Marx's accounting solution to the 'transformation problem'

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Abstract

Critics have argued for more than 100 years that in Volume 3 of *Capital* Marx failed to solve his 'transformation problem', failed to reconcile separate systems of values with prices, and simultaneously value inputs and outputs at closing prices, and doing so showed his solution was inconsistent, fatally undermining his labour theory of value. From the 1980s the 'New Interpretation' (NI), the 'Simultaneous single-system interpretation' (SSSI), and the 'Temporal single-system interpretation' (TSSI) challenged this standard interpretation to differing degrees. The paper supports their criticisms of its 'dual system' and 'simultaneist' interpretations by showing that they are inconsistent with Marx's theory of capitalist accounting, but goes beyond them by arguing that it underlies his theory of value. It supports the NI's focus on Marx's core claim that only 'socially necessary labour time' adds money value to commodities, but reinforces the SSSI's criticism of its dual-system accounting for constant capital. It supports the TSSI's dismissal of charges of 'inconsistency' in Marx's theory by rejecting both dual system and simultaneist readings, but qualifies and clarifies its 'temporal' accounting for input price changes. Accepting that Marx's theory is logical, the paper argues that we can test its empirical validity by understanding it as a theory of capitalist control. Marx had no 'transformation problem' to solve as economists pose it, of transforming socially necessary labour times into prices of production to give all capitalists the general rate of profit, but an accounting problem. He solved the reverse of the economists' problem, showed how capitalists transform the general rate of profit and prices of production into socially necessary labour time, eventually working out that capitalists' did this by measuring 'capital' as the 'money value of socially necessary labour time', which is equal for identical use-values. The history of capitalism had solved the 'transformation problem' by requiring individual capitalists to take control of the valorisation process and pursue 'cost-price', what accountants today call 'standard' or 'target' costs. This discovery, the paper argues, explains Marx's decisions to change the title of his project to *Capital*, and to begin by assuming that the price of a commodity equals the money value of the socially necessary labour time for its production. It argues that capitalist accounting practice supports Marx's claim that the sum of the profits of all individual enterprises is society's total surplus value; that an individual enterprise's profit is a 'fragment' of society's surplus value, challenging the view that we cannot use Marx's theory to explain the prices of commodities and the profits of individual capitalist firms. It dissolves the apparently incorrigible problem of allocating joint costs, including fixed capital. It concludes that Marx's *Capital* provides a testable theory of how capitalists use accounts to control enterprises collectively to produce, circulate, and simultaneously distribute, surplus value from the exploitation of labour, so that every capitalist gets an equal return on capital.

Introduction

> "The nonsense about the necessity of proving the concept of value arises from complete ignorance both of the subject dealt with and of the method of science" (Marx, 1868, Letter to Kugelmann).

Marx thought that his work on political economy, eventually published in the three volumes of *Capital*, had dealt "a theoretical blow to the bourgeoisie from which they will never recover" (Marx and Engels, 1987, p.4). Today many economists (including Marxist economists) think his labour theory of value is inconsistent, if not incoherent and irrelevant. Marxists often argue defensively that Marx did not try to explain prices and rates of profit, but propounded only a qualitative social theory of capitalist exploitation (e.g., Elson, 1979; Harvey, 1982, p.36). Only a minority cling to its intuitive appeal and search for proof that Marx's theory of value has the quantitative rigour and generality he claimed. The paper supports the minority, but argues that only by understanding his theory as a theory of capitalist accounting can they overcome the apparently "formidable problem of finding an interpretation and reconstruction of the labor theory of value which

is simultaneously an unimpeachable representation of Marx's own views and a foundation for a progressive economic research programme" (Foley, 2000, p.3). It argues that his explanation of how capitalism controls the production, circulation and distribution of surplus value, is a theory of capitalist accounting; that to work out his explanation, Marx theorised capitalist accounting practice.[1] Some economists have detected an affinity between Marx's theory of value and accounting (for example, Sweezy, 1942; Hicks, 1974; Foley, 1986; Klamer and McCloskey, 1992), but have not pursued it. According to Sweezy, "Marx's value theory has … the great merit, unlike some other value theories, of close correspondence to the actual accounting categories of capitalistic business enterprise" (1942, p.63), but apparently thought these too obvious to state or discuss. Others simply believe that reported "profits as evidence of exploitation is clear to all who care to see" (Fine, 2001, p.51). Grounding his theory in accounting could explain why Marx dismissed criticism that he had not 'proved' his concept of value: "Even if there were no chapter on 'value' in my book, the analysis of the real relationships which I give would contain the proof and demonstration of the real value relation" (Letter to Kugelmann, 1868, quoted by Meek, 1973, p.153). As we will see that throughout *Capital* Marx uses the accounting categories of 'capital', 'profit', 'revenue', 'cost', etc., and real capitalist accounts, to explain real relationships between capitalists and workers, the paper agrees with Marx that he had no need to 'prove' his theory of value.

Volume 3 of *Capital*, published in 1894, quickly became the focus of Marx's critics who, following Bortkiewicz (1906-7), agreed that he had failed to solve his 'transformation problem' rigorously, and that doing so showed that it was inconsistent, which fatally undermined his value theory (Kliman, 2007, pp.45-46; see, for example, Loranger, 2004 for a survey). The charge that "chapter 9 contains a demonstrated error that invalidates Marx's results" has naturally been "one of the most potent weapons in the arsenal of those who would seek to suppress his work" (Kliman, 2007, p.139), so it is important to thoroughly test its validity. Although typically presented as an "abstruse and technical" issue (Kliman, 2007, p.139), requiring a knowledge of advanced mathematics and economic theory to grasp, which Kliman (2007) shows is not the case, the paper argues that the "transformation controversy" is a relatively simple accounting controversy. Kliman (2007) shows that the controversy comes down to two interpretations of Marx: "On the standard interpretation, Marx had a *simultaneist* and *dual-system* theory", which meant, "inputs and outputs are valued simultaneously, so input and output prices are necessarily equal, and … there are two separate systems of values and prices" (Kliman, 2007, p.2). The paper supports Kliman's and others' rejection of these interpretations by showing they are inconsistent with Marx's theory of capitalist accounting.

In the 1980s, some Marxists began to question the standard interpretation, producing the 'New Interpretation' (NI), the 'Simultaneous single-system interpretation' (SSSI), and the 'Temporal single-system interpretation' (TSSI) (Kliman, 2007, pp.52-53). The paper supports their criticisms of the standard interpretation, but subjects them to an accounting

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[1] There are several possible reasons why Marx did not highlight the role of accounting in his work (Chiapello, 2007, pp.291-292). Probably the most important was, as we will see, it was too obvious to need stressing.

critique, and goes beyond their 'solutions' to Marx's 'problem'. The NI provides a solution that is consistent with Marx's core claim that only 'socially necessary labour time' adds money value to commodities, which the paper argues is the core of Marx's accounting theory.[2] However, by adopting the dual-system interpretation for constant capital, and retaining simultaneous valuation, the NI is inconsistent with Marx's other claims (Kliman, 2007, 161-163), and, the paper shows, with his accounting for the production and realisation of value. By dropping the dual system interpretation the SSSI provides a formal solution that is consistent with Marx's claims, but by retaining the simultaneity interpretation it remains inconsistent with other aspects of his value theory (Kliman, 2007, pp.163-164), and the paper shows with his accounting for price changes. Accounting for price changes is critically important because, as Kliman says, the "alleged proofs of Marx's inconsistencies and errors all depend crucially upon one key … interpretive error – the notion that inputs and outputs are valued simultaneously in Marx's theory" (Kliman, 2007, p.205). Detailed attention to Marx's accounting supports but qualifies and clarifies the TSSI's claim that by dropping both the dual system and simultaneous valuation interpretations we get a substantive solution that is consistent with Marx's solution, and with his value theory (Kliman, 2007, pp.52-53, 164-165).[3] It supports the TSSI's assertion that "valuation is temporal" (Wolff, 2009, p.421) because, it argues, within Marx's accounting theory the function of accounting is social accountability for capital, which requires accounts to follow the temporal sequence of its circuit, M-C-M′ (Bryer, 1999a, 1999b, 2000a, 2006).[4] The paper therefore supports the TSSI's claim to have removed the taint of 'inconsistency' from Marx, but this leaves the question of empirical substance.[5] It shows that Marx's value theory is consistent with conventional capitalist accounting practice, and argues that his solution to the 'transformation problem' is a testable theory of capitalist control, a theory of social accountability for the circulation of capital.[6] There is therefore no 'transformation problem' in *Capital* to solve in the way economists pose it, a problem of transforming

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[2] In Volumes 1 and 2 Marx defined 'socially necessary labour time' to mean the labour time "required to produce an article under normal conditions of production, and with the average degree of skill and intensity prevalent at the time" (1996, p.49). In Volume 3, he modified the definition because, Part 3 argues, he there concluded that capitalist competition imposed an overriding definition of 'socially necessary' labour time to mean that implied by 'cost price', what accountants today call 'standard' or 'target cost', the maximum cost of production that allows the capitalist to earn the general rate of profit. Until then, references to 'socially necessary labour time' are to Marx's general definition.

[3] Andrew Kliman is a leading figure in the development of the 'Temporal Single System Interpretation (TSSI), and for this interpretation the paper focuses on his work, particularly Kliman (2007).

[4] Accounting primarily gives 'results control', that is, control by setting targets, requiring objective accounts, and punishing or rewarding performance (Bryer, 2006). For this to work, to hold agents accountable for results, accounts must follow the temporal sequence of advancing capital at time t and measuring results and comparing them to target at time t + 1.

[5] Particularly important politically, as Kliman stresses, the TSSI claims to have removed the charge of 'inconsistency' from Marx's "law of the tendential fall in the rate of profit" (LTFRP), his theory that general increases in labour productivity tend to decrease the rate of profit, which underlies his theory of recurring crises in capitalism (Kliman, 2007, pp.31, 113-138). Part 3 argues that understanding how Marx accounts for price changes supports but clarifies Kliman's interpretation of the LTFRP.

[6] By 'conventional accounting', I mean the capitalist accounting that emerged from around 1850 in Britain (Bryer, 1993, 2005) that we will see Marx summarised as 'cost-price' and 'profit'. Marx saw capitalist accounting as ideological but "practically adequate" (Sayer, 1979, p.8), the assumption made here. Ideological distortions of accounts (e.g., Bryer 2012, 2013a, 2013b) are beyond the paper's scope.

socially necessary labour time into prices of production to give all capitalists the general rate of profit, but an accounting transformation problem that Marx did solve. This accounting solution supports the TSSI's "interpretive move … to understand values and prices as quite distinct but determined 'interdependently' … [which] means that neither is the essence to which the other reduces" (Wolff, 2009, p.420), but makes this concrete in capitalist accounting practice.

Bohm-Bawerk (1896) opened a different line of criticism. He did not argue that Marx's solution was internally inconsistent, but that Marx had failed to provide any solution at all. In Volumes 1 and 2 Marx assumed that the market prices of all commodities equals the money value of the socially necessary labour time required to make them, yet from part two of Volume 3 he accepted that, in reality, competition means that prices equal the cost of production plus the general rate of profit. Bohm-Bawerk argued that Marx had claimed in Volume 1 that commodities sold at their values in the long run, and that he would reconcile this with them actually selling at their prices of production in Volume 3, but had failed to do so (Kliman, 2007, pp.144-145). Following Bohm-Bawerk (1896), many of Marx's critics, but particularly economists, argued that the volumes of *Capital* themselves contained a contradiction etched into the structure of its presentation. Marxists usually reject this characterisation of Marx's claim (Kliman, 2007, pp.145-146), but they usually accept this definition of his 'transformation problem', the apparent need to explain how capitalism 'transforms' socially necessary labour time into prices of production, the long-run market prices that give all capitalists the (risk-adjusted) general rate of profit.[7] The paper argues that this framing of the problem stands Marx on his head.[8] The problem Marx solved in Volume 3 was how 'total social capital', capitalists acting collectively, a concept that does not figure in the TSSI or other interpretations, transforms the general rate of profit and prices of production into 'socially necessary labour time' in production, which solves the 'transformation problem' by requiring individual capitalists to take control of the valorisation process. This would explain why Marx, who was not averse to mathematics, made no attempt to solve the economists' 'transformation problem', how to turn socially necessary labour time into prices, and it would justify his dismissal of the issue: "our present analysis does not necessitate a closer examination of this point" (Marx, 1959, p.165).

Solving the 'transformation problem' at the aggregate level of the economy is consistent with the central claim of Marx's theory of value that only socially necessary labour time adds money value to commodities in production. However, working only in aggregates effectively accepts Bohm-Bawerk's denial "that Marx had reconciled the law of value with real world prices" (Kliman, 2007, p.145), that is, it implicitly accepts that Marx

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[7] Bohm-Bawerk's assertion that in Volume 1 Marx claimed he would show in Volume 3 that "products tend to sell at their values" is at best a weak interpretation of selected "snippets, never even a complete sentence", that we will see many other statements directly contradict (Kliman, 2007, pp.145, 146).

[8] Many Marxists dismiss the issue of alleged inconsistency in Marx's solution of the transformation problem by arguing that he had no interest in explaining prices (Kliman, 2007, p.4). However, as Marx undeniably "wished to explain where profit comes from and what determines its magnitude", and "price is cost plus profit …, the theory of price determination is essentially the same as the theory of profit determination", "Marx's theory does address how real-world prices are determined" (Kliman, 2007, pp.139-140), so we cannot ignore price determination.

"locat[ed] the labor theory of value at the level of the aggregate production of commodities … not, as Ricardo expressed it, in each particular commodity" (Foley, 1986, p.15). According to this view, Marx gave us only an "aggregate theory asserting that the labor-time worked by productive labor is the source of all money value-added, whatever prices happen to be" (Mohun, 1996, p.41). In other words, we cannot use Marx's theory to explain the prices of individual commodities and the profits of individual capitalist firms.[9] The paper argues that we can explain commodity (average or long run) prices and individual entity (average or long run) profits using Marx's theory of accounting. It argues that, consistent with the NI's treatment of variable capital (productive wages), and the SSSI's and TSSI's treatment of variable and constant capital (materials and means of production), accounting for the 'money value of socially necessary labour time' is the key principle underlying capitalist accounting that Marx, with help from Engels, identified. This correspondence, the paper argues, is evidence that his concept of value is not "metaphysical", that "the distinction between value and price exists in real life", not only in personal evaluations of "money's worth" (Kliman, 2007, pp.140, 141), but observable in capitalist accounts. Evidence that Marx's theory of value is a theory of capitalist accounting is evidence that profit really is, as he claimed, a 'form' or 'fragment' of 'surplus value', that the sum of individual 'profits' equals society's total 'surplus value', which supports his theory that "the exploitation of workers in capitalist production is the exclusive source of profit" (Kliman, 2007, p.140).

Part 1 shows that Marx drew on Engels' knowledge of accounting to work out his labour theory of value and theory of capitalist control.[10] It argues that a breakthrough in Marx's theorising of accounting for fixed capital explains his decisions in December 1862 to change the title of his projected series of books to *Capital* and to start it with an analysis of the commodity assuming that the money value of socially necessary labour time required to produce it equalled its long-run market price.[11] Part 2 argues that Marx's method of presenting *Capital* followed from his theory of capitalist accounts. Volumes 1 and 2 analyse 'capital in general', the circuits of capital at the level of the capitalist firm as a representative of all capitals combined, how the capitalist firm accounts for the production of surplus value. Volume 2 analyses how it accounts for the production and circulation of value (its sales) and shows they are part of the same integrated circuit, that production equals circulation. Volume 3 analyses the accounts of 'total social capital', the consolidated accounts of capitalists collectively, and how competition between individual enterprises (subsidiaries or branches) seeking the general rate of profit ensures they all produce and circulate surplus value so that every enterprise gets an equal return for equal capital.[12] It analyses how total social capital's accounting control of the

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[9] References to the 'individual capitalist', 'capitalist firm' or 'the capitalist' are to joint stock companies with managers and shareholders who hold diversified portfolios.

[10] Bryer (1994) noted the correspondence between Marx and Engels on the topic of depreciation accounting. Chiapello (2007) analysed some of this and other correspondence on accounting. This paper extends the range of accounting topics and goes into the details and their significant for Marx's project in *Capital*.

[11] From 1861 to 1863, Marx wrote the 'second draft' of what became *Capital* under the title *A Contribution to the Critique of Political Economy* (1991), also known as the *Economic Manuscripts of 1861-63*.

