of a cold bath I found the only means of conquering my aversion was to plunge in: my experiment has so far succeeded. Mr. J.W. jun’. & myself with the occasional advice of the old gentlemen have the entire Management of the Engine business & for the last 12 mos.” (Tan, 1981, p.235).

It remains unclear whether the sons followed Lee’s advice to use their immersion in the business to generate a “moderate Understanding [and] analyse & arrange [costs] with as much Accuracy as is usually necessary” for ABM. However, besides books giving the cost of materials and the direct labour cost, from 1797 new books were opened for indirect charges analysed according to the principle of ABM. That is, instead of analysing expenditures by type (e.g., labour, materials, fuel, lighting), doing so by function or activity:

“for recording the other indirect charge, such as fuel and lighting, other books were kept. Indirect labour costs were entered under such headings as ‘wheeling sand’, ‘carting lime’, and ‘errands’. ...Some of the overhead charges were also tabulated in a similar way, and statements covering a period of years were usually prepared for the future guidance of the firm. One very elaborate example is that of the consumption of oil and candles which, from a certain date onwards, was tabulated for each week under twenty-three different headings” (Roll, 1930, p.249).

There is, apparently, “no information available concerning the way in which [indirect charges] were apportioned for each job” (Roll, 1930, p.249). As the necessary data existed, Roll surmises “that, if they were taken into account at all in the calculation of the profit on individual contracts, they would be charged up to each department for a certain period and then divided by the output of that department” (1930, p.249). What is clear from the above is that BW analysed expenditures on indirect materials and labour according to the activities - wheeling sand, carting lime, running errands - that consumed them. Fleischman and Parker say “there are hundreds of bundles, thousands of items, replete with actual and estimated expenses of this genre” (1997, p.200). From the social accountability perspective these records are evidence of relationships of intended accountability. Roll had no doubt of their purpose: “In the same way as in any well-organised factory of today, the purpose of keeping statistical records as Soho was mainly for the detection of waste and efficiency” (1930, p.250), i.e., higher profits. Given its small size and records based on the principle of activity-based management, we can agree with Roll that BW’s statistics, calculations and accounts “seem to exceed the limits of reasonableness...for a business of the size to which they refer” (1930, pp.250-251).
BW also applied the activity-based costing idea when it revised its method of calculating the prices of its engines. It adjusted the price of the smallest (4 horse-power) engine upwards compared to the price from using the old royalty system, as “a greater proportionate profit should be laid on these small engines to compensate for the trouble of drawings, etc.” (Roll, 1930, p.243). That is, the products consuming more overheads had to bear a higher charge and, therefore, to earn a satisfactory profit, BW had to sell these commodities at a higher price. As James Watt had said in 1796, “otherwise will be attended with a loss” (Williams, 1999, p.73).

Conclusions

Roll suggests that “these changes in book-keeping methods were to some extent bound up with the changes in the partnership”, particularly “the greater use of the delegation of certain functions of management to supervisors, foremen and clerks” (1930, pp.251-252). It was no longer possible to rely, as Matthew Boulton had, on close involvement alone to attempt to control production for profit. Whereas Boulton exercised such direct control as was possible (relying on his good relations with his workmen), the new system exercised as much indirect, economic control as possible. What BW desired, sought and substantially achieved is clear from its thoroughly modern capitalist accounts. Consistent with Marx’s idea that the real subsumption of labour requires the capitalist to seize control of the valorization process, Williams concludes that its

“accounting system was set up to reflect the organization of production. It was designed around profit centers and recorded the flow of materials and work from one department to another. Product was transferred at predetermined transfer prices” (1999, p.85).

Within this capitalist accounting framework the limited development of BW’s social relations of production determined what was possible in shaping its labour power. The accounting evidence, however, shows there is no meaningful sense in which we can judge BW’s mentality as less than fully modern.