[12] 'Total social capital' appeared when individual capitalists held well-diversified portfolios of shares in

production and circulation of surplus value simultaneously distributes it so that individual firms earn an equal rate of return on capital. Part 3 provides an accounting critique of the NI, SSSI, and the TSSI. It argues that the NI and SSSI are inconsistent with Marx's accounting theory, and that while the TSSI is partially consistent, understanding Marx's accounting for price changes, what accountants call 'replacement cost accounting', qualifies and clarifies its 'temporal' interpretation, and sharpens its criticism of the SSSI's 'replacement cost interpretation'.

Part 4 gives Marx's accounting solution that, it argues, supports his claim that in Volume 3 he would show that labour remained the source of all value in the real world of competitive capitalism when prices diverged from values. The two critical aspects of this claim are that his 'solution' is historical, and that it relies on his theory of capitalist accounting. It presupposes the "really difficult" history of 'total social capital', capitalists functioning as a living collective, demanding the general rate of profit, and competing individual capitalists using accounts to control their labour processes to transform prices of production into socially necessary labour times, which they account for at what accountants today call 'standard' or 'target costs'. History created the 'general rate of profit' and 'total social capital' that requires individual capitalists to transform market prices to values rather than, as economists understand it, to transform values to prices. Part 4 argues that Marx's accounting solution was capitalists keeping socially necessary labour time accounts in money, according to the 'law of one cost' whereby identical commodities absorb equal amounts of the 'money value of socially necessary labour time'. It uses Marx's accounting theory to dissolve the apparently incorrigible problems of accounting for production overheads, fixed capital, and joint costs, to illustrate how capitalists account for the cost of production as target cost. It concludes that we can best understand *Capital* as a theory of social control based on a theory of value derived from Marx's theory of capitalist accounts, that there is no 'transformation problem' to solve, but a theory of capitalist society to test and develop.

Part 1: Marx's theory of value and accounting

Marx only occasionally refers to 'bookkeeping' in *Capital,* but his letters to Engels contain many questions about accounting (Bryer, 1994; Chiapello, 2007), particularly from 1858 when he was writing the *Grundrisse*, to the publication of Volume 1 of *Capital* in 1867, to which Engels provided answers. Engels' father was a textile manufacturer who removed him from school before graduation to train in business (Wheen, 1999, pp.76-77). After working in Europe, despite his radical inclinations, in 1842 he came to Manchester to work in a branch of his father's partnership to learn to be a 'good tradesman' (Chiapello, 2007, p.285), a business executive. Marx knew his philosophy, but before he met Engels his "practical knowledge of capitalism was nil" (Wheen, 1999, p.75; Chiapello, 2007, p.285). Engels, by contrast, had "invaluable firsthand knowledge of the machinery of capitalism" (Wheen, 1999, p.83), and knew from his training and experience that accounting was a vital cog. A letter in 1850 about disagreements between his father and Peter Ermen (a partner in the Manchester firm of

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joint stock companies controlled by managers, which began in Britain from around 1880, and in the US from around 1930 (Bryer, 1993; 2013a).

Ermen & Engels), shows that he appreciated that good accounts were critical to controlling capital:

> "The balance for the year 1849/50 has not yet been struck; debits and credits are in the most splendid confusion. Father would seem to have been pressing them again, so I hear, and tomorrow they will set about putting this in order …. If Peter Ermen takes over the management of the office … this will greatly interfere with my examination of the books. … I have abstracted the essentials, however …. In a few days' time I shall send Father Ermen Bros' complete accounts for 1849/50, duly classified and set out, as also those of Ermen's bleaching concern, so that he may see how these gentlemen carry on business with his capital" (Marx and Engels, 1975, p.253).

In 1844, while working for his father, Engels published *Outlines of a Critique of Political Economy*, his first theoretical publication, which kick-started Marx's study of political economy, and set the direction for his later work.[13] It fitted with Marx's materialist philosophy because Engels drew on practical reality to criticise the received theories of political economy. His paper denounced Adam Smith for defining value solely as the 'cost of production', and John-Baptiste Say for defining value solely as 'utility' (i.e., demand), and criticised both for sneaking their opponent's ideas into their theories by the back door. In practice, he argued, both the cost of production and the utility of the consumer (effective demand) determined value: "Value is the relation of production costs to utility. The first application of value is the decision as to whether a thing ought to be produced at all; i.e., as to whether utility counterbalances production costs" (Engels, 1975, p.426). Engels knew from experience that 'value' to capitalists meant only expected profit, and that they would not produce without it. He criticised the idea that the cost of production was the sum of rent, profit and wages, because neither Smith's theory of rent nor Ricardo's theory dealt with obvious practicalities. Smith's theory did not account for varying land fertilities, and Ricardo's theory assumed that in practice landlords could instantly withdraw inferior land from production if prices fell (Engels, 1975, pp.428-429). More significantly, no economists recognised that, in reality, capital and labour were "identical", and not just in the sense all admitted, that capital was stored-up labour. In practice, in the process of production, "the momentarily postulated separation of capital and labour is immediately superseded by the unity of both"; "capital is nothing without labour, without movement" (Engels, 1975, p.431). After their unity in production, at its end the capitalist separated capital and labour and started the cycle again, typically on a larger scale. It was as a businessman accountant that Engels knew, "After this separation [of capital and labour] is accomplished, capital is divided once more into the original capital and profit – the increment of capital, which it receives in production; although in practice profit is immediately lumped together with capital and set into motion with it" (Engels, 1975, p.430). The relationship between the cost of production, market prices, and value; the practical inadequacy of Ricardo's theory of rent; how capital and labour were both 'separated' and 'identical'; were all questions that

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[13] Marx referenced this article several times in his later works, calling it a "brilliant essay on the critique of economic categories" (Marx and Engels, 1975, p.615, fn.180).

preoccupied Marx for many years. Part 3 argues that his eventual understanding of these issues underlay his solution to the so-called 'transformation problem'.[14]

After many philosophical and political detours, Marx began his study of political economy in earnest in late 1857, turning to write what became his *Grundrisse.* In January 1858, he wrote to Engels asking for practical information to stimulate his theoretical analysis of 'the circulation of capital', the focus of what eventually became *Capital*:

> "In my economic work I have now reached a point at which I could do with some information on practical matters from you, since nothing of the kind is to be found in theoretical writings. I mean, the *circulation* of capital – how it varies in various kinds of businesses; the effects of the same on profits and prices. If you can provide me with any information on the subject, it would be VERY welcome" (Marx and Engels, 1983, p.256).[15]

Working out the effects of the circulation of capital on profits and prices would preoccupy Marx for several years. Engels provided him with accounting information, particularly about the circuit of fixed capital, which later gave Marx serious theoretical problems. This was the subject of their letters in March 1858, when Marx was writing the 'Chapter on Capital' in *Grundrisse.* He wrote to Engels asking him whether Babbage was right that in Manchester manufacturers replaced machinery every 5 years. Engels replied, "the most reliable criterion is the percentage by which a manufacturer writes down his machinery each year for wear and tear and repairs, thus recovering the entire cost of his machines within a given period. This percentage is normally 7½ on the declining balance" (Marx and Engels, 1983, pp.279-280). Marx and Engels here talked in the language of accounting, but this did not mean that Marx (or Engels) then had an articulated theory of capitalist accounting.[16] Marx followed up with other accounting questions:

> "Another question in respect of which I require only one example (approximate), is how, e.g., in your own mill or rather manufacturing business, floating capital is apportioned over raw material and wages, and what portion on average you leave in the bank. Further, how you *calculate* turnover in your books. Here the theoretical rules are very simple and self-evident. But it is nevertheless just as well to have some inkling of how things look in practice. The method of businessmen is, of course, partly based on illusions and even greater than those of the economists; on the other hand it rectifies the latter's theoretical illusions by means of practical ones" (Marx and Engels, 1983, p.283).

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[14] It is not possible to accept Oakley's claim that Engel's paper "lacks sophistication", or his view that "it is appropriate to see the piece as a *catalyst* in Marx's intellectual development only in the sense that it in no way directed or limited his subsequent studies" (1983, p.24, cf. Meek, 1973, p.140).

[15] Words in capitals are Marx writing in English.

[16] This implied a much longer useful economic life than 5 years. Engels said the charge for depreciation was 'on the declining balance', but he estimated it straight-line at 13 years, but he thought that taking scrap value into account reduced to 10 years. Marx replied, "The figure of 13 years corresponds closely enough to the theory" of crisis he was attempting to formulate (1983, p.281: see Clarke, 1994, p.263).

Marx used the contemporary accounting terms – 'floating capital', for current assets, and 'turnover' for the ratio of sales or cost of sales to capital, as we shall see. He wanted to know the proportion of 'raw materials and wages' in the finished goods – in other words, we shall see below when he asks again, he wants a breakdown of the cost of production – and how much capital was in the bank, owed by debtors, etc. In the same letter, he uses some accounting information he found in a Report of the Factory Commissioners to calculate the rate of return on sales, but he also wants to calculate the cost of production (Marx, 1983, p.283):

Capital sunk in building and machinery……………………   £10,000
Floating capital……………………………………………..   £ 7,000
      £500 interest on 10,000 fixed capital
      £350 interest on floating capital
      £150 Rents, taxes, rates
      £650 Sinking fund of $6_{1/2}$ p.c. for wear and tear of the
          fixed capital
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      £1,650
       1,100 contingencies (?), carriage, coal, oil

      £2,750
      £2,600 wages and salaries

      £5,350
      £10,000 for about 400,000 lbs raw cotton at 6d

      £15,350

[£]16,000 [sales] for 363,000 LBS TWIST SPUN. VALUE [£]16,000. _Profit_ [£]650, OR ABOUT 4.2 P.C. HENCE THE WAGES OF OPERATIVES here ABOUT 1/6.

Marx was not happy with the 'about 1/6' proportion of wages to sales which he simply assumed, and complained "It is a great pity that the above STATEMENT does not show the _number_ of operatives, or the proportion of actual WAGES to what appears as SALARIES" (Marx and Engels, 1983, pp.283, 560, fn.147). This information would have allowed Marx to distinguish productive from unproductive workers and therefore to calculate cost of production. He used these accounts in the _Grundrisse_ to illustrate calculating the rate of surplus value, the rate of profit, and the rates of turnover of fixed capital and floating capital (Marx, 1986, pp.485-486). There is no evidence of a reply from Engels to the question of the practical calculation of turnover, and Marx asks it again nearly 10 years later.[17]

These questions show that Marx did not yet have an articulated theory of capitalist accounts, but he persisted with his questions and analysis until he did. His comment that he was interested in accounts because "The method of businessmen is, of course, partly based on illusions and even greater than those of the economists; on the other hand it rectifies the latter's theoretical illusions by means of practical ones" (Marx and Engels,

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[17] In _Grundrisse,_ Marx calculated it in the same way that accountants still do today (Marx and Engels, 1983, p.560, fn.145).

1983, p.283), suggests he thought that capitalists had no theoretical illusions in their accounts.[18] It also implies that he theorised practical accounts to confront and rectify the theoretical illusions of the economists, particularly the illusion that the only value of interest to capitalists was market value, as we shall see in part 3. Businessmen had 'practical illusions', but it was critical to Marx's theory that, as he put it in Volume 3, "the nature of surplus-value impresses itself on the capitalist's consciousness in the course of the immediate production process, as we were shown by his greed for the labour time of others" (Marx, 1981, p.135). As he carefully said, for without it his theory would have no practical relevance, the "surplus value and the rate of surplus value … are, *relatively*, the invisible and unknown essence" (Volume 3, quoted in Meek, 1973, p.187, emphasis added). It is critical to the coherence of his theory that the capitalist has at least an inchoate "inkling of the source of his profit" (Marx, 1981, p.135), of labour as the source of his surplus value, to explain the bias towards increasing profits by reducing labour costs rather than reducing constant capital (Foley, 1986, p.55). In Marx's theory, this 'inkling', that it gets its surplus only from labour, is embedded within the collective mentality of capitalists as a class, in the collective mentality of 'total social capital', signatured today in the universal use of double bookkeeping (DEB) and cost-based accrual accounting (Bryer, 1993, 1999a, 1999b, 2000a, 2006b). Predictably, Marx used DEB to deepen his understanding of 'total social capital', the aggregate logic of its circuits of capital, and its control of individual capitalists and their workers.

Total social capital and DEB

In June 1861, at the beginning of his most productive three years during which he wrote the second draft of *Capital* and the *Theories of Surplus Value* in the *Economic Manuscript of 1861*-1863, Marx asks Engels,

> "If it could be done very briefly, without making undue demands on you, I should like to have a sample of Italian book-keeping (with explanations). It would help throw light on Dr Quesnay's Tableau economique" (Marx and Engels, 1985b, p.381).

From his study of 'Italian book-keeping', that is, DEB, Marx would learn how it automatically accounts for flows of capital by simultaneously recording the effect of every transaction as both a source (a credit) and a use (a debit) of capital (Bryer, 1993a). He would also learn that capitalists used DEB to produce integrated departmental profit and loss accounts that calculated profitability as the increment to capital at the level of the individual department and at the level of the firm. This would certainly help him understand that it was necessary to distinguish between 'capital' and 'revenue' at the level of the individual firm or sectors of production (as Adam Smith did), and at the level of society (which Smith did not). Part 3 argues this was critical to Marx's understanding of 'total social capital' and therefore to his solution of the transformation problem in Volume 3, because it allowed him to reconstruct François Quesnay's Tableau and to

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[18] By the 'practical illusions' of businessmen Marx meant that they saw 'cost' rather than the money value of socially necessary labour time, 'profit' rather than surplus value, and believed they earned profit from all their capital.

reveal Adam Smith's "nonsensicality of subsuming the *gross product* of a society *simply under revenue* (which may be consumed annually)". Smith's accounting was nonsense, Marx discovered, because "if this were so, a society would have to start each year *de novo, without capital*" (Marx and Engels, 1985b, p.485)!

Marx stayed in Manchester in April 1862 where he probably wrote his 'digression' on Quesnay's Tableau in the *Theories of Surplus Value* (Marx, 1963, p.484, fn.88). In July 1863, he sent Engels his own Tableau (and a presentation of Quesnay's Tableau) that produced integrated departmental profit and accounts for a two-sector ('department') economy (means of subsistence and means of production) showing how the accounts of both sectors balanced individually and overall (Marx and Engels, 1985b, pp.485-487, 490-491). What follows first presents Marx's Tableau in modern DEB and then shows that DEB underlies his presentation by comparing it with his version of Quesnay's simpler Tableau. First, Marx's example and his solution:

Marx's example

> Society has opening money capital of £1,166.66 (all numbers are millions) that it invests in two departments, £500 in the means of subsistence department (MOS) that produces the means of consumption, and £666.66 in the means of production department (MOP). The subsistence department spends £400 on means of production (constant capital) and £100 on wages (variable capital). It sells its total output for £700 and makes a profit (surplus value) of £200. The means of production department spends £533.33 on constructing its own means of production and spends £133.33 on wages. It sells its total output for £933.33 and makes a profit of £266.66. The departmental businesses distribute all their profits to their capitalists as dividends who spend them all on the means of subsistence (consumption). Similarly, the workers spend all their wages on subsistence.

To explain the circulation of capital Marx effectively does two departmental profit and loss accounts using the simplest possible double entries (indicated by the connecting arrows), recognising that each transaction had two sides – each involved a use of capital (a debit, Dr) and a source of capital (a credit, Cr). The debit sides of the departmental and gross product accounts record the costs of production and the balance of profit; the credit sides record the sales.

Department 1 – Means of Subsistence (MOS):

Dr   Cr

                                £   £
Wages   100.00 - - - - → Wages (MOS)   100.00
Means of production   400.00   Wages (MOP)   133.33
                                                         Dividends (MOS)   200.00
Profit   200.00   Dividends (MOP)   266.67
                             ---------   ---------
Sales   700.00   700.00
                             =====   =====

Department 2 – Means of Production (MOP):

Dr   Cr

Wages   133.33   MOP (MOS)   400.00
Means of production   533.33 - - - - - - → MOP (MOP)   533.33
Profit   266.67
                             ---------   ---------
Sales   933.33   933.33
                             =====   =====

Gross Product (Society):

Dr   Cr

Wages   233.33   MOS   700.00
Means of production   933.33   MOP   933.33
Profit   466.67
                             ------------   -----------
Sales   1,633.33   1,633.33
                             =======   =======
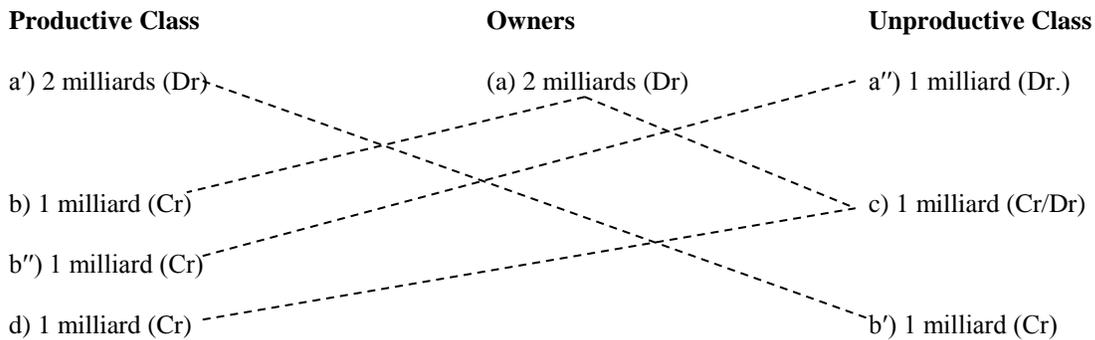
Marx used a complex diagram showing the flows of capital between the two sectors (1985b, pp.490-491). That the lines joining up the numbers in the departments indicated the double entries[19] is evident from an examination of his solution to Quesnay's much simpler Tableau in *Theories of Surplus Value* (1963, pp.308-344) (reproduced below) where he uses the same diagrammatic approach. Here he links together the effects of transactions between farmers (Quesnay's 'productive class'), landlords (owners), and manufacturers (Quesnay's 'unproductive class'), but this time with a lettering system which maps the appropriate double entry debits and credits:

<center>**Quesnay's Tableau**</center>

The farmers buy 1,000 million of means of production from the manufacturers and produce 3,000 million worth of food for sale (after their consumption). The farmers sell 1,000 million of food to landlords, 1,000 million of raw materials to manufacturers, who also consume 1,000 million of food. Farmers make a surplus of 2,000 million that they pay to the landlords as rent. The landlords spend 1,000 million of their rent on food and 1,000 million on manufactured goods. The

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[19] These lines show the double entries, but Marx does not call the links between the numbers debits and credits.

manufacturers buy 1,000 million of raw materials from the farmers and produce manufactured goods for sale worth 2,000 million. The manufacturers sell 1,000 million to the landlords and 1,000 million to the farmers. Marx presents Quesnay's Tableau thus:

Productive Class	Owners	Unproductive Class
a′) 2 milliards (Dr)	(a) 2 milliards (Dr)	a″) 1 milliard (Dr.)
b) 1 milliard (Cr)		c) 1 milliard (Cr/Dr)
b″) 1 milliard (Cr)		
d) 1 milliard (Cr)		b′) 1 milliard (Cr)

In the *Theories of Surplus Value* Marx says that his lettering system and lines make Quesnay's Tableau "clearer" by showing "what Quesnay regards each time as the starting point of a circulation, as a, a′, a″, the following link in the circulation as b, c, d, and as b′, b″ respectively" (1963, p.308). All the starting points, a, a′, a″ (and c in the line c to d, which Marx neglects to mention), are debits (uses of capital). The ending points c, d, b′, b″ are credits (sources of capital). We can see this by writing Quesnay's Tableau in double entry profit and loss accounts for farmers and manufacturers:

Quesnay's Tableaux in DEB

Farmers' Profit & Loss Account

Dr			Cr
Means of production	1,000	Landlords (food)	1,000
		Manufacturers (materials)	1,000
Rent	2,000	Manufacturers (food)	1,000
Sales	3,000		3,000

Manufacturers' Profit & Loss Account

Dr			Cr
Materials	1,000	Landlords	1,000
		Farmers	1,000
Surplus value	1,000		
Sales	2,000		2,000

Part 3 argues that Marx's excursion into DEB made concrete his theory of 'total social capital', the idea that capital as a whole controlled the 'departments' of production, whether sectors or individual firms, through the general rate of profit, and this underlay his accounting solution to the transformation problem in Volume 3, which he wrote in 1864-65. In the meantime, Marx continued to study accounting at the level of the firm and quickly ran into a major problem understanding accounting for fixed capital that temporarily threw him (as Engels put it) "off the rails". Jumping back onto the rails

appears to have been a watershed in understanding accounting that Marx needed to solve the 'transformation problem' and fix the name and structure of '*Capital*'.

Theorising capitalist accounting at the level of the firm

Engels gave Marx more information from the accounts of his firm when Marx visited Manchester in August and September 1861. Marx used these (plus later) figures in *Contribution to the Critique of Political Economy* (Marx and Engels, 1988, p.161), and in Volume 1 of *Capital* (1996, pp.228-229), to illustrate how to use capitalist accounts to calculate the rate of surplus value. In August 1862, Marx wrote asking for practical guidance: "In my critique I have demolished so much of the old stuff that there are a number of points I should like to consult you about before I proceed" (Marx and Engels, 1985b, p.411). Top of the list, "One point which you, as a practical man, must have the answer", was the question of "what becomes of this fund, which yearly replaces [in his example] 1/12 of the machinery?" (Marx and Engels, 1985, p.411). In other words, what happened to the capital returned for what accountants call the 'wear and tear' or 'depreciation' of fixed assets? Marx's comments and questions show that, in addition to seeking support for his conclusion that it was "in fact, an accumulation fund to extend reproduction", he was struggling to understand the theory underlying capitalists' calculations of depreciation:

> "[T]he same applies to machinery … as …to a horse with a life – or useful life – of 10 years. Although it would have to be replaced with a new horse after 10 years, it would in practice be wrong to say that 1/10 of it died every year. Rather, … machinery (at least some types of machinery) RUNS BETTER in the second year THAN IN THE FIRST. AT ALL EVENTS, in the course of [a useful life of] … 12 years does not 1/12 of the machinery have to be replaced *in natura* each year?" (Marx and Engels, 1985, p.411).

Marx here asked fundamental questions about the calculation of depreciation for fixed capital, rather than merely assuming an average calculation that, if (say) a life is 12 years, the capitalist always recovers 1/12th of the cost each year. Engels bluntly replied, quite rightly as we shall see, that "on the question of wear and tear … I rather suspect you have gone off the rails", but promised "more about this" (Marx and Engels, 1985, p.414). Although at this time Marx understood that labour transferred the value of the fixed asset to commodities, his questions show that he had not yet grasped that changes in technical efficiency did not determine this transfer.

In capitalist accounting, the same rules do apply to machines and horses. If a horse lasts 10 years, Marx knew the capitalist recovered its cost over this period. However, his statement that "it would be wrong to say that 1/10 of it died every year" really asks the question, how does the capitalist recover the cost if he or she cannot allocate it over the horse's useful life in accordance with the decline in its technical efficiency? Horses lose very little 'technical efficiency' over their useful working lives – and have not lost 90% of it by the end of year nine of a ten-year life, for example. His question about machines that run better in their second year raised the same point. It implies that, if technical

efficiency determined the transfer of value from the machine to the commodity, in year 2 we could have negative depreciation, i.e., appreciation in value, a clear non-labour source of value and a catastrophe for Marx's theory if true.[20] This question shows that Marx had not yet understood that run-in costs were additional socially necessary costs of producing the machine. That is, he had not yet worked out that capitalists added these costs to the cost of the machine and spread them over its economically useful lifetime such that each use-value the machine produced cost the same amount, just as they did with all other necessary costs.[21] Exactly the same principle applied to the recovery of the cost of the horse that (assuming equal operating costs) the capitalist spreads evenly over the horse's use-values (for example, the distances it travels or the loads it pulls).

There is no further correspondence on this issue until 1867, but in December 1862 when Marx resumed work on 'The Chapter on Capital', turning to draft the section on 'Capital and Profit' (Oakley, 1981, p.89), he makes it clear that, whether through discussions with Engels or by other means, he had jumped back on to the accounting rails. Marx now confidently theorised capitalist accounting for the cost of production, including the costs of fixed capital:

> "The value of a *commodity* is determined by the total labour time, *past* and *living*, which enters into it …; hence not only by the labour time which is added in the final production process, but by the labour contained in the fixed capital and the circulating capital, or in the conditions of production of the labour last to be added, by the labour time contained in the machinery, etc., the *matières instrumentals* … [such as the coal consumed, the heating, lighting, etc …] and the raw material, in so far as their value reappears in the commodity, which is entirely the case with raw materials and … the *matières instrumentals*, whereas the value of the fixed capital only reappears partially in the product – in proportion to its WEAR AND TEAR" (Marx, 1991, pp.136-137).[22]

Part 2 argues that Marx's theorisation of capitalist depreciation accounting completed his theory of 'capital in general' begun in *Grundrisse*. The link between this discovery and his decision in December 1862 to change the title of his proposed books from *A Contribution to a Critique of Political Economy* to *Capital* is, we shall see, that it was through theorising the cost of production as 'capital', as 'cost-price', that Marx found the accounting solution to his 'transformation problem'.[23]

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[20] The idea that machines transfer their use-value to the commodities they help to produce appears to be a lingering influence of Ricardo whose views on fixed assets Marx applauds in the *Grundrisse* (1987, p.35).

[21] The paper shows this in part 4.

[22] The paper discusses capitalist accounting for the cost of production in parts 3 and 4. Bryer (1994) shows that Marx understood capitalist depreciation accounting, whereas Part 3 shows that Marxist economists do not.

[23] Oakley (1981, pp.105-109) leaves as a complete mystery why Marx changed the title of his project to *Capital,* and its implications for our understanding of whether at this point Marx either compromised his ambitions or felt he could accomplish them under the heading of *Capital*. Part 3 argues for the latter interpretation.

Accounting and the reproduction and accumulation of capital

In Volume 2 of *Capital* Marx recognised the importance of accounting (that, like accountants of his day, he called 'bookkeeping'), to capitalists in controlling the valorization process: "By way of bookkeeping, which also includes the determination or reckoning of commodity prices (price calculation), the movement of capital is registered and controlled" (Marx, 1978, p.211). Here, as Engels' did, he saw it providing the means for "the supervision and ideal recapitulation of the process [of production]" (Marx, 1978, p.211), for controlling the circulation of capital through production and back from the market. To determine selling prices, Marx knew from Engels that capitalists turned to their books. He knew that where purchased and self-produced commodities "are not changed into actual money [i.e., sold], they are converted into accounting money; in short they are used as exchange-values and the element of value they add to the product in one way or another is precisely calculated" (Marx, 1976, p.952). In the capitalist's mind the value of the product is "express[ed] … more precisely as money of account" (Marx, 1976, p.955). Like accountants, he thought of 'capital' as money invested for recovery with a return, and distinguished 'fixed' from 'circulating' capital, and 'productive' from 'capital of circulation'.[24] We will see that he shared their idea of 'physical capital maintenance'. The stocks in Marx's circuit of capital are the 'assets' we find in capitalist balance sheets and the flows, their 'cost prices' and 'profits', appear in their profit and loss accounts (Bryer, 1999a, 1999b).

Some Marxist economists have recognised the affinity between capitalist accounting and Marx's circuit of capital, but they have not probed it. Sweezy said that $c + v + s$ = total value "is in effect a simplified version of the modern corporate income statement", "constitutes the analytic backbone … of Marx's economic theory" (1942, p.63).[25] That "Total value is equivalent to gross receipts from sales, constant capital to outlay on materials plus depreciation, variable capital to outlay on [productive] wages and salaries, and surplus value to all income" (Sweezy, 1942, p.63), but he did not explain the underlying principles of accounting. Foley says that the circuit of capital, "M – C…P…C′ – M′ … corresponds directly to the income, or profit and loss statement, of a capitalist firm" (Foley, 1986, p.33). That capitalist accounts measure the cost of production (C) as the "capital outlays" on "labor and nonlabor inputs to production over a period of time" (Foley, 1986, p.68); that M′ is sales that returns as money capital, and that gross profit is therefore sales minus the cost of production. Foley adds, and is right, that the "stock variables in the circuit of capital model correspond to the categories on the asset side of the balance sheet of the firm" (1986, p.68). He is right again that "When we turn to Volume III of *Capital* we find Marx firmly in control of capitalist accounting categories underlying profit and profit rate measures. He clearly distinguishes stocks and flows … and the definitions of accounting cost" (Foley, 2000, p.11). "Indeed, it is striking that the ordinary conventions of capitalist accounting reflect the labour theory of value concepts so faithfully", both insisting "on a strict rule of conservation of value" (Foley, 1986, p.69; 2000, p.12); that is, the accountants' principle that particular 'costs

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[24] Marx added that money became productive capital only by exploiting labour so that, for example, speculative profits did not come from exploitation although the value did.
[25] c = constant capital; v = variable capital and s = surplus value.

attach', which we shall see in part 3, Marx's theory of value explains. Finally, Foley is right that "All the circuit of capital variables for a real capitalist firm … can be determined from ordinary accounting data" (1986, p.69), including surplus value (p.70) – assuming that prices equal value, or in the aggregate that surplus value equals accounting profit. He is certainly right that "Capitalists calculate the rate of profit as the ratio of surplus value to the stock of capital tied up in their production" (Foley, 1986, p.76). Foley (1986) models the circuit of capital using "accounting conventions" (particularly, that 'costs attach') and, apparently without realising it, shows how Marx's circuit of capital anticipates the widely used so-called 'Du Pont' formula supposedly invented in US company in the early 20th century (Bryer, 2013a) for decomposing the rate of profit to financially control corporations.[26] However, neither Foley nor any other Marxist economist has told us what capitalist accounting categories are, how capitalists measure capital, the cost of production, and assets, profit, etc. Earlier work argued that in Volumes 1 and 2 of *Capital*, Marx's theory dealt with many of the major issues facing accountants then and today (Bryer, 1994, 1998, 1999a, 1999b, 2006). Part 4 shows how Marx applied his accounting theory to solve his 'transformation problem', but first we must explain the origin of the economists' 'problem' in the accounting logic of *Capital* as a whole, which they fail to grasp.

Part 2: The accounting logic of *Capital*

Why did Marx begin *Capital* assuming that prices equal the money value of socially necessary labour? Some say he did because it had the political advantage of allowing him to first focus on the distinction between constant and variable capital to demonstrate that labour alone in production was the source of all value. Workers could then plainly see that capitalists exploited them even if they bought labour power and sold commodities at their values (Duménil, 1983-84, p.443; Mohun, 1994a, p.396). Others suggest it fitted in with Marx's history of the transition from feudalism to capitalism (Meek, 1971; 1977). Neither explanation commands general support as a sufficient reason for structuring his presentation in a way that would cause problems for readers, as it apparently left the 'proof' of real world relevance to the end.

Another possible explanation, consistent with the evidence of part 1, is that only having resolved the problem of accounting for fixed capital was Marx confident that he could explain how in the real world of competition capitalists accounted for cost and profit as forms of value. Only then did he fully understand that capitalists' accounts measured costs as the money value of socially necessary labour time and that he could therefore prove that in aggregate and individually profit equalled the money value of surplus socially necessary labour time. Secure in this knowledge, he could then prove his theory while simultaneously simplifying, politicising, and historicising the presentation by starting with 'simple commodity production', the circuit C-M-C that prevailed in pre-capitalist formations, before analysing the circuit M-C-M′ in Volumes 1 and 2. He could fulfil his intellectual project and hope to reach political theorists, activists, and educated workers, in a simple world with no fixed capital, where all costs were labour costs, and where value equalled price, knowing that the same principles underlay the complex world

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[26] See the Appendix.

of competitive capitalist commodity production, which he could therefore postpone to the concluding volume. In short, Marx's methodological approach to writing *Capital* is consistent with him knowing from real accounts produced under competition conditions, that the theory of value developed in Volumes 1 and 2 also worked when the money value of socially necessary labour time and price were not equal, in Volume 3. This knowledge would allow Engels to confidently taunt Marx's rivals in his *Preface* to Volume 2 to come up with their own solution before he published Volume 3, and it would justify Marx's claim that "The laws thus found … hold good *no matter how* the surplus value is later divided among the producer, etc" (Marx and Engels, 1988, p.23). Marx had a solution he was confident worked for 'capital in general'. This understanding appears to explain his decision to begin *Capital* with a detailed analysis of the commodity and the production of surplus value before turning to its circulation in Volume 2 and its distribution through production and circulation in Volume 3.