Part four: Explaining variation in the sophistication of accounting: concluding comments and directions for research

Part one of the paper argued that Marx gave us a testable theory of the BIR as the result of the capitalist mentality’s search for control of the valorization process. Part two argued that published accounting evidence is consistent with a transition from feudal and semi-capitalist systems into capitalist systems of accountability in key sectors of production in the eighteenth and early nineteenth century. The BW case in part three showed the capitalist mentality at work. This evidence contradicts Pollard’s conclusion that “there was no new systematized technique developed in parallel with new techniques in the production field” (1965, p.248) - that there was no parallel revolution in accounting. There is now good evidence that “this era was an important formative period for the development of sophisticated managerial accounting methods” (Fleischman and Parker, 1997, p.17). However, the capitalist mentality was not ubiquitous. No-one would disagree with Pollard’s other conclusion that “the
outstanding fact to emerge…is the enormous variety and ranges of practices in the counting houses in this period and the variety of assumptions on which they seem to have been based” (1965, pp.244-245). Research continues to show significant variation in the modernity of accounting. The challenge is to explain this variation and use it to uncover the genesis of the BIR.

In Marx’s history the BIR and management accounting were the product of changing mentalities and social relations of production. Traditional accounting historians, by contrast, assume economic necessity drove the adoption of management accounting. This framework does not convincingly explain historical variability in accounting. Fleischman and Parker, for example, explain variety in accounts by variations in the abilities of entrepreneurs and competition - variations in natural endowments and economic necessity. On the one hand they “attribute the superior methods to the acumen of those individuals, often the founding entrepreneurs themselves, who devised the various systems” (Fleischman and Parker 1997, p.22). On the other hand, for example, they found that there are

“not…a significant number of differences between the costing procedures employed by [most of the] textile and iron industry concerns [they looked at]…. This outcome in all likelihood resulted from the common periodic exposure of firms in both industries to strong competition, market-driven pricing, and narrow profit margins” (Fleischman and Parker, 1997, p.113).

These explanations are unconvincing because Fleischman and Parker do not explain why acumen had not produced modern management accounting before the BIR and, in particular historical circumstances, competition had not spread it. Furthermore, they do not explain why the competitive advantage of sophisticated management accounting did not mean that all, not just the majority of major companies, should use it. Even some major firms did not use it, and more research into small firms may reveal an even greater absence here.

According to Marx’s theory we must explain variation in accounting during the BIR by variation in the social relations of production - variation in the socialisation of capital and in the freedom of the workers. A wealth of case-study materials exists to test Marx’s approach. Crouzet (1985), for example, identifies 316 ‘first industrialists’ who established large industrial undertakings from 1750 to 1850 (1985, Table 4, p.149) who should form the core of a substantial accounting history research programme. We need many case studies across industries and through time that examine interconnections between accounts and social relations of production (e.g., Toms, 1998, 2002). For present purposes, however, reinterpretations of two well-known case studies - Walsh and Stewart’s (1993) comparison of New Mills (Haddingtonshire, formed in 1681) with The New Lanark Cotton Factory (1800 to 1812) and the Carron Company, first formed in 1759 - will illustrate the method of explaining variation in the sophistication of accounting.

New Mills and New Lanark

Marx’s semi-capitalists should not only do very different forms of accounting, they should also have very different systems of accountability. Under formal subsumption
capitalists hold labour accountable only for use-values and exchange values and the
mode of accountability is feudal - accountability for use-values and exchange values
based on direct coercion. Under real subsumption capitalists hold labour accountable
for capital and the mode of accountability is economic. Under formal subsumption
labour is not free; under real subsumption labour is free and must control itself within
the economic constraints of the labour market and the capitalist’s supervision. Walsh
and Stewart (1993) do not see it this way, but their comparison of the accounts of New
Mills with New Lanark highlights precisely Marx’s formal and real subsumption.41
The evidence shows that New Mills only formally subsumed its labour whereas New
Lanark really subsumed its labour.