The commodity as 'capital in general'

What did Marx mean when he wrote, "the commodity-form of the product of labour – or the value-form of the commodity – is the economic cell-form" (*Preface*, Volume 1)? Sweezy gives the common explanation and, we shall see, the starting point for the NI. Sweezy says it is because the commodity "absorbs a part of society's total available labor force (i.e., they are all materialized abstract labor) … (which presupposes use value and manifests itself in exchange value) that makes of 'commodity' the starting point and central category of the political economy of the modern period" (1942, p.33). In other words, Marx starts with the commodity because, like an accountant, he wants to add these up to get total capital as the sum of its parts, and this is one meaning of what Marx called 'capital in general'. His other meaning, almost wholly neglected by Marxists and non-Marxists alike, is the total capital as more than the sum of the parts, as the structured totality that he calls 'total social capital'. Marx does want to add up commodities. However, the other reason for starting with the commodity was that understanding the formation of commodity value under 'total social capital' and competition was the key to understanding capitalists' control of society's valorisation process, and from his study of their accounts he eventually concluded the same principle applied to both 'capital in general' and to 'total social capital'.

Rosdolsky (1977) highlighted the importance of Marx's idea of 'capital in general', but Heinrich (1989) argues that Marx had difficulties applying the concept to competition when writing the second draft of *Capital* in the early 1860s, abandoned it, and this explains the structure of *Capital* (1989, p.64). Moseley shows that Heinrich's evidence is weak and argues that Marx did maintain the idea through Volumes 1 and 2 and parts of 3, but fails to analyse 'total social capital' as a developed form of 'capital in general' for the remainder of Volume 3. Heinrich is right that Marx did encounter difficulties, but they were not over the idea of 'capital in general', and is right that the idea of 'total social capital' is present in Volumes 1 and 2, but he also only thinks of it, like Moseley and others, as the whole defined as the sum of its parts. In *Grundrisse,* by contrast, Marx distinguished between 'capital in general' as an 'abstraction', and as a 'real existence', as capital in motion, acting as an individual:

> "*Capital in general* as distinct from particular capitals, does indeed appear (1) *only as an abstraction*; not an arbitrary abstraction, but … which grasps the specific characteristics which distinguish capital from all other forms of wealth … (2) however, capital in general, as *distinct* from the particular real capitals, is itself a *real* existence" (1973, p.449).

'Capital in general', treating the sum of all individual capitals as an abstract, undifferentiated individual, is the focus of Volumes 1 and 2. There Marx was not concerned with "an individual capital as distinct from other individual capitals", not with the differences between capitals, but with what was common to them all, "capital as such, say the capital of the whole society" (1973, pp.310, 346). In Volumes 1 and 2, 'capital in general' meant, "the individual capitals are to be regarded simply as 'fragments' … of social capital" (Rosdolsky, 1977, p.48); that we treat the whole society as an undifferentiated individual, or the individual as the ideal-typical representative of the whole (Moseley, 1997, p.12). In Volume 3, however, 'capital in general' means 'total social capital', the whole in motion caused by differences between individuals, where the whole did not just equal the sum of the parts, but is a structured totality, the emergent outcome of interactions between the parts and the whole. Marx gave his solution to the historical transformation problem in Volume 3, where he analysed 'capitalist production as a whole', carefully labelling it 'total social capital', aggregating the effects of competing individual capitals into the movements of "one single capital" (1981, p.255). There he explains the result of competing individual capitals – the results that emerge in reality from "the process of capital's movement considered as a whole" (Marx, 1981, p.117), the functioning of 'total social capital'.

Marxist economists, including supporters of the NI and SSSI we shall see, think only of 'capital in general' as the sum of the parts. For example, Moseley, following Rosdolsky (1977), distinguishes "between 'capital in general' (or 'total social capital') on one side, and 'many capitals' (or 'competition')" on the other (Moseley, 2000a, p.286; see also Moseley, 1995; Foley, 1986). Arthur sees the distinction between the two meanings of 'capital in general', but thinks they are "two contradictory discourses in Marx. The one asserts that total capital is an effective power and individual capitals simply replicate its categories as aliquot parts of it, picking up their share of the total surplus value as if they were merely shareholders in a single enterprise. The other discourse insists that capital necessarily exists as many capitals *confronting* one another in competitive struggle, that only thus are determinations of capital in general enforced on each other" (Arthur, 2002, p.141). Marx's discourses on 'capital in general' are not contradictory once we understand that capitalist accounting enforces the determinations of capital in general through 'generally accepted accounting principles' (GAAP) and the general rate of profit as the target or required return. Total social capital becomes an 'effective power' in competition, as an all-encompassing joint stock enterprise with many branches, with which individuals posit themselves and others as 'general beings', as joint stock companies:

"The influence of individual capitals on one another thus becomes precisely their positing as general beings, and the suspension of the seeming independence and independent survival of individuals. This suspension takes place even more in credit. And the most extreme form to which suspension proceeds, which is however at the same time the *ultimate positing* of capital in the form adequate to it – is the joint stock company" (Marx, 1973, pp.657-658).

Marxist economists puzzle over whether the 'general rate of profit' in Volume 3 is different from the 'average rate' in Volumes 1 and 2 (Arthur, 2002, pp.133-136). From a social accountability perspective, the answer is that under total social capital the 'average' rate becomes the 'general' rate by enforcement through accounting, enforcement of GAAP, to become the 'general', that is, the 'required' return on capital (Bryer, 1994). They overlook the role of accounting in holding capitalists together as a class, as a joint-stock enterprise against workers as a class; that its common rules, enforced as the 'laws of accounting' for capital, allow capitalists to socialise capital fully by holding well-diversified portfolios and simultaneously to promote a competitive system of individual enterprise for the benefit of all capitalists. Part 4 argues that total social capital is Marx's social mechanism for controlling the production and distribution of profit to individual capitalists who compete for capital and a share of total surplus value under the discipline of the general rate of profit, enforced through accounting.

Accounting for the production and realisation of value

Marxist scholars usually explain the structure of *Capital* as the movement from the abstract to the concrete, which it was, but whereas they see this as a movement from theory to reality, Marx said his initial abstractions had captured reality in thought. By contrast, scholars usually argue that before a capitalist sells a commodity on a competitive market, the "value categories of *Capital* have no *direct* empirical counterpart" (Yaffe, 1994, p.82; see also Meek, 1977, p.121). That is, in production, the focus of Volumes 1 and 2,"There is no manifestation of value in terms of its substance, abstract labour, nor of its measure, socially necessary labour-time[;] … the reduction of labour to abstract labour is something that can only be done by the market" (Himmelweit and Mohun, 1994, p.158), that Marx deals with in Volume 3.[27] In short, a common view is that it is "the market mechanism [that] determines *a posteriori* which labors are to count as portions of social labour and for how much they are to count" (Mohun, 1994, p.33; see also, Elson, 1979).

Marx certainly says many times in his early writing that the market finally stamps labour time as abstract labour and measures it as socially necessary labour time, particularly in *A Contribution to the Critique of Political Economy* (1971). It is consistent with the chronology of Marx's accounting theory of part 1 that in this work "there is no clear distinction between value and exchange value" (Elson, 1979, p.130). He says in Volume

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[27] Elson also says that "divorced from its expression as exchange value, value is simply an abstraction, without practical reality. It cannot stand on its own: it is not a category designating a reality which is manifested through exchange value" (1979, p.134). Perelman claims, "the process of abstraction of labour defies quantification" (1999, p.721).

1, "It is only by being exchanged that the products of labour acquire, as values, one uniform social status, distinct from their varied forms as objects of utility". However, he now adds that following the expansion of the market, where "useful articles are produced for the purpose of being exchanged … their *character as values has therefore to be taken into account, beforehand, during production*" (Marx, 1996, p.84, emphasis added). "Value … does not stalk about with a label describing what it is" (Marx, 1996, p.85), namely, its social character, but it did stalk around in the capitalist's mind; it was an elemental cell in the capitalist mentality:

> "Our capitalist has two objects in view: in the first place, he wants to produce a use-value that has a value in exchange…; and secondly, he desires to produce a *commodity whose value shall be greater than the sum of the values of the commodities used in its production*, that is, the means of production and the labour power, that he purchased with good money in the open market" (1996, p.196, emphasis added).

Marx never thought that value and surplus value were 'stalking around' as a material reality waiting for capitalists to harvest. "Universal social labour is … not a ready-made pre-requisite but an emerging result" (Marx, 1971, p.45). However, in *A Contribution to the Critique of Political Economy* Marx attributes this 'emerging result' solely to the market. "Social labour-time exists in these commodities in a latent state, so to speak, and becomes evident only in the course of their exchange" (Marx, 1971, p.45). As Dobb said, "Marx started, indeed, from concepts such as supply and demand, competition and the market … [b]ut it is apparent also in the … *Critique* of fifteen years later. (*Capital*, however, deals with the market 'level' towards its close, towards the end of Vol. III)" (1971, p.6). Marx's answer in *Capital* was to leave the market as the final arbiter of value, but put the capitalist in control of the valorization process as the active prime mover and initial arbiter in the creation of value, not the market that can only verify its realisation or loss. This change of view is consistent with Marx's comment in a letter to Engels on 15th August 1863 that in writing *Capital* he "had to turn everything upside down" (Oakley, 1981, p.110).

This change of view also followed Marx's decision in December 1862 to change the name of his project to *Capital* (Marx and Engels, 1985, p.435). We saw in Part 1 that this change followed Engel's jibe that Marx was 'off the rails' in his understanding of depreciation accounting. Shortly after this Marx sat down to write the 'Capital and Profit' section of the 'Third Chapter' of what had been the *Critique* (Oakley, 1983, p.89). In this chapter, for the first time, he spelt out the relationship between value and the 'cost of production', and (as we saw) spelt out the capitalist theory of depreciation accounting for the first time (Marx, 1991, pp.78-103, 136). Having done this, Marx did not continue with the *Critique,* but "started the critical theory over again" (Oakley, 1981, p.109), "returned to the point of departure from which we proceeded in considering the general form of capital" (Marx, 1991, p.80). He goes back, in other words, to rework his presentation to start from the most elemental cell of 'capital in general', the commodity, now confident he has the theoretical principles to handle the uncertain world of competition in which the individual capitalist had to control the labour process to create

the desired result. Before this, when "Marx was struggling to draw up the plan of *Capital* he was uncertain how to present the early chapters on commodities or money: were they part of the thematization of capital itself or were they merely introductory" (Arthur, 2002, p.58). Marx knew that commodities were 'capital' in *Grundrisse* but, as his question on depreciation accounting showed, he was not confident he could explain how all commodities were capital, particularly fixed assets. However, in January 1863 he immediately goes on to write a plan starting with opening chapters on the commodity and money and to complete his work with an analysis of competition (Oakley, 1983, pp.90-91).

Marx argued in *Grundrisse*, "The action of the individual capitals upon one another has the effect, precisely, of forcing them to behave as *capital"* (1987, p.47). That is, competition forces individual capitalists to behave as capital – to calculate as capital – only because they are capitalists in the first place. Competition did not create the capitalist mentality, but expressed it. "Competition merely *expresses* as real, posits as an external necessity, that which lies within the nature of capital; competition is nothing more than the way in which the many capitals force the inherent determinants of capital upon one another and upon themselves" (Marx, 1973, p.651). However, this left the question of what that "inner nature of capital, its essential character" (Marx, 1973, p.414) was exactly. In 1863 he knew he could start with a detailed analysis of the 'inner essence' of capital, starting with the commodity and capital in general as the typical individual capitalist, and defer his analysis of competition to what became Volume 3, knowing he would use the same principles to analyse this essence under competition. Consistent with this interpretation, in a letter to Kugelmann, where Marx first reveals his decision to change the title to *Capital*, he tells him

> "… all it comprises is what was to make the third chapter of the first part, namely 'Capital in General'. Hence, it includes neither the competition between capitals nor the credit system. What Englishmen call 'the principles of political economy' is contained in this volume. It is the quintessence" (Marx and Engels, 1985b, p.385).

Oakley finds these comments "confusing" (1981, p.109), whereas seen as Marx's response to working out his theory of accounting they are clear. What Englishmen meant by the 'principles of political economy' was the art and later 'science' of the '*management* of the economy by the state' (Bullock et al, 1977, p.659, emphasis added), by which Marx meant management by capital, that is, by total social capital and individual capitalists. Marx now emphasised that the capitalist must spend money (capital) securing all the necessary inputs and organise and control labour to create a use-value with a potential exchange value greater than its cost, and then must "expose it to the chances and risks of circulation" (1991, p.79). To guide them towards their goal, Marx knew that individual capitalists kept accounts and his analysis of 'cost prices', the cost of production, is consistent with him theorising their underlying, but inchoate, principle of 'costs attach', which for Marx meant measuring capital at the 'money value of socially necessary labour time'. This, we shall see, gave him an accounting solution to his transformation problem, his 'law of one cost', which became a social law of

capitalism and of accounting, that all identical commodities have the same long-run 'socially necessary' cost. Parts 3 and 4 argue that this discovery gave Marx his accounting solution. Part 3 introduces Marx's problem and his solution, but the focus is how economists understand it, their criticisms, and the responses of the NI, SSSI and TSSI. Having understood the accounting limitations of the NI, SSSI and TSSI, Part 4 presents Marx's solution.

Part 3: The 'transformation problem'

In Volumes 1 and 2 of *Capital* Marx assumes that the exchange (market) price of all commodities equals (or fluctuates around) their 'value', the money price of the socially necessary labour time it takes to make them. From Part Two of Volume 3, Marx drops this assumption. He knew from classical political economy that it conflicted with the demand that all capital must earn the risk-adjusted general rate of profit, and probably from Engels that in practice capitalists added it to the cost of production to get the minimum prices of production, the familiar cost-plus-profit pricing formula. However, as Marx claimed that labour is the source of all value, if commodities sold at their values, capitals with a high organic composition of capital – using a high proportion of variable capital (v) (productive wages) to constant capital (c) (the means of production) – would get higher rates of return on their capital than capitals having a low organic composition.[28] The challenge was to show how, even though commodities did not exchange at their values, "the law of value regulates the prices of production" (Marx, 1981, p.281). Marx gave an example of the transformation, apparently from value to price, with five different capitals with different organic compositions (1981, pp.255-256), that part 4 examines in more detail:

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[28] Marx distinguished: (i) the 'technical composition of capital', the notional physical ratio of labour to materials. (ii) The 'organic composition of capital' that measures the technical composition assuming values equal market prices, and (iii) the 'value composition' that measures the technical composition at market prices. If values equal prices, his assumption until chapter 9 of Volume 3, the organic and value compositions are equal (Marx, 1998, p.54). As he said in Volume 1, "The composition of capital is to be understood in a two-fold sense. On the side of value, it is determined by the proportion in which it is divided into constant capital or value of the means of production, and variable capital or value of labour-power, the sum total of wages. On the side of material, as it functions in the process of production, all capital is divided into means of production and living labour-power. This latter composition is determined by the relation between the mass of the means of production employed, on the one hand, and the mass of labour necessary for their employment on the other. I call the former the *value-composition*, the latter the *technical composition* of capital. Between the two there is a strict correlation. To express this, I call the value-composition of capital, in so far as it is determined by its technical composition and mirrors the changes of the latter, the *organic composition* of capital" (Marx, 1996, pp.607-608). The organic composition therefore refers to the ratio of variable to constant capital within production, "in value terms, but *leaving aside* the differences created by the greater or lesser value of the raw materials employed", whereas the value composition refers to the ratio after accounting for changes to input prices in circulation (Fine and Saad-Filho, 2004, pp.105, 113). The distinction between the organic and value compositions is important for Marx's LTFRP accounting, as we will see in Part 3.

Capitals	Organic composition of capitals of 100	Rate of surplus value %	Surplus value (s = 100% x v)	Rate of profit %	Used up c (c)	Value of commodities (c+ v + s)	Cost price (c + v)	Price of commodities [1 + r](c + v)	Profit (price – cost)	Rate of profit r	Divergence of price from value
I	80c + 20v	100	20	20	50	90	70	92	22	22	+2
II	70c + 30v	100	30	30	51	111	81	103	22	22	-8
III	60c + 40v	100	40	40	51	131	91	113	22	22	-18
IV	85c + 15v	100	15	15	40	70	55	77	22	22	+7
V	95c + 5v	100	5	5	10	20	15	37	22	22	+17
Totals	390c + 110v		110		202	422	312	422	110	22	0

Marx explained his solution:

> "… although the capitalists in the different spheres of production get back on the sale of their commodities the capital values consumed to produce them [i.e., cost price], they do not secure the surplus value and hence profit that is produced in their own sphere in connection with the production of commodities. What they secure is only the surplus-value and hence profit that falls to the share of each aliquot part of the total social capital, when evenly distributed, from the total surplus-value or profit produced in a given time by the social capital in all spheres of production" (1981, p.258).

The key question was the formation of the general rate of profit: "The really difficult question here is this: how does this equalisation lead to the general rate of profit, since this is evidently the result and cannot be a point of departure" (Marx, 1981, p.274). Marx criticised Ricardo for not attempting to explain the formation of the general rate of profit, but merely assuming it (Moseley, 1995, p.20). To derive rather than assume it, Marx argued that the equalisation must result from the exchange of commodities as "products of capital" (1981, p.275), but economists usually ignore the word 'capital', and conclude that Marx really meant that the general rate of profit resulted from exchanges of commodities as use-values, as we shall see below. Marx does not say he derived the general rate of profit from the technical conditions or use-values of production. He says his point of departure into the real world of total social capital and competition was its history, suggesting that this history is the "really difficult" question, and that the general rate of profit was its result. He says, "The rates of profit prevailing in the different branches of production are … originally very different. These different rates of profit are balanced out by competition to give a general rate of profit which is the average of all these different rates" (Marx, 1981, p.257). By 'originally', he means historically because to bring out the "salient point" of the "whole difficulty" he imagines the historical absence of total social capital and hence the absence of the general rate of profit:

> "Let us suppose the workers are themselves in possession of their respective means of production and exchange their commodities with one another. … Under these conditions, the differences in the profit rate would be a matter of indifference, just as for a present-day wage labourer it is a matter of indifference in what profit rate the surplus-value extorted from him is expressed …" (Marx, 1981, pp.275-277).

In short, without capitalism and its history there is no general rate of profit. Marx concluded, therefore, that the general rate of profit was the product of the history of capitalism, the history of its social relations:

> "The exchange of commodities at their values, or approximately these values … corresponds to a much lower stage of development than exchanges at prices of production, for which a definite degree of capitalist development is needed. … [I]t is … quite apposite to view the values of commodities not only as theoretically prior to the prices of production, but also as historically prior to them. … Capital arrives at this equalization [of the rate of profit] to a greater or lesser extent, according to how advanced capitalist development is in a given national society" (Marx, 1981, pp.277, 297).

History supports Marx view. The history of the general rate of profit is the history of the socialisation of capital – beginning in England in the late 16th century, growing from the late 17th century, but flowering from the middle of the 19th century, and spectacularly as total social capital from its end (Bryer, 1991; 1993a; 1997, 2000a; 2000b; 2004). The history of social capital is the 'really difficult' interconnected histories of merchants, farmers, landlords, peasants, workers, industrialists, joint stock companies, capital markets and accounting (Bryer, 2004, 2005, 2006a, 2006b). With total social capital came competition for capital and with this the formation of the general rate of profit. The competition is for capital in the different spheres: "competition of capitals in *different* spheres … brings forth the production price that equalizes the rates of profit between those spheres" (Marx, 1981, p.281). Under total social capital, investors hold the market portfolio and care only for the general rate of profit (adjusted for risk), and their preference for rates of profit above average, and intolerance of those below, acts as a selective mechanism in levelling up disparate rates of profit towards the moving, value-weighted general rate of profit. In those sectors offering over the average, capital flows in thereby reducing its rate of profit and increasing it in those sectors now relatively neglected where supply falls (Marx, 1981, p.297). Part 4 argues that we must understand Marx's history of the formation of total social capital both to explain his solution to the 'transformation problem' and to understand how it is consistent with the determination of value by labour time.

The criticisms of Marx's solution

Marxist economists usually ignore history and focus on the claimed inconsistencies, incompleteness, and vagueness of Marx's quantitative solution, and they are unhappy with his qualifications. The major complaint is that Marx did not attempt to deal with the apparent contradiction in his table that, as he himself put it,

> "… the elements of productive capital are generally bought on the market in capitalist production, so that their prices include an already realized profit and accordingly include the production price of one branch of industry together with the profit contained in it, so that the profit of one branch goes into the cost price of another" (1981, pp.261-262).

The same applied to the commodities workers buy, but he appeared to dismiss the issue with the thought that "Under capitalist production, the general law acts as the prevailing tendency only in a very complicated and approximate manner, as a never ascertainable average of ceaseless fluctuations" (Marx, 1998, p.160). He apparently confessed that it was "only an accident if the surplus value, and thus the profit, actually produced in any particular sphere of production, coincides with the profit contained in the selling price of a commodity" (Marx, 1998, p.167). Do these and other comments show that Marx gave only "perfunctory" attention to the transformation problem, effectively dodging the "crucial question" of how, after the transformation of values into prices of production, he could still claim that value regulated prices (Meek, 1977, pp.109, 107)? Is it true that Marx "resorts to evasion to bring closure"; that he "retreat[ed] to a position that there is no general rigorous quantitative relation between surplus-value and unpaid labour time" (Foley, 2000, pp.12, 13)?

In the 1970s, following the lead of Sraffa, but originally based on Bortkiewicz (1906-7), many Marxist economists abandoned the idea that value was socially necessary labour time, and accepted the impossibility of a mathematical solution to what they took to be Marx's transformation problem, seeing the economy as a system of 'commodities producing commodities'. The 'givens' in Marx's theory were supposed to be physical quantities of use-values, technical coefficients of their conversion from one use-value to another, and the real wage defined as a given bundle of use-values for workers (Mohun, 1994, p.400). From these assumptions, the neo-Ricardians derived a physical rate of profit simultaneously with prices of production, and claimed to disprove Marx's theory of value in the process (Moseley, 2000a, p.283). Consider a two-sector economy comprising agriculture producing the means of subsistence (call it 'wheat') and industry producing the means of production (call it 'steel') (taken from Roemer, 1990). The technical givens are that to produce wheat and steel requires steel and labour in definite proportions. If relative labour hours determine the exchange prices of steel and wheat, and capitalists get an equal return on all capital, according to the neo-Ricardians Marx should have solved the following simultaneous equations:

$$p_s = (1+r)(p_s a_s + w l_s) \qquad\qquad (1)$$
$$p_w = (1+r)(p_s a_w + w l_w) \qquad\qquad (2)$$

Where:

r	=	required return on capital;
p_s	=	price of steel;
p_w	=	price of wheat;
a_w	=	amount of steel required for wheat production;
a_s	=	amount of steel required for steel production;
l_w	=	labour hours producing wheat;
l_s	=	labour hours producing steel;
w	=	money wages.

We have two equations and four unknowns (p_s, p_w, r, and w). To reduce the unknowns, dominant solutions impose a 'normalisation condition' (which requires for example

aggregate price to equal aggregate value or that total profit equals total surplus value) and assume a constant real wage. The 'solutions', however, are the kiss of death.

> "It is well-know that this interpretation leads to the following damaging criticisms of Marx's theory of prices of production: (1) Marx's determination of prices of production is logically inconsistent because Marx failed to transform the inputs of constant and variable capital. (2) Marx's error can be corrected … but this correction implies Marx's two aggregate equalities (aggregate price = aggregate value, and aggregate profit = aggregate surplus value) cannot both be true simultaneously. (3) This correction also implies that the rate of profit changes in the determination of prices of production, so that the price rate of profit is in general not equal to the value rate of profit. (4) Finally, the entire Volume 1 value analysis is 'redundant' because the same price of production and rate of profit that are derived by transforming values into prices of production could also be derived direct from the given physical quantities" (Moseley, 2000a, p.283).

The TSSI refutes Bortkiewicz's 'proof' of an internal inconsistency in Marx's solution, Bortkiewicz's claim that buying the inputs at value but selling the outputs at the prices of production would disrupt the process of reproduction, by extending his example to two periods. Kliman constructs an example that shows that "equality of input and output prices is not necessary for reproduction to take place or for supplies to equal demands" (Table 8, p.150; 2007, p.152). In his example, "simple reproduction does occur" even though "Period 1's inputs are bought at their value, but period 2's inputs are bought at … the prices of production that prevail at the end of period 1" (Kliman, 2007, p.151). This removes the charge of inconsistency. However, it leaves unexplained why individual capitalists in Kliman's three departments would choose to buy period 1's inputs at their values, generate surplus values to produce commodities with a given value, and then sell them at different prices of production, charging more than value in department 1, but less in departments 2 and 3 (2007, Table 8.2, p.150). Part 4 argues that Marx's historical answer to this question gave him his accounting solution.

The New Interpretation

The NI begins from Marx's idea of 'capital in general', and the claim that over a defined period the money value of all the new commodities produced equals the money value of the total labour hours worked in that period, which must equal those that society has deemed 'socially necessary'. If so, we could say that each commodity consumes a particular share of the total social labour and that money gives the owner the right to a particular share of that social labour. If the money value of the share of social labour consumed in every commodity equals its money price, we have what Marx called 'equal exchange', but it could as easily not be equal, as he recognised. Foley and others therefore conclude that "the labor theory of value is valid for *any* commodity producing system, no matter what deviations of price from labor values that economy exhibits" (1982, p.38). They mean *could* be valid. If the prices of commodities are proportional to embodied social labour we get Marx's "extremely simple and powerful … way of looking at capitalist production" (Foley, 1982, p.40). As this is not the case, the issue for

the NI becomes which of Marx's propositions to maintain in making the transformation (Foley, 1982, p.40). One proposition is that the value of money equals its claim to a proportion of total social labour; the other is that the value of labour power equals the bundle of use-values it commands. The NI makes its choice by maintaining Marx's core claim that labour adds value in production by limiting its application to total value added and the value of labour power. Mohun (1996) summarises Marx's 'basic claims' according to the NI:

$$MVA = \frac{LVA}{VM}$$

$$LVA = \sum V + \sum S$$

$$w = \frac{VLP}{VM}$$

$$W = wH = \frac{VLP.H}{VM}$$

$$\sum W = \frac{\sum V}{VM}$$

$$\sum \Pi = \frac{\sum S}{VM}$$

$$MVA = \sum W + \sum \Pi$$

$$MVA = \frac{\sum V}{VM} + \frac{\sum S}{VM}$$

Where:

MVA	=	aggregate money value added.
LVA	=	aggregate labour value added (hours).
VM	=	value of money.
w	=	wages per hour.
H	=	hours worked.
VLP	=	value of labour power per hour (hours).[29]
V	=	variable capital (hours).
S	=	surplus value (hours).
W	=	money wages.
Π	=	money profit.

To maintain these claims the NI only partially abandons the neo-Ricardian assumption, that prices should be proportional to the use-value of labour hours embodied in commodities, by dropping the requirement for a given real wage, replacing it with a given money wage determined by class conflict before consumption (Mohun, 1994, p.403). That is, the NI drops the requirement to transform variable capital to maintain the real wage (Foley, 1982; Mohun, 1994, pp.400-402, 405). It justifies this interpretation as consistent with Marx's core idea, namely, that the value which labour 'embodies' in commodities is the 'money value of socially necessary labour time', not the use-value of

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[29] The socially necessary labour time (variable capital) produced per hour to reproduce the worker.

the labour (Foley, 1982).[30] Unlike the commodities they sell, on which capitalists realise variable amounts of surplus, they do not produce and sell workers for profit (Foley, 1986, pp.43-44). Labour reproduces itself, which means that unlike other commodities, on average labour power always sells at its 'socially necessary' value, the money price of the socially necessary labour time for the workers' reproduction, whatever the real wage (the outcome of class conflict) or the price setting process for produced commodities (Mohun, 1994a; 1996). The 'money price of socially necessary labour time' is therefore the NI's measure of the value of labour power and its measure of the value of money. Part 4 argues that Marx had concluded that this was the core idea underlying capitalist accounts.

According to the NI, therefore, we can solve equations (1) and (2) by taking the money wage (w) as given and only requiring society's total value added at market prices to equal the total socially necessary labour time value added, converted into a money value using the aggregate 'money value added per productive labour hour' (m):[31]

$$S(p_s - p_s a_s) + W(p_w - p_s a_w) = m(l_s S + l_w W) \qquad (3)$$

Where:

S = Total production of steel.
W = Total production of wheat.

$$m = \frac{S(p_s - p_s a_s) + W(p_w - p_s a_w)}{l_s S + l_w W} = \text{Money value added per productive labour hour.}$$

Given S, W, m, and w, mathematically at least, "prices and the profit rate are given" (Roemer, 1990, p.1728). Foley showed that value added, surplus value, and the aggregate rate of surplus value are unchanged by this transformation; that total value added at market prices equals the money value of total social labour time; and surplus value equals unpaid labour time in money (1986, p.101). He concluded the "basic claims of the labor theory of value" are met (Foley, 1986, p.101). Others were not so easily satisfied.

An accounting critique of the NI, SSSI and TSSI

The NI transformation does not meet all Marx's claims because it corrects the supposed 'defect' in Marx's method that commodities sell at prices of production whereas Marx's table assumes that purchasers buy them at cost. The NI transforms the labour value of constant capital by adding a profit, and therefore the money value of the social labour time of constant capital differs from the money value of constant capital (Moseley, 2000a, p.313). This means that the NI can only require equality between total profits and total surplus value and between money value added at market prices and labour value

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[30] The NI accepts the common view that in Marx's theory there are two sets of accounts of constant capital to reconcile, one in kept labour time and the other in money (e.g., Moseley, 1993; Loranger, 2004). I discuss the accounting problems this creates later.
[31] Foley calls the money value-added per hour of productive labour the "monetary expression of labor time" (MELT) (Foley, 2000, p.7, fn1).

added, but not between the total labour value of production and total production in prices (Moseley, 2000a, p.284). This is a fundamental weakness of the NI because, as Kliman says, "The equality of total price and total value ... was surely regarded by Marx as a fundamental result of his own solution" (Kliman, 2007, p.163). Dumenil choose to maintain total value added because this avoids 'double-counting' the labour input in constant capital. That is, the socially productive labour embodied in one commodity becomes constant capital in the commodities to which it is an input (Foley, 1982, p.39). Supporters of the SSSI, such as Moseley, argue that this is irrelevant (2000, fn.13) to measuring the total current labour in the net output for a period. As Kliman says, SSSI supporters

> "… construe variable-capital value as the actual sum of value that workers receive as wages, as the NI does. However, they also construe constant capital value in an analogous manner, as the sum needed to acquire the means of production. The constant-capital value therefore depends on the prices of means of production, not their values. Thus the SSSIs do away entirely with the notion of a distinct value system in which constant and variable capital depend on the values of inputs (means of production and subsistence)" (Kliman, 2007, p.163).

Moseley argues that Marx had no need to transform constant capital into prices of production because he took this as a given money magnitude from Volume 1, just as he took variable capital as given in money. He is right that Marx takes both variable and constant capital as given money amounts, but not because they come from Volumes 1 and 2. First, to be consistent with the rules of consolidated accounting, at the aggregate level we should account only for the cost to an entity (here society) of transfers of assets within the entity. As Marx put it, "if the sum of the cost prices of all commodities in a country is put on one side and the sum of profits or surplus values on the other, we can see that the calculation comes out right" (1981, p.260). Second, there is no need to transform constant capital at the sector or firm level either because, as we shall see in Part 4, for Marx the transformation is not from a technically determined cost to the price of production. Rather, the transformation is from the historically given general rate of profit and prices of production to the accountant's 'standard' or 'target cost', Marx's 'cost-price', the maximum socially necessary cost of production to allow each capitalist to earn the general rate of profit, regardless of its components, and how much of the supplier's profit the cost includes.

If we do not transform constant capital into prices of production, Foley's MELT becomes the total value realised from production (sales revenue) per hour of social labour time, both direct and indirect labour time (Foley, 2000, p.24). Marx's aggregate identities hold by definition, as we can see by adapting Fine et al's 'simple formal presentation' of the NI (2004, pp.5-6). If TR = total revenue, P = profit, w = the money wage rate, Cm = the money value of the constant capital advanced, C_{LT} = the social labour time embodied in constant capital, L = total social labour time, S = surplus value and m = the MELT including constant capital:

$$TR = Cm + wL + P$$

$$P = TR - Cm - wL$$

$$S = (L + CLT) - (wL + Cm)m$$

As

$$m = \frac{L + CLT}{TR}$$

$$S = P\frac{(L + CLT)}{TR} = Pm$$

In this single system interpretation, money remains the social expression of value, but of the whole commodity, of its sales price, which includes variable and constant capital, and not just the value-added. By dropping the NI's dual system interpretation of constant capital, the SSSI and the TSSI maintain all of Marx's three key identities (Kliman, 2007, pp.34, 163-165).[32] Some dualists "have argued that the single interpretations contradict Marx's theory that a product's value is determined by the amount of labour needed to produce it", the labour time for the means of production consumed and freshly added, not the "the amount of labor needed to acquire them …, that is, their money price divided by the MELT" (Kliman, 2007, p.34). However, consistent with the single system interpretation, as we shall see in part 4, in Marx's accounting theory capitalists use the same principle, that the cost of each identical use-value is equal, to account for both labour and the means of production.

Foley's NI did not transform constant capital to prices of production because, he admitted

> "At the time … there seemed to be no plausible interpretation of the labor time equivalent of the constant capital or invested since these measures will in general be equal neither to the historical labor embodied in the means of production, nor to the labor that would be required to reproduce them with contemporary technology" (2000, p.24).