A group of Edinburgh merchants obtained privileges from the Scottish government in
1681 and established The New Mills Woollen Manufactory. This had a central dyeing
and bleaching facility and had both domestic and workshop weaving and spinning. New
Mills paid its weavers and spinners piece rates it calculated by adding the
customary rate of profit to expenses judged according to “fair allowances” (Walsh and
Stewart, 1993, p.785). New Mills bound its workers by long-term contracts
(indentures) varying from one year to life. Its workers were “virtually serfs” (Pollard,
1965, p.51). To combat the “many difficulties with its work-people” (Scott, 1912,
p.145) the directors formulated detailed rules including a series of exemplary
punishments including fines, the pillory and spells in New Mills own prison for any
infringements. The accounts reflected these semi-capitalist relations of production. New
Mills only loosely socialised its capital even though was a joint-stock company. For
eexample, it admitted only “actuall tradeing merchands”; required the consent of all
members for admission of new members; and it retained the feudal practice of selling
finished cloth at conventional prices to its shareholders (Scott, 1905, p.xc; 1912,
p.142). As we saw in section one, under Marx’s formal subsumption the workers’

“association by capital…concerns only the product of labour, not labour itself.
Instead of exchanging with many, they exchange with the one capitalist.
Capital therefore effects a concentration of exchanges” (Marx, 1986, p.506).

New Mills’ accounts reflected this social reality. Its “Bookkeeping became the archive
for all exchanges of goods and money which took place at the manufactory” (Walsh
and Stewart, 1973, p.786). It focused on fining workers for failing to meet quotas or
for poor quality, and preventing embezzlement. Its accounts evince no clear
understanding of the full cost of production, revealed by the way it accounted for
waste, which it treated in the feudal fashion as a loss:

“At New Mills, deficiencies arising from waste and embezzlement were
indistinguishable, indeed wastage was treated as a natural occurrence at New
Mills - allowances were made for ‘indrying’ and anything beyond this
allowance was treated as embezzlement” (Walsh and Stewart, 993, p.793).

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41 Walsh and Stewart explain this difference as the product of the new disciplinary discourse identified
by Michael Foucault. Others have pointed out the problems in using Foucault’s framework in
researching accounting history (e.g., Armstrong, 1994; Neimark, 1994), particularly the indecipherable
question of the origins of this new discourse and its limitations, and we do not pursue them here.
One possible sign of the capitalist mentality is charges for what Walsh and Stewart calls “wear and tear of equipment” in calculating piece rate prices (Walsh and Stewart, 1993, p.785). The company did not use the words ‘wear and tear’. It described these charges as “For wast [or west] of cords and wheills [or wheels]” (Scott, 1905, p.55), which could be outlays for repairs to or replacement parts for looms and spinning wheels. The costings included an allocation of central management salaries - “For proportion of selleries” (Scott, 1905, p.55) - but make no apparent charge for depreciation of fixed assets other than buildings (e.g., looms, Dutch shears, coppers, scribbling cards, spinning wheels, burling irons, Teasesell handles). The company leased its land and buildings from one of the founder members. Because the company only paid lease payments after it had earned legal interest on its capital “it does not enter into the cost of production” (Scott, 1905, p.lvii). In other words, the company accounted for a major production overhead, rent of its buildings, as a distribution of surplus whereas a capitalist would capitalise the lease as an asset and (in this case) equity and include a charge in the cost of production for buildings. The company’s prospectus included only wages and materials as expenses in calculating the expected profit (Scott, 1905, pp.lvii, lxxxiv-lxxxix; 1912, pp.138-158).

As Marx would have predicted New Mill’s directors had “a complete lack of interest in the way people made things” (Walsh and Stewart, 1993, p.790). After the Union of 1707 allowing the importation of English cloth the company failed to innovate and eventually collapsed (Scott, 1912, p.157). By contrast, at New Lanark the focus of Robert Owen’s accounts was precisely the use of the labour power of his free-wage labours, that is, control of the valorisation process. At New Lanark “accounting had become the study of production rather than the study of exchange” (Walsh and Stewart, 1993, p.791). Unlike New Mills, New Lanark carefully accounted for waste by identifying the responsibility for abnormal waste and it apparently capitalised the normal waste: “Waste is...internalized, rather than something that was guessed at and happened outside the ambit of the factory” (Walsh and Stewart, 1993, p.793). Instead of direct coercion, the purpose of accounting was to make workers “mindful to do their work well” (Ogden, 1815, quoted by Walsh and Stewart, 1993, p.793). That is, the aim was a regime of economic accountability where workers controlled themselves. Walsh and Stewart’s summary of the differences between New Mills and New Lanark perfectly mirrors what we expect according to Marx’s ideas of formal and real subsumption of labour and the different social relations of production that provide their foundation:

“In New Mills, bookkeeping was concerned with things. Individuals were discouraged from transgressions by a series of contracts and punishments. In New Lanark...bookkeeping...is augmented by a series of reports and other administrative devices to create compliance. Bookkeeping, calculation of expense, production and discipline were linked together...[and] people were held to account for output rather than things - an entirely new accountability” (1993, p.795).

Walsh and Stewart compare the accounts of different entities at different times. We also need case studies of variations in the accounts of the same entity through time to

42 We discuss accounting and innovation in more detail below.
see if we can explain them by variations in the social relations of production. An illustrative case is the Scottish Carron Company.

*The ‘paradoxical’ case of the Carron Company*

From Fleischman and Parker’s economic rationalist perspective, variation in the Carron Company’s accounts presents a “paradox”:

“Prior to 1786, the Carron records reflected correct instincts about cost accounting methodology but they failed utterly to integrate costing with acceptable financial reporting. …As the financial reporting improved post-1786, evidence of this costing sophistication disappeared” (Fleischman and Parker, 1997, p.173).

How can we explain this apparently negative correlation between the quality of cost and financial accounting? Fleischman and Parker suggest that

“declining evidence of management accounting is not atypical as many Industrial Revolution enterprises aged, and supports our contention that the dynamic founders may have provided the motivational spark. Sophisticated costing often did not survive them” (1997, p.170).

Fleischman and Parker give us evidence of sophisticated management accounting at Carron before 1786 and there is little evidence of it thereafter, but their depiction of Carron’s financial accounting as ‘unacceptable’ before 1786 but ‘improving’ afterwards is questionable. Understanding Carron’s accounts in the context of changing social relations of production removes the apparent ‘paradox’.

In 1759 three partners - Garbutt, a successful manufacturer and merchant from Birmingham, Roebuck, a chemist and partner of Garbutt, and Cadell, a Scottish merchant and ship-builder - formed the Carron Company to make iron and iron wares. Unlike New Mills that employed local labour, Carron brought skilled miners from England allowing them to hire their own labourers “without making contact with the local serfs” (Pollard, 1965, p.42). Just as the works began to take its finished form, “[a]fter 1762 the failure of revenue to meet expectations led to increasing stress on administrative reoganization, aimed at controlling expenditure and keeping costs low” (Campbell, 1969, p.61). A key element in this was that in 1763 the partners began a series of meetings in a General Court of all partners which

“quickly introduced certain changes. The accountancy system in use was overhauled. Until then the system employed had been haphazard, being at most a record of expenditure and income, with little attempt at coherent classification, and certainly with little indication of the current level of profits being earned either generally or departmentally” (Campbell, 1969, p.62).

In short, as Carron began to function as a social collective employing wage labour its new accountancy system gave the partners calculations of profit both generally and departmentally, that is, it gave them financial reports and sophisticated cost information.
After the reforms the Company balanced its management accounts monthly; divided them into seven groups with separate accounts for each; and allocated overheads to departments. “It was hoped these methods would provide a firm record of costs of production” (Campbell, 1969, p.63). There is clear evidence that they did - that Carron now produced modern costings. “In 1763, Carron Company’s General Court ordered a breakdown of all costs for each product individually, including applied overhead”, whilst being “careful to specify which items of expense to include in ‘general charges’ and which to charge directly to the productive departments” (Fleischman and Parker, 1997, pp.31, 35). From 1765 and 1784

“a costing system was developed to monitor the performance of individual departments. …This enabled the profitability of different departments to be measured on a monthly basis, and comparisons to be made with other companies to discover areas of relative advantage. It enabled the performance of departmental heads to be monitored so that those producing poor results could be called to account. This is an early example of ‘responsibility accounting’” (Edwards and Newell, 1991, p.49).