The SSSI avoids this problem by interpreting Marx as a 'simultaneist', imagining that capitalists "retroactively revalue inputs at output prices" (Kliman, 2007, p.165).[33] Like the SSSI, the TSSI construes constant capital as the "sum of [money] value needed to acquire the means of production", but differs by calculating constant and variable capital at "the output prices of the previous period" (Kliman, 2007, p.165). As Kliman says, "although the TSSI and SSSI's both preserve Marx's aggregate equalities, their implications and results are radically different. The SSSI's, like other simultaneist interpretations, make value redundant, while the TSSI does not" (2007, p.165). The SSSI makes 'value' redundant because, as we will see, it reduces it to market prices and

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[32] The other two identities are: $P/[wL + Cm] = S/[wL + Cm]m$, and $TR = [L + C_{LT}]/m$.

[33] Mohun says the NI defines the value of money excluding constant capital "to avoid the difficulties surrounding both the effects of technical change and the effects of changing interest rates on the valuation of the existing stock of constant capital" (1996, fn.4), implying that capitalists account for constant capital at its present value! Fine et al say we cannot transform any capital into a meaningful monetary amount equivalent because of "forcible and violent changes of valuation of capital" (2004, p.14).

changes in market prices. The TSSI and SSSI agree, "the values of previously produced commodities, and the sum of values transferred to them, are determined by the value of new products" (Kliman, 2007, p.97). The issue between them is whether "the sum of value transferred from an input to a newly produced commodity depend on the input's price when it enters production, as the TSSI holds, or upon the cost of replacing the input when the new commodity is completed, as the replacement-cost interpretation holds" (Kliman, 2007, p.97). TSSI proponents "deny that there is any sense in which Marx held, or in which his theory implies, that inputs entering production now and outputs emerging later must have the same prices or values" (Kliman, 2007, pp.34-35). What follows shows that, with one clarifying qualification, the TSSI is consistent with Marx's and capitalist accounting for input price changes, whereas the SSSI is not.

When input prices change markedly, as they did in the 1970s and early 1980s, capitalist accountants use 'replacement cost accounting' (RCA), as we will see Marx did (Bryer, 1999b, p.563).[34] RCA adjusts historical cost accounts for changes in the input prices (current replacement costs or 'entry prices') of tangible assets (inventories and fixed assets).[35] It accounts for tangible fixed assets and inventories at their current replacement costs at the balance sheet dates. It charges the profit and loss account with the current cost of sales calculated using the current replacement cost of the variable and constant capital (tangible assets) consumed in producing a commodity or service at the time of its sale, not their historical cost, and not their future replacement costs, and makes 'capital maintenance adjustments' (CMAs). As we will see, Marx's RCA supports recognising constant capital in the closing balance sheet at current replacement cost, and for replacement cost charges in the profit and loss account, but questions the SSSI's call for the revaluation of constant capital in the opening balance sheet, and criticises its failure to make CMAs. To this extent, it supports the TSSI criticism that the RCI that requires simultaneous valuation "produces an incorrect measure of profitability, one that systematically undervalues the capital advanced when values are falling" (Kliman, 2007, p.122). However, while Marx's accounting supports the TSSI's insistence on not revaluing the opening balance sheet, on following the temporal sequence of the accounts, and its insistence on charging the profit and loss account with constant capital consumed at opening prices, it goes beyond the TSSI by requiring recognition of CMAs and revaluation of the closing balance sheet at closing prices. Doing so clarifies the TSSI's interpretation of disputed passages in Marx's *Economic Manuscripts of 1861-1863*, but particularly a lengthy numerical example where Marx, in effect, does RCA.[36]

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[34] 'Replacement cost accounting' was the core of the system of 'inflation accounting' used in Britain, the USA, Australia, Canada and New Zealand in the 1970s and early 1980s (Revsine, 1973; Sandilands, 1974). As we will see, 'replacement cost accounting' (RCA) is not the "replacement-cost interpretation" (RCI) of Marx offered by the SSSI.

[35] 'Historical cost accounting' maintains records of assets at their original transaction costs, and charges them into the profit or loss account at those costs. RCA updates historical costs to the current prices at each closing balance sheet date; it does not revalue the opening balance sheet using the closing prices. As Kliman says, there is a "substantial body of evidence that Marx rejected historical-cost valuation" (2007, p.97), but Marx knew that this was where the accounts started.

[36] See Marx (1991, pp.266-274).

Kliman highlights Marx' criticisms in the *Economic Manuscripts of 1861-1863* of Sir George Ramsay's claim that "if productivity rises, so that a smaller share of total output is needed to replace inputs, the profit rate must rise" (Kliman, 2007, p.102). Kliman argues that these criticisms, particularly their foundation in a long numerical example, supports the TSSI's argument that Marx was not a 'simultaneist' requiring input and output prices to be equal (Kliman, 2007, pp.102-103). Marx constructed his example to examine "the influence that a change in the value of constant capital exerts on the rate of profit" (1991, p.267). In effect, he produced RCA to clarify his theory that increases in labour productivity influenced the rate of profit only by reducing or increasing the value of the constant capital required, and was unrelated to the physical 'rate of profit'. This accounting interpretation of Marx's example supports but qualifies Kliman's conclusion that "these passages disconfirm the replacement-cost interpretation"; that "The contested passages *need not* be construed as the replacement-cost interpretation construes them" (2007, pp.102, 105, emphasis added). Understanding Marx's example from an accounting perspective shows that he rejected the RCI, that he was not a 'physicalist'. However, it also shows, contrary to Kliman's interpretation, that Marx's aim was not to demonstrate that "the value of used-up constant capital is determined before, and is thus a determinant of the value of the product" (Kliman and McGlone, 1999, p.41). Rather, that Marx's aim was to understand how capitalists accounted for input price changes to constant capital, particularly decreases brought about by increases in labour productivity, in calculating the rate of profit. Consistent with the TSSI, Marx showed in his example that increases in labour productivity that reduced the input prices of constant capital post-production had no effect on rate of profit for which the capitalist held production accountable for that year. However, going beyond the TSSI, he also showed that the price change did affect the capitalist's accountability at the end of the year, and increased the rate of profit for which production was accountable in the following year. This example supports Kliman's demonstration of the logical consistency of Marx's 'law of the tendential fall in the rate of profit' (LTFRP) by demonstrating its accounting possibility, and contradicts the RCI and claims that Marx's "texts vacillate between historical and replacement cost valuation" (Kliman, 2007, p.41), as we will see.

What follows summarises Marx's example, considers Kliman's use of it to support the TSSI, and supports but qualifies his conclusions by following Marx's accounting calculations through to the end, which Kliman does not:

Marx's example

> A capitalist farmer advances capital of £120 at the beginning of year 1. The price of corn is £2 per quarter from the beginning of year 1 to the end of year 2, when it falls to £1 per quarter. The farmer buys 20 quarters of seed corn at the beginning of year 1 for £40, spends another £40 on other constant capital, and further £40 for labour.[37] In year 1, the farmer produces 100 quarters of corn, sells the 100 quarters and buys 20 quarters of seed corn at the end of year 1. In year 2, the farmer repeats the investment of 20 quarters of seed corn at £2 per quarter, spends another £40 on constant capital, and £40 on labour, but during year 2 production doubles to 200 quarters, and the

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[37] Marx noted that the £40 spent on other constant capital and the £40 for wages are equivalent to 20 quarters at the opening price of £2, but does not use them in his accounting. It is therefore misleading to say, "All costs are measured in terms of both money and corn" (Kliman, 2007, p.102).

price drops to £1 per quarter at the end of the year. The farmer sells the 200 quarters and buys 20 quarters of new seed corn at £1 per quarter at the end of year 2. Assume that the farmer purchases seed corn and other constant capital the beginning of the first day of each year, pays wages and withdraws all the profits at the end of the last day of each year.

Kliman argues that Marx calculates that the farmer makes £80 profit in year 1, which is equivalent to a surplus of 40 quarters of corn, and that in year 2 the farmer still makes a profit of £80, but this is now equivalent to 140 quarters of corn (2007, Table 6.2, p.102).[38] He concludes that Marx calculations show that while the money value rate of profit is constant at 66.7% (£80/£120), the physical rate is not constant, increasing from 66.7% (40qrs/60qrs) to 233.3% (140qrs/60qrs) in year 2 (Kliman, 2007, Table 6.2, p.102). This shows that Marx was not a physicalist, but Kliman argues the example shows that Marx was not a simultaneist in any respect. He says, "Marx's conclusion that profit remains £80 despite the rise in the physical surplus from 40 qrs to 140 qrs, is valid only if the value transferred from the seed corn is determined by its preproduction value of £2/qr". He refers to other examples from which "Marx draws similar conclusions" to conclude that Marx does use £2/qr (Kliman, 2007, p.103). Clearly, "If we use the seed corn's replacement cost in Year 2, £1/qr, to compute the value it transfers to the product, profit would exceed £80" (Kliman, 2007, p.103). Kliman argues that his interpretation of the calculations "should" dispel "any doubts" about the plausibility of his TSSI interpretation that we can read Marx in this non-simultaneist way. However, if we follow Marx through to the end of his example we find that matters are not so simple. As we will see, Marx in effect first produces (historical = current) cost accounts that calculate 'profit' as £80, but he then adjusts them to current costs that charge the seed corn in year 2 at £1 per quarter which produces a 'surplus' of £100 for year 2.[39] Marx's concludes that, as this extra £20 is a return of unnecessary capital at the new input prices, this proves his argument that "Anyhow, the rise in the *rate of profit* is not due to the *value* [of constant capital] remaining unchanged, as Ramsay supposes" (1991, p.268), was not in other words, due to the increased physical rate of profit. There is no argument between the SSSI and the TSSI about the profit in year 1, or the rate of profit:

Year 1

Opening balance sheet

Cr		£		Dr £
Capital advanced		120	Seed corn	40
			Other constant capital	40
			Cash for wages	40
		-----		-----
		120		120
		===		===

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[38] The equivalent surplus of corn in year 1 = 100 (production) – 20 (seed corn) – 20 (other constant capital) – 20 (labour) = 40. The equivalent surplus in year 2 = 200 – 20 – 20 – 20 = 140.

[39] Marx carefully distinguishes between 'surplus' and 'profit' as we will see.

Profit and loss account

	£	£
Sales (100 x £2)		200
Seed corn (20 x £2)	40	
Other constant capital	40	
Labour	40	120
	---	-----
Profit		80
		===

There is no question that here, as Marx had earlier said, "Profit … expresses … the increment of value which the total capital receives at the end of the process of production and circulation, over and above the value it possessed before this process of production, when it entered into it" (1991, p.91). It was "an excess over and above the capital advanced" (Marx, 1991, p.133). Marx therefore calculated the rate of profit using the capital advanced and profit as the increment (£80/£120), as capitalists do when they hold management accountable for the rate of profit ex-post. In this sense, as Kliman says, "Marx measured profit and the rate of profit essentially the same way that businessmen and investors do" (2007, p.125). Kliman concludes that because Marx repeats this calculation for year 2, this refutes the replacement-cost interpretation (Kliman, 2007, p.102 and Table 6.2). Marx, however, considered alternative calculations of the profit and capital for year 2 before concluding that £80 was the correct figure for calculating the rate of profit after the change in price. As he said, we could calculate a 'profit' of £80 for year 2 by assuming that the farmer liquidated his business:

> "The matter would be simplified if we could consider it *d'abord* without regard to the production process, that is, if we assumed that the tenant farmer was withdrawing from the business and selling his whole product. Then he would indeed have to sell 120 quarters to recover his outlay of £120 (to reimburse himself). In this way he would recover the capital advanced. Thus, a surplus of 80 quarters would remain, not of 140, and since these 80 qrs = £80, they are worth in absolute terms as much as SURPLUS in the first case" (Marx, 1991, p.269).[40]

Avoiding such simplifications, assuming reproduction Marx found "the matter is altered to a certain extent" (1991, p.269) in year 2. To examine the impacts of the price change at the end of year 2 assuming reproduction, Marx in effect first produced the farmer's historical cost accounts, accounted for the seed corn at its opening (historical = current) cost of £2 per quarter, from which he calculated the profit of year 2 as £80:

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[40] The Collective works (Marx, 1991) shows "80 qrs = £40", which is incorrect. See: https://www.marxists.org/archive/marx/works/1863/theories-surplus-value/ch22.htm or Marx, 1972, p.343.

Year 2

Opening balance sheet

Dr		£		Cr £
Capital advanced		120	Seed corn	40
			Other constant capital	40
			Cash for wages	40
		-----		-----
		120		120
		===		===

Profit and loss account

	£		£
Sales (200 x £1)			200
Seed corn (20 x £2)	40		
Other constant capital	40		
Labour	40		120
	---		-----
Profit			80
			===

As Marx put it, "His total product [in year 2] = 200 qrs = £200. But £120 out of this £200 replaces the 60 qrs which he has expended, each one of which cost him £2. There thus remains a profit of £80 which = the remaining 140 qrs", which seemed straightforward. However, Marx was not satisfied. "How does this happen?" The value of "the qr has fallen from £2 to £1", "But since there was a SURPLUS of 140 qrs, it seemed that it had to come to £140, for one qr is worth just as much as any other" (Marx, 1991, pp.268, 269). This profit would imply the physicalist notion that the farmer pays for other constant capital and wages in corn and therefore retrospectively charges £1 per quarter for all inputs, which would calculate a money profit of £140 for year 2, and a money rate of profit of £140/£60 (233%):[41]

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[41] This is the simultaneist/physicalist RCI, as Kliman explains, that we must correct *all* input prices to current replacement cost: "Assume, for example, that ten bushels of corn are invested (to plant as seed and pay farmworkers) at the start of the year, while twelve bushels are harvested at the year's end. If the value (or price) of corn is £$/bushel at the start of the year but only $5/bushel at the end, then the capital value invested is $6 x 10 = $60 and the total value of output is $5 x 12 = $60. Although the physical quantity of corn increases by 20%, there is no increase in the corn's aggregate value …. Yet proponents of simultaneism, valuing the corn invested and the corn harvested at the same price – for example, $5/bushel – declare that the capital value invested is only $5 x 10 = $50. They therefore find that aggregate value increases from $50 to $60. This is an increase of 20%, precisely the percentage by which physical output exceeds physical input. The economy has grown in value terms only because and to the extent that, it has grown in physical terms" (Kliman, 2007, p.79).

Profit and loss account

	£	£
Sales (200 x £1)		200
Seed (20 x £1)	20	
Other constant capital (20 x £1)	20	
Labour (20 x £1)	20	60
	---	-----
Profit		140
		===

Closing balance sheet

Dr			Cr
	£		£
Capital advanced	60	Cash for seed corn	20
		Cash for other constant capital	20
		Cash for wages	20
	-----		-----
	60		60
	===		===

In rejecting the physicalist measure of profit Marx rejected the simultaneist view that the "replacement-cost rate" of profit, based on recalculating opening capital at closing prices, "is a meaningful measure because it is the '*potential* profit rate' … and therefore the rate that governs investment decisions" (Kliman, 2007, p.124).[42] Kliman is right that Marx was no physicalist. However, as Marx did deal with the effects of changes in the price of constant capital (only the seed corn in his example) in his accounting by distinguishing the effects as end of period CMAs, the TSSI overstates its opposition to Marx's use of current post-production replacement costs. Marx realised that if productivity caused a fall in the input price of constant capital the capitalist "has laid out less objectified labour", and that "The account will therefore work out … [such that] the rate of profit would have risen [despite a fall in the value of the product]" (1991, p.268). In his example, the accounts worked out as follows:

> "… the farmer replaces the 20 qrs of seed corn *in natura* out of his own product.[43] … The rest of his expenditure [expressed in qrs] increases in the same ratio as the qr is devalued (provided wages do not fall). To replace the remaining portion of constant capital, he now needs 40 qrs instead of 20. Altogether he must now lay out 100 qrs, compared to 60 previously; but he need not lay out 120, the amount corresponding to the to the depreciation of the corn, because the 20 qrs used as seed, which were worth £40, are replaced by 20 [quarters] (since in this context only their use value matters), which are worth [£]20" (Marx, 1991, pp.269-270).

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[42] Simultaneists in effect call for comprehensive 'exit price' accounting, using hypothetical selling prices (here equal to buying prices), a neoclassical theory of accounting that made inroads into US GAAP from the 1970s and into global GAAP (IFRSs), but it has never commanded the general support of capitalists or accountants.

[43] It makes no difference if the farmer sells the 20 qrs, as assumed above, or retains 20 qrs for seed corn.