On the financial accounting side, before the late 1760s, “there is little statistical information on how the Company fared” (Campbell, 1969, p.137). That is, there is no figure of profit for the Company as a whole. The Company did not regularly prepare balance sheets and depreciate or otherwise revalue its assets. “Afterwards, some figures of profit are given. From 1774 it is possible to quote these with a reasonable degree of assurance”, but sometimes only by adding up the profit credited to the individual partners’ capital accounts (Campbell, 1969, p.137). As Campbell says, up to the mid-1780s the trend is towards “increasing coherence in the balance sheets and other financial records” (Campbell, 1969, p.137). In Fleischman and Parker’s view the most “serious shortcoming” of Carron’s financial accounting system was that “[t]hough depreciation was taken in the records as early as 1769, there were major asset write-downs in 1769, 1784, and 1812, indicating the system was functioning on an ad hoc basis” (1977, p.186). The General Court agreed all these write-downs and the absences of depreciation. Fleischman and Parker say that financial reporting ‘improved’ after 1786 because the company began charging regular depreciation (although not regular amounts) with the agreement of the General Court. However,

“[f]rom 1799 Stainton adopted a different procedure, and, with exceptions, began the policy, which Joseph Dawson followed, of depreciating assets without authority from the General Court and before the books had been closed and inspected by the shareholders. …[T]hese allowances were made in such a way that they were concealed from other partners and that, in consequence, an excessive amount was written off and so hidden reserves were accumulated” (Campbell, 1969, p.169).

Stainton and Dawson became the managing partners from 1786. These partners also manipulated stock valuations “aimed simply at reducing or, occasionally, at increasing profits to whatever level was thought desirable” (Campbell, 1969, p.170). They made excessive provisions for bad debts and, in the summary balance sheet they gave to the other partners, they hid reserves in an omnibus item in the balance sheet headed ‘debts
due by Carron Company’(Campbell, 1969, pp.170-174). By these and other devices these two partners systematically depressed the profits reported to the other owners so they just covered the required percentage dividends on the partners’ capitals to encourage them to sell their shares to them (Campbell, 1969, p.178).

Thus, up to 1786 and for some years, the investors increasingly functioned as a social collective vis-à-vis production, but between themselves their capital remained only crudely socialised. From the first, the partnership agreement embodied the “desire to be and to remain in essence a family business”, and it placed strong restrictions on the transfer of shares to keep it that way (Campbell, 1969, p.22). There was a new partnership agreement in 1771 “made necessary by the expansion of the Company’s activities and the growing number and diversified interests of the partners” (Campbell, 1969, p.23). Also, although slightly more liberal in allowing share transfers, it provided the means of “retain[ing] control of Carron Company in a few - and what were also considered desirable - hands” (Campbell, 1969, p.23). In particular, only the original partners had continuous access to the accounts; new partners had to accept what the Company gave them at the meetings that they could attend, the General or Monthly Courts. Up to 1786 or the Company did not exploit the potential it had to hide information from the new partners:

“In 1769, Charles Gascoigne became general manager at Carron, but the information continued to flow because the General Court remained a committed, involved group that was interested in participating in the firm’s management” (Fleischman and Parker, 1997, p.169).

With its capital functioning collectively Carron’s cost accounting became capitalist and simultaneously the trend was towards “increasing coherence in the balance sheets and other financial records” (Campbell, 1969, p.137). By contrast, “As the firm entered its second phase, Joseph Stainton (1786-1825) and Joseph Dawson (1825-1850) ruled the firm with an iron hand, soliciting virtually no input from the other owners” (Fleischman and Parker, 1997, p.169). After 1786 the capital became less socialised and from 1799 after they secure control these partners manipulate the financial accounts by excessive depreciation charges and reserve accounting to depress reported profits as part of a strategy to oust the remaining partners. Fleischman and Parker are, therefore, wrong that Carron’s financial accounting ‘improved’ after 1786. As Carron’s capital became more socialised its management and financial accounting ‘improved’, became more capitalist; as its capital became less socialised after 1786 both its management accounting and its financial accounting became less capitalist.