Marx could therefore understand why the farmer, apparently contradicting the calculation of 'profit' as £80 in year 2, would calculate a 'surplus' of £100 for year 2. If the farmer continued in business, of the 200 quarters he produced he needed only 20 quarters for seed corn, and needed to sell 80 quarters at £1 per quarter to recover the other constant capital and cost of labour. Marx agreed that this left the farmer with another 'gain' or 'surplus' of 20 quarters worth £20 at £1 per quarter, over the £80 profit calculated using the opening cost of £2 per quarter:

> "So evidently he has made a gain … of these 20 qrs, now worth £20. His surplus is therefore not £80 but £100 …. This is an unquestionable FACT, and … the farmer can sell 20 qrs more at the new value, thus gaining £20. In the course of *reproduction*, moreover, the farmer obtains the SURPLUS of £20 on the same outlay, because the labour has become more productive, without the rate of surplus value having risen or the workers having performed more SURPLUS labour …. This then is a rather peculiar phenomenon" (Marx, 1991, p.270).

To explain this 'peculiar phenomenon', Marx calculated that £20 of this 'profit' in year 2 was a return of capital, a "release of a portion of the capital previously tied up in constant capital" (1991, p.271), and he in effect adjusted his historical cost profit and loss account to current cost with a negative CMA (cost of sales adjustment):

<div align="center">Profit and loss account</div>

	£	£
Sales (200 x £1)		200
Seed corn cost (20 x £2)	40	
Seed corn CMA	(20)	
Other constant capital	40	
Labour	40	100
	---	-----
Profit		100
		===

To continue at this scale at the new price the farmer needs only £20 for seed corn, and therefore needs a capital of only £100 and can withdraw the additional £20 of capital in addition to his profit of £80, requiring a corresponding negative CMA in his balance sheet recording the reduction in the capital required.[44]

<div align="center">Closing balance sheet</div>

	£		£
Capital advanced	120	Cash for seed corn	20
CMA	(20)	Cash for other constant capital	40
		Cash for wages	40
	-----		-----
	100		100
	===		===

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[44] The double entry is Dr Capital, Cr Profit and loss.

Marx concluded, "What this phenomenon amounts to is this: release of a portion of capital previously tied up in constant capital, or the conversion of a portion of the capital into revenue" (Marx, 1991, p.271). In other words, the farmer calculates the surplus of £20 as a negative CMA, and therefore "will not consider that he has obtained a larger profit, but that a portion of his capital previously tied up in production has been freed" (Marx, 1991, p.272).[45] Marx likewise does not count this as part of the rate of profit in year 2 because it is a correction to capital caused by a fluctuation in input prices of constant capital.

> "How little the above phenomenon has to do with the determination of the rate of profit, becomes clear if one considers the case of a FARMER (or *manufacturer) who enters the business under the new conditions of production. … HE NOW HAS TO ADVANCE £20 TO BUY 20 qrs OF SEED, £40 as previously [to buy the other elements of constant capital, £40 FOR WAGES, so THAT HIS OUTLAY OF CAPITAL = [£]100. AND profit is £80, that is 80%. THE AMOUNT OF PROFIT HAS REMAINED THE SAME, BUT ITS RATE HAS INCREASED by 20%. Thus one can see that the fall in the value of SEED (or of the PRICE which has to be paid to *replace* the seed) has in itself nothing to do with the increase in the amount of profit [in year 2], but implies merely AN INCREASE IN THE RATE OF PROFIT" (Marx, 1991, p.272).[46]

Because the £20 increase of 'profit' in year 2 came from a return of constant capital, it had "in itself nothing to do with the increase in the amount of profit". In short, the £20 does not count in the calculation of the rate of profit because the farmer did not extract it in that year from the capital advanced to production, of which it turned out £20 was superfluous. To reinforce his point that the increase in productivity did not cause an increase in profit, Marx contrasts this calculation with the effects of an equivalent fall in wages, which does:

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[45] The same but opposite accounting applies to a "rise in prices of the ingredients [of constant capital] [that] has the opposite effect of a fall in prices. … If production is to be continued on the old scale, then a greater outlay of capital is necessary. Therefore, apart from a fall in the rate of profit, extra CAPITAL MUST BE EMPLOYED OR A PART OF the REVENUE MUST BE CONVERTED INTO CAPITAL, although it will not have the effect of extra capital" (Marx, 1991, p.271). In other words, if the post-production replacement cost of seed corn increased, the farmer would need to withhold part of his apparent profit from consumption to invest more in seed corn and his balance sheet would require a positive CMA to withhold some revenue as additional necessary capital for continued reproduction. As Marx put it in Volume 2, if commodities "suffer any change of value during the circuit... then the [reproduction] process cannot run its normal course" (Marx, 1978, p.153). For example, "If the value of cotton, coal, etc. rises ... additional money capital is then necessary, i.e., money capital is tied up. Conversely, if these prices fall, money capital is set free" (Marx, 1978, p.187).

[46] He drew the same conclusion when he worked the example at 10s per quarter to see how "The account will therefore work out": "In the first case [year 1] it amounted to $66_{2/3}$%, in the second [year 2] to 80[%]" (Marx, 1991, p.268), that is, £40/£50 or £80/£100. By calculating the surplus in year 2 as £100, Marx implied that under the new conditions the profit in year 3 would be £100 on a capital of £100. Thus he here appears to mean that the rate of profit would increase to 80% for a new farmer in year 3 if the profit was £80, giving a higher rate of profit than the existing farmer earned in year 2.

"Suppose for example, that, in the above-mentioned case, the price of the seed (assuming the FARMER grows FLAX) remains the same, that is, £40 (20 qrs) and that the rest of the constant capital costs £40 (20 qrs), but that wages … fall from £40 to 20 (from 20 qrs to 10). … The capital advanced is now 100 instead of 120 just as in the case when the seed fell by half. But the profit is now [£]100, i.e., 100%, whereas in the other case, where the capital advanced was likewise reduced from 120 to 100, it was 80%. … But in the former case, the surplus remained unchanged – [£]80 (and since 40 was paid as wages, [the rate of surplus value] was 200%). In the latter case, the surplus value rises to 100 (and since wages now come to [£]20, [the rate of surplus value increases] to 500%)" (Marx, 1991, pp.273-274).[47]

Such a farmer would produce the following accounts for year 2 (recall that the farmer pays wages in arrears):

<div align="center">Profit and loss account</div>

	£	£
Sales (200 x £2)		200
Seed (20 x £2)	40	
Other constant capital	40	
Labour	20	100
	---	-----
Profit		100
		===

<div align="center">Closing balance sheet</div>

	£		£
Capital advanced	100	Cash for seed	40
		Cash for other constant capital	40
		Cash for wages	20
	-----		-----
	100		100
	===		===

In the following year (year 3, not explicitly considered by Marx), if prices and everything else stayed the same, the farmer in the first case would produce a profit of £100 on a capital of £100 from the fall in the input price of seed corn. However, as Marx implied from his comparison of the first case where productivity rises and constant capital falls with the second case where wages fall, this would be because the farmer in the first case would advance £20 less constant capital for seed corn and therefore extract a rate of profit of 100%.[48] In year 3, the rate of surplus value would be £100/£40 (250%) in the first case rather than £100/£20 (500%) in the second, but Marx implied that both cases would produce the same rate of profit because the composition of capital, the ratio of the value of variable to constant capital, is higher in the first case. According to Marx, the

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[47] By 'other case', Marx means the hypothetical new farmer. By 'former case', he means the farmer who faced a fall in input costs for seed corn in year 2.

[48] Marx appears to spare himself the need to analyse three years by his imaginary new farmer who advances only £100 at the new prices.

rate of profit r = [s/v] x [v/c] x [c/(c + v)], where s/v = the rate of exploitation, v/c = the organic or value composition of capital, and c/(c + v) = the turnover of capital. Thus, in year 3 of Marx's example, assuming seed corn prices are £1 as in year 2, in the first case the rate of profit = [£100/£40] x [£40/£60] x [£60/£100] = 100%, and also in the second case, when wages are £20, the rate of profit = [£100/£20] x [£20/£80] x [£80/£100] = 100%. The difference is that in the first case the higher proportion of variable capital caused by the fall in the input price of seed (50% rather than 25%), the fall to a 'value composition' of 25% compared to the previous 'organic composition' of 50%, offsets the lower rate of exploitation compared to the second case (250% rather than 500%). As Marx said, "In this [second] case, not only has rate of profit risen but the *profit* itself, because the rate of surplus value has risen and consequently the surplus value itself. This differentiates this case from the other, something which Ramsay does not grasp" (Marx, 1991, p.274). To differentiate the cases, to explain the change in the rate of profit in the first case we must, as in effect Marx did, employ RCA and recognise that if input prices change following production the capitalist revalues the constant capital in the closing balance sheet and in the profit and loss account. If prices fall because labour productivity increases, as in Marx's example,

> "Since one part of the labour expended, i.e., the part contained in the constant capital (in seeds in this case), has diminished, the value of the product falls if *production* continues *on the same scale*, just as the value of 100 lbs of twist falls if the cotton it is made of becomes cheaper. But the ratio of variable capital to constant capital increases (without the *value* of the variable capital increasing). In other words, the ratio of the total capital outlay declines in relation to the surplus. HENCE the rate of profit rises" (Marx, 1991, pp.268-269).

This RCA reading supports but clarifies the TSSI's interpretation of the 10 sentences of the "controversial" passage earlier on in the *Economic Manuscripts of 1861-63* (Kliman, 2007, pp.98-99).[49] These amount to Marx's initial verbal formulation of the necessary accounting for input price changes, which he sees must first account for the price when constant capital enters production (sentences [1], [4], [5]), but must then account for prices change during (or after) production (sentences [2], [3], [6], [7], [8], [9] and [10]):

> "[1] But the value of the material and means of labour only re-appear in the product of the labour process to the extent to which they were preposited as values, i.e., were values before they entered into the process. … [2] If later on more or less labour time were to be required to manufacture these particular use-values, … their value would have risen in the first case and fallen in the second. … [3] Hence although they entered the labour process with a definite value, they may come out of it with a value that is larger or smaller …. [4] But this change in the value of material and means of labour involves absolutely no alteration in the circumstance that in the labour process into which they enter … they are always

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[49] Moseley (2000b) provides a comprehensive survey of all Marx's discussions of the impact of price changes of constant capital, arguing that they support the RCI, to which Kliman's discussion responds. As Kliman says, there are many other "passages [that] contradict the replacement cost interpretation" (see: Kliman, 2007, pp.100-101).

preposited as given values, values of a given magnitude. [5] For in this process itself they only emerge as values in so far as they entered as values …. [6] If their general conditions of production have changed, this reacts back on them. [7] They are an objectification of more or less labour time, of more or less value than originally; but only because a greater or smaller amount of labour time is now required than originally for their production. … [8] If [their] value changes before the new product of which they are the elements is finished they nevertheless relate to it as independent, given values preposited to it. [9] Their change of value stems from alterations in their own conditions of production, which occur independently of the labour process into which they enter. … [10] For it they are always values of a given, preposited magnitude, even though … they are now preposited as of a greater or smaller magnitude than was originally the case" (Marx, 1989, pp.78-79, Kliman's numbering added).

Kliman reconciles all the sentences with the TSSI by distinguishing between "the inputs' own values [sic] and the amounts of value they transfer [sic]" (2007, p.99). Inputs do not have their "own value", and they do not "transfer" value; the values at which inputs enter are values for the labour process that transfers them to the finished commodity by adding value. From an accounting perspective we can more persuasively read the passage as Marx's first attempt at distinguishing between the opening value 'transferred' or 'preserved' by the labour process, for which it is accountable, and external changes in value caused by changing prices, for which it is not accountable. As Marx put it shortly before the above passage, "The material and means of labour are … only preserved as exchange values by being consumed in the labour process as use value" (1988, p.76). The labour process transfers whatever value they have to the finished product by preserving their use values for the commodity: "the worker is not concerned in the labour process with the value of the means of production but rather with their use value" (Marx, 1981, p.324).[50] Rather than simply an argument for using input prices, we can more clearly read the passage as a whole, but particularly the concluding sentences [9] and [10], as an accountability argument. In short, that the capitalist holds production accountable for the rate of profit realised on the current value of the capital advanced to it, but the capitalist is accountable to total social capital for the change in value post-production. As Marx put it, value "reappears" from the labour process in reality as preserved use-values and in its accounts only if "preposited", presupposed, calculated on entry [1, 5 & 6], "preposited as given values, values of a given magnitude" [4], for which it is accountable.[51] Changes in value caused by changes the labour time required [2 & 3] that occur "only because" [7] of a change in prices "independently of the labour process into which they enter" [9], to produce the inputs, do not change that accountability [4, 7 & 8], although it does add another dimension. For accountability for the capital advanced to the labour process and its circulation, capitalists must make CMAs in the profit and loss account, and in the closing balance sheet that "now preposited [the capital] as of a

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[50] As Mohun and Veneziani point out, according to the TSSI "an inventory revaluation because of price changes … [s]hould be included as part of the value created by living labour", which implies that "value is dissociated from labour performed" (Mohun and Veneziani, 2007, p.144).

[51] Production is therefore accountable for input use-values (e.g., waste) as well as the cost of finished commodities.

greater or smaller magnitude than was originally the case" [10], as Marx later precisely worked out in his example.

This RCA reading also clarifies the TSSI's support for Marx's 'law of the tendential fall in the rate of profit' (LTFRP) that he elaborated in Volume 3 of *Capital* (Marx, 1981, pp.317-338). Marx argued that capitalists tended to adopt more productive, labour saving technologies, increased the technical composition of capital which increased the organic composition of capital, increased the proportion of constant to variable capital, which assuming a constant or more slowly rising rate of exploitation, tended to cause the rate of profit to fall. The proportion of constant capital increased, Marx argued, because individual capitalists seek 'relative surplus value'. That is, they seek to increase the rate of exploitation to get an excess rate of profit over the risk-adjusted general rate from investing in constant capital (particularly fixed capital) to increase labour productivity, but as this investment and productivity increase is generalised, competition causes the general rate of profit to fall (Marx, 1981, pp.373-374). Marx's LTFRP assumes that labour time determines value, and presumes a given total workforce and labour intensity, total wages and profits, continual investment in constant capital to increase labour productivity, and competition for capital and labour that tend to equalise rates of profit and the rate of exploitation over time. Marx hypothesised that the tendency for the rate of profit to fall, combined with capitalism's tendency to 'overproduction', to produce 'surplus capital', periodically overrides the 'counteracting tendencies' of increasing rates of exploitation, scientific revolutions creating new commodities, markets, etc., causing crises that were self-correcting through 'devaluations' of capital that would restore the rate of profit (1981, chapters 14 and 15). Marx's law is not therefore a prediction that the rate of profit will fall, but a prediction "of what would occur if there was no destruction of capital value or other 'counteracting influences' such as the tendency of the rate of surplus-value to rise" (Kliman, 2011, p.25). In capitalist accounting, these 'devaluations' are of two types. First, those that arise because the input price of constant capital falls, which using RCA automatically 'devalues' the capital though CMAs, but as we have seen, which merely "condition the fall in the profit rate, and … delay it" (Marx, 1981, p.356). Second, there are the losses that arise from "surplus capital", from capitalists' tendency to its overproduction, write offs which 'devalue' capital through "the competitive struggle in which the loss is divided very unevenly and in very different forms" (Marx, 1981, p.362).

Kliman's temporal criticism of the Okishio theorem is that it "appears to prove that rising productivity *cannot* lead to a falling rate of profit … [because] it overlooks the price effect, or, more precisely spirits it away by valuing inputs and outputs simultaneously" (Kliman, 2007, p.114, emphasis added). We have seen that Marx's RCA supports Kliman's interpretation that an increase in the productivity of labour does not increase the amount of profit generated from the capital advanced to production, or the rate of profit, for that year. Moreover, he is certainly right that capitalists would not "retroactively reduce the capital that was advanced at the start of [the year for the price change at the end]. What's done is done" (Kliman, 2007, p.123). Capitalists would however calculate CMAs to adjust the closing constant capital and distinguish the sources of their 'profits' for the year, as Marx did, which would increase the rate of profit in the following year.

Kliman accepts that in Volume 3 of *Capital* Marx "recognized [that] the cheapening of means of production does reduce the capital advanced, and this tends to counteract the tendency of the rate of profit to fall" (Kliman, 2007, p.123; see, Marx, 1981, pp.342-343).[52] Kliman argues, however, that "it is only the rate of profit in subsequent years, not the *current years* rate, which tends to rise as a result of the cheapening of means of production" (2007, p.123), but this is not a sufficient accounting demonstration of the conditions for a fall in the rate of profit. To refute Okishio's claim to have proved that increases in labour productivity can *never* cause a fall in the rate of profit, "Subsequent rising-rate-of-profit examples are irrelevant" (Kliman, 2007, p.134), but they are relevant to demonstrating the accounting possibility of Marx's LTRPT.