We can therefore explain the historical variations in Carron’s accounting as the product of the waxing and waning of the capitalist mentality and the social relations of production. What we see in Carron’s accounts during the second half of the eighteenth century are transitional, semi-capitalist mentalities that changed as the social relations of production changed. However, Carron became an island of non-socialised capital in a growing and stormy sea of increasingly socialised capital. In this context, the policy of manipulating accounts ultimately backfired. Although the continued manipulations well into the nineteenth century showed that the Staintons and Dawson had effective control of Carron, “the declared profits were so unrealistically stable that they were obviously grossly suspect” (Campbell, 1969, p.176).
“Their attempts to depress the apparent profitability of the Carron Company were, at least in part, dictated by their desire to force other partners out and so gain the majority shareholding. Their desire to achieve this was so great, however, that once other shareholders were willing to sell they could generally rely on being able to force a Stainton or a Dawson to pay highly” (Campbell, 1969, p.178).

By 1839 Stainton, Dawson and their dependants owned 366 of Carron’s 600 shares, but they did not get them “without encountering considerable opposition from other shareholders” (Campbell, 1969, pp.180-181). In 1825 three partners asked “Dawson for a copy of the balance sheet ‘not the abstract, but the full one showing the items of funds and debts’. They had chosen the most vulnerable point” (Campbell, 1969, p.181). They also demanded a cut in the managing partner’s salary, and removal of the restrictions on selling shares only to the Company. The managing partners resisted these demands, scorning the last in particular because it “would ‘throw Carron open to be made a scene and subject for gambling speculation in shares’” (Campbell, 1969, p.185), precisely the intention of those would-be socialisers of its capital. Although there were a long series of “stormy meetings” the controlling partners stood firm on precisely this point - there would be no socialisation of the capital. As Henry Stainton told Joseph Dawson, “I will not submit to be overborne in general questions by this knot of insolent bullies, who, after all form a very trifling minority in the Company” (Campbell, 1969, p.184). By the later 1830s two of the opponents lost heart and sold out to the Dawsons. In 1839, however, a letter from a clerk at Carron revealed the exact accounting manipulations Stainton and Dawson were using and with this information the remaining opponent demanded the appropriate information. In response, reported profits and dividends paid increased (Campbell, 1969, pp.187-188). After the two controlling partners died in the early 1850s and with further revelations of anti-social capitalist behaviour, “the whole tenor of the affairs of Carron Company abruptly changed” (Campbell, 1969, p.190). In 1854 the General Court called in a professional accountant to check whether the financial accounts were ‘properly’ kept and to simplify them (Fleischman and Parker, 1997, p.186).

Accounting and innovation

We need many case-studies to understand the full significance of variability in accounting during the eighteenth and nineteenth century. A useful by-product could be a deepening of our understanding of the social roots of technological innovation. The capitalist mentality should be inherently innovative. If Marx is right, we should expect entrepreneurs who use capitalist accounting to be both technologically and organisationally innovative. They should be the first to erect factories and install and improve machines. At a general level, confining ourselves to the major enterprises of the BIR, the relationship is clear:

“The innovative genius of British entrepreneurs was not confined to their well-documented technological advances, but extended to their approach to cost management in a dynamic and competitive environment” (Fleischman and Parker, 1997, p.47).
The question is whether British entrepreneurs were innovative with cost accounting because they were innovative with technology, or whether they were technologically innovative because they were innovative in cost accounting? In short, we must look to see if well-known innovators were capitalists like BW. However, we must also look to see if we can find examples of the reverse. That is, examples where feudal accounting correlates with lack of innovation. A possible example is the firm of Newton Chambers that Fleischman and Parker call “a cost accounting wasteland” (1997, p.61) and yet was a large, “premier Sheffield iron concern” (1997, p.112). Another possible example is McConnel & Kennedy, the huge Lancashire textile firm that “exhibited unsophisticated cost accounting” (1997, p.112). “McConnel & Kennedy and Strutt chose to compete on the basis of high quality rather than price (Fitton & Wadsworth, 1958; Lee, 1972)” (Fleischman and Parker, 1997, p.84). Strutt’s accounting system was amongst “the best”, but “was deployed at peak efficiency only sporadically” (Fleischman and Parker, 1997, pp.76, 83). We must also look for cases - we expect none - where evidence is available for both the capitalist mentality and innovation and no correlation exists between them.

In some instances the link between capitalist accounting and technological innovation is clear. Fleischman and Parker find that “[m]any textile manufacturers were vitally concerned with technology costings” (1997, p.99). An example is “The Marshalls [who] were proactive in attempting to influence costs as evidenced by their continuous experimentation with more efficient spinning and hackling machinery and their willingness to restructure workloads to conform to test results relating yarn output to the number of spindles individual workers tended” (Fleischman and Parker, 1997, p.29). Another example comes from “The notebooks of Benjamin Gott [that] were replete with cost comparisons…, e.g., the cost/benefit of machines rather than manual methods for converting raw wool into yarn, the savings anticipated from cheaper spinning and finishing methods, and the cost differentials between Spanish and English wools” (Fleischman and Parker, 1997, p.29). In 1820 Philips calculated that the powerloom would “result in a weekly savings of £90, mostly as a result of labour reductions” (Fleischman and Parker, 1997, p.100). An example from the iron industry are the accounts of the Darby iron enterprise, “one of the most famous Industrial Revolution firms because of its longevity and its prominence in the development of new technology”. Darby management distinguished between productive overheads and ‘General Charges’ “[f]or expenses such as the maintenance of workers’ cottages”. “Commencing with these promising beginnings, Darby management employed its accounting system to control labour costs and, in association with technology, to reduce its production costs” (Fleischman and Parker, 1997, pp.54-55). At Dowlais an 1802 costing includes an overhead allocation (‘general charges’) and “[t]he firm employed technology to reduce costs” (Fleischman and Parker, 1997, p.57). Fleischman and Parker conclude:

“When new technology was introduced in the iron industry, it was often related to demonstrable cost savings. Results of technology experiments have survived in the Carron and Darby archives. …Although product line decision making was most advanced at Carron and Darby according to surviving evidence, the care taken by most firms to allocate overheads reflected an effort to generate the data necessary to gauge the long-run profitability of individual products” (1997, p.69).
Note, however, that

“In Carron’s case the founding partners were willing to experiment with new methods and technologies and thereby gained notoriety in Europe for innovation. By 1786, with this reputation established, experimentation declined” (1997, pp.172-173).

This decline in experimentation also coincided with the fall in the socialisation of capital at Carron from 1786 or so discussed above.

**Down to the roots**

Given the agricultural origins of handicrafts, manufacture and mining, to understand the origins of industrial accounting and its variability - to fully test Marx’s history of the BIR - we must go back to the agricultural and commercial revolution of the sixteenth, seventeenth and eighteenth centuries. The many historical links between agriculture, trade and industry amongst the 226 of founders of large industrial undertakings in Britain from 1750 to 1850 whose father’s occupation Crouzet (1985) could identify - his ‘first industrialists’ - may help us to explain regional variations during ‘the’ industrial revolution, that was, in reality, many revolutions. For example, “product costing and production reporting were far less frequently undertaken in textile firms as compared to...the iron industry” (Fleischman and Parker, 1997, p.93), but ‘firms’ in both textiles and iron-making may themselves vary according to their regional agricultural roots and the prevailing social relations of production (e.g., Hudson, 1986; Flinn, 1962). There are many other regional differences in the social relations of production that may relate to differences in the sophistication of accounting. For example, between the agriculturally, commercially and industrially sophisticated North-East, South East, parts of the South West of England, and of Wales, in the late seventeenth century and the generally less sophisticated Midlands, North-West and Scotland (Bryer, 2000c). There are international differences to explore.

**Concluding comment**

The aim of a Marxist accounting history of the BIR is not simply to produce correlations between the changing social relations of production and modes of accounting. It is to locate accounting in changing historical contexts of social accountability to help us to understand its implications for economic and social change. To do this we must take Marx and accounting history seriously. If Marx’s theory survives an extensive exploration of the archives we can use it to explain the BIR as a capitalist revolution - as a revolution in the dominant calculative mentality. Providing the evidence to allow us to test Marx’s theory of its emergence, its eventual triumph and its consequences, is a vital service for history that only accounting historians can perform.

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