We can use Marx's capitalist farmer examples to illustrate his LTFRP. We saw that in his first case, where production costlessly doubles, in year 3 the rate of profit = [£100/£40] x [£40/£80] x [£80/£100] = 100%, and in the second case when wages are reduced to £20, the rate of profit = [£100/£20] x [£20/£80] x [£80/£100] = 100%. It follows that if the proportion of constant capital increased in the first case, or the rate of exploitation fell in the second, the rate of profit would fall. Suppose the farmer in the first case advanced an additional £40 of constant capital to double output in year 2, expecting the price to remain at £2/qr and to earn a rate of profit of 162.5% (£260/£160), but that all farmers do the same, so total output doubles and the price falls.[53] The price falls to £1.20 per quarter because, as the additional constant capital is socially necessary, the farmer can recover the £40 additional cost, and his revenue increases to £240 for 200 quarters of corn. The farmer's capital initially increases to £160 and (excluding the CMA) profit stays at £80, reducing the rate of profit to 50% in that year (£80/£160), but in the assumed conditions it returns to 66.7% (£96/£144 = £80/£120) in the following

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[52] Kliman argues that counteracting this are "recurrent devaluations of means of production" (2007, p.30), but he does not distinguish the two types. He says that when the prices of fixed assets fall, "The size of … [a company's] investment can only be reduced by taking a loss or by increasing the company's depreciation expense, both of which lower its rate of profit" (2007, p.123). However, we have seen that Marx and capitalists account for CMAs when input prices of constant capital fall, which are 'devaluations' of capital distinct from asset write-downs for losses and depreciation charges. If a company 'devalues' its fixed capital this will reduce the depreciation charge, which increases the rate of profit, and it will account for any losses separately. Kliman appears to see 'devaluation' as 'impairments', the view from neoclassical economics that we should write-down assets to their present value: "Imagine, for instance, a business that can generate $3 million in profit annually. If the value of the capital invested in the business is $100 million, the owner's rate of profit is a mere 3 per cent. Yet if, as a result of the destruction of capital, new owners can acquire the business for only $10 million instead of $100 million, their rate of profit – the return they receive on *their* investment – is a healthy 30 percent. A tremendous incentive to invest, expand production and employ more workers has been created" (Kliman, 2011, p.23). This appears to mean that the business invested $100 million expecting annual 'profits', that is, distributable cash flows in perpetuity, of $30 million or 30% ($30m/0.30 = $100m), but earns only £3 million which has a present value of $10 million ($3m/0.30), generating a 'loss' of $90 million. If, however, the present value of $10 million equalled the replacement cost of the capital, the owners would have received $90 million back as a CMA, 'devalued' it in the company's accounts to restore the rate of profit to 30%, and they would have no need to sell the business to achieve this. If the replacement cost remained at $100 million, and new owners purchased the business for $10 million, its capital would not be devalued, but balanced by a capital reserve, a CMA known as 'negative goodwill'.

[53] Expected sales are 200 qrs x £2 = £400, and expenses and capital of £160 (£40 for seed corn, £80 for constant capital and £40 for wages).

year.[54] The composition of capital, however, has fallen from an organic composition of 50% (£40/£80) to a value composition of 38% (£40/£104).[55] Therefore, if through the competitive equalisation of the rate of profit the rate of exploitation tended to fall back to 200% (from 240% = £96/£40), which was Marx's initial assumption in his example, profit would tend to return to £80 (£40 x 2), and the rate of profit would tend to fall to 55% (£80/£144).[56] Marx's general illustration in Volume 3 of the LTFRP, which he intended to depict the "actual tendency of capitalist production", its history, shows the rate of exploitation and the amounts of wages and profit as constant over time, and an increasing proportion of constant capital in a growing total capital (1981, pp.317-318). The justification for assuming constant amounts for total wages and profit, according to his theory of value, was that "If we take a given working population", and assume a given working day, intensity of labour, and rate of exploitation, "then the total labour of these … workers always produces the same magnitude of value" (Marx, 1981, p.323). It follows that "as the mass of constant … capital … grows, so there is a fall in the ratio between this magnitude [profit plus wages] and the value of the constant capital" (Marx, 1981, p.323), and with a constant rate of exploitation the rate of profit falls.

We can illustrate the LTFRP in Marx's second case by assuming that all farmers costlessly reduced labour costs to £20 in year 2 while maintaining output. The organic composition of capital falls from 50% to 25% (£20/£80), and assuming the rate of exploitation remained at 250% (£100/£40), profit would tend to fall from £100 to £50 (2.5 x £20) and the rate of profit from 100% (£100/£100) to 50% (£50/£100).[57] Kliman gives a similar two period example that contrasts the SSSI's calculation of an increased rate of profit when labour productivity costlessly doubles in period 2, with the TSSI's calculation of a fall (Kliman, 2007, pp.158, 163-166, Tables 9.4 and 9.5), which is consistent with his temporal reading of Marx's LTFRP, but does not fully illustrate or explain Marx's accounting.[58] Following Marx's RCA, the table below reproduces and extends Kliman's example to the end of year 3, revaluing the opening constant capital in

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[54] The farmer's expenses are £40 for seed corn, now £80 for constant capital, and £40 for labour, £160 in total, leaving a profit in year 2 of £80 (£240 - £160). The required CMA (£40 - £24 = £16) at the end of year 2 is Dr Capital £16; Cr P&L £16. In year 3, at current prices seed corn costs £24 and profit is (£240 - £144) = £96 on a reduced capital of £144 (£160 – [£40 - £24]), or 66.7%.

[55] In year 2, the organic composition of capital, "restricted to changes in production without any references to value change in circulation", is 33.33% (£40/£120), whereas the "formation of the VCC [value composition of capital of 38%] is associated with the counteracting tendency" (Fine and Saad-Filho, 2004, pp.113, 110).

[56] Okishio argued that the rate of profit cannot fall unless real wages rise (Fine and Saad-Filho, 2004, p.121), but here they are constant.

[57] Capital turnover remains constant (£80/£100).

[58] Fine and Saad-Filho also conclude, "For Marx … the tendency for falling profitability is due to the evaluation of inputs and outputs at old values" (2004, p.123). They distinguish this from "the process of price (and VCC [value composition of capital] formation out of technical change [that] is a counteracting tendency to the falling rate of profitability for capital as a whole" (Fine and Saad-Filho, 2004, p.124; see also p.120). This is fine for an "*abstract law* that does not give prospective indications about movements in the rate of profit", and Marx's theory of crisis is not simply a question of adding together "algebraically" the decrease caused by the law minus the counteracting tendencies (Fine and Saad-Filho, 2004, pp.110, 115). However, for empirical relevance it is important to do the accounting for both the law and, so far as possible, for its counter-tendencies, such as the formation of the value composition, or in other words, for CMAs.

year 3 at output prices (rounded down) from year 2, which demonstrates the possibility of Marx's LTFRP from a fall in the organic and value compositions of capital given a constant rate of exploitation.

Extending Kliman's example								
	C	V	S	W	Π	P	s/(c + v) (%)	π/(c + v) (%)
Period 1: SSSI & TSSI								
Department 1	192	8	16	216	40	240	8.0	20.00
Department 1	24	16	32	72	8	48	80.0	20.00
Total	216	24	48	288	48	288	20.0	20.00
Period 2: SSSI								
Department 1	113.05	1.82	10.18	125.05	26.44	141.42	8.9	23.00
Department 2	14.13	3.64	20.26	38.13	4.09	21.87	114.5	23.00
Total	127.19	5.47	30.53	163.19	30.53	163.19	23.0	23.00
Period 2: TSSI								
Department 1	192	4	8	204	20.63	216.63	4.1	10.50
Department 2	24	8	16	48	3.37	35.37	50.0	10.50
Total	216	12	24	252	24.00	252.00	10.5	10.50
Period 3: TSSI								
Department 1	113	4	8	125	20.20	137.20	6.80	17.27
Department 2	14	8	16	38	3.80	25.80	72.70	17.27
Total	127	12	24	163	24.00	163.00	17.27	17.27

Department 1 produces the means of production and Department 2 produces the means of consumption. Starting from given physical quantities and a given MELT (Kliman, 2007, Table 9.1, p.158), in period 1 the SSSI and the TSSI give the same result. "Imagine that labor-saving technological progress now takes place in both branches. In the next period [period 2], the same amount of output is produced, using the same amount of means of production, but each branch uses only half as much living labor as before", but the real wage rate, the rate of surplus value, and the MELT are the same (Kliman, 2007, pp.164-165). The TSSI calculates a fall in the rate of profit to 10.5% for period 2. The rate of exploitation is constant in periods 1 and 2 (48/24 or 24/12). The fall in the rate of profit from 20% in period 1 to 10.5% in period 2 therefore results from the fall in the organic composition of capital from 0.111 (24/216) to 0.055 (12/216) not offset by the increase in turnover from 0.9 (216/240) to 0.947 (216/228). Kliman therefore rejects the SSSI's conclusion that increases in labour productivity could not cause the money rate of profit to fall "in relationship to the physicalist rate", which contradicts Marx's LTFRP (Kliman, 2007, p.120). Marx's accounting supports his criticism of the SSSI's solution for period 2, that retroactively restates all inputs to output prices including wages, effectively adopting physical accounting, which produces an equalised money and physical rate of profit in period 2 of 23%, contrary to the LTFRP. Period 3 extends the TSSI period 2's results by revaluing constant capital using the new price for constant capital at the end of period 2, which produces a fall in the rate of profit from 20% in period 1 to 17.27% in period 3.[59] Following the price change, the value composition increases in period 3 to 0.944 (12/127) and turnover reduces to 0.913 (127/139). However, they are, respectively, below and above the ratios in period 1 before labour productivity increased, whereas the rate of exploitation remains constant at 200% (48/24 = 24/12) and, therefore, over the three years the rate of profit falls.

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[59] I ignore the impact of the CMA (216 − 127 = 89) on the 'profits' reported in period 2.

Foley accepts that the NI "is a set of definitions rather than an empirical hypothesis" (2000, p.28), a tautology (Fine et al, 2004, p.5), and so are the SSSI and the TSSI. Therefore, when, for example, the NI's supporters say that the Marx's theory of value *is* valid for any price system, they mean it *could* be valid. The NI's equations merely say that "LVA is by definition the sum of aggregate variable capital … and aggregate surplus value …, and … MVA is by definition the sum of the aggregate wages of productive labor … and aggregate profits" (Mohun, 1996, p.41). The TSSI "presumes that aggregate variable capital in value terms is equal to aggregate wages divided by the monetary expression of labour time", and that "the total value of the means of production is the labour time equivalent of total expenditure on the means of production" (Mohun, 2003, pp.89, 92). It is true that a definitional advance of the NI was to "regard as the key Marxian insight, the quantitative equivalence between capitalist gross profit and unpaid labor" (Foley, 2000, p.22). However, as neither Foley nor anyone else has theorised 'capitalist profit', that is, explained the principles capitalists use to measure it, how do we know that in total and without correction (e.g., for earnings management, 'fair value accounting', etc), it equals surplus value? We cannot observe surplus value or the labour value of commodities that would exist without total social capital and competition. How, therefore, do we know (to use Marx's transformation table) that the sum of profits equals £110 because it is the sum of surplus values, or that the sum of the prices of production equals £422 because this is the sum of commodity values?

Economists generally rest content with a circular definition of profit as 'revenues minus costs' (e.g., Fine, 1977), or the equally unhelpful tautology from the NI that profit = money value-added (i.e., profit + wages) – wages. Shaikh and Tonak (1994) criticise the NI for this omission, but they do not rectify it. They say that whereas Marx argued that price and profits were monetary forms of value and surplus value, the NI "abandons this altogether by defining surplus value to be a form of profit. The whole relation between surplus value and profit is turned on its head" (quoted in Foley, 2000, p.25). In other words, we will see, whereas Marx defines individual profits as fragments of surplus value, the NI effectively defines individual surplus values as fragments of total 'profits', but without defining 'profits'. Foley suggested making the NI operational "in terms of accounting data from capitalist firms" (1982, p.37), arguing that the NI's categories "have measurable correlatives" (p.38), that (following Gillman (1957) and Shaikh (1980)) we can "test hypotheses in the labor theory of value framework by looking at the actual accounts of capitalist firms" (Foley, 1982, fn.1). Although he is right that accounting categories do not necessarily "*directly* correspond to the relevant labor theory of value categories" (he means those concerning the division of surplus value and the identification of productive labour), he does not probe into these "subtle issues" (Foley, 1982, fn.1). Instead, he says Marx's breakthrough was to "translate flows of money in real world capitalist accounts into flows of labor-time and vice versa" (Foley, 2000, p.20). Mosley goes further and claims, "Marx's key concept of capital is defined in terms of *money*, not in terms of labor time" (2000, p.289).[60]

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[60] Elson also thinks there is "pressure on commodity producers to represent labour-time expended in production in money terms, to account in money terms for every movement" (1979, p.170).

These views are misleading because capitalists do not primarily account for flows of money, of cash or its equivalent, but for flows of capital, money that circulates as commodities, as use-values with exchange-value – into and through production and out to the market to return with a profit. The quotations Moseley (2000) gives make this abundantly clear. Marx did not therefore translate flows of money in real capitalist accounts into flows of labour time and vice versa, but in the accounts he studied he found labour time already translated into money value, into capital, which he theorised. His argument, in short, was that we know that profit is a fragment of total surplus value because capitalists account for all capital, as the NI does for variable capital, and the SSSI and TSSI do for constant capital, at the 'money value of socially necessary labour time'. Grasping this idea was the real definitional advance of the NI, and extending it to constant capital was an advance of the SSSI and TSSI, as we shall see in part 4, because it lies at the core of Marx's theory of accounting. However, in illustrating a 'solution' to the 'transformation problem', the potentially important advance of Kliman's TSSI, implicit in his dismissal of the prevalent view of *Capital* "as a narrowly 'economic' work" (Kliman and McGlone, 1988, p.57) is lost. Kliman and McGlone persuasively argue that Marx presented a 'dialectical' explanation of "*how* value *becomes* prices of production" in the context of the capitalist system as a whole and its history, but they admit that their illustration "does constitute a response to the criticism that Marx 'failed' to account for the transformation of input prices" (1988, pp.58, 69). However, what follows argues that Marx's accounting theory had no need as it had 'dissolved' the problem.

Understanding the commodity as a fragment of capital in general was for Marx a necessary preliminary to dissolving the 'transformation problem': "The whole difficulty arises from the fact that commodities are not exchanged simply as *commodities*, but as *products of capital*", i.e., as "capitalistically modified" commodities (1998, p.174). The problem was that in reality exchange occurred at 'prices of production' based on 'cost price', the value of the capital embodied in commodities, not necessarily at the money value of socially necessary labour time to produce them, his assumption in Volumes 1 and 2, where 'socially necessary' meant at average technical and social efficiency. What follows argues that it understanding commodities as fragments of capital in general, as the theoretical equivalent of the accountant's assets – as the unity of exchange values and use-values in circulation –gave Marx his solution to the 'transformation problem'.

Part 4: Marx's accounting solution to the 'transformation problem'

Under simple commodity production where price equalled value and all costs were labour costs, the sum of the surplus values of all the individual producers must equal the consumable money surplus. This needed no demonstration. However, to prove that the sum of capitalist profits equals society's surplus value Marx had to show that an individual capitalist's profit, interest and rent were "particular fragments of surplus value" (Marx and Engels, 1987, p.514); that "in its essence profit consists of surplus value" (Marx, 1991, p.97). Marx claimed that

"Just as the surplus value of the individual capital in each particular sphere of production is the measure of the absolute magnitude of the profit – in so far as this is merely a converted form of surplus value – so is the *total surplus value* produced by the total capital, hence the whole class of capitalists, the absolute *measure of the total profit of the total capital*" (Marx, 1991, pp.98-99).

In saying that individual surplus value is 'the *measure* of the absolute magnitude' of individual profits that are its 'converted form', Marx cannot mean that surplus value sets the limit of the individual profit, because he stressed that these can diverge; profit can be greater or smaller than surplus value. What he appeared to mean was that it is because individual capitalists *measure* profit as a converted form of surplus value, that is, *calculate* profit using principles consistent with the labour theory of value, that total profits equal total surplus value – is why total surplus value becomes 'the absolute measure of the total profit' and here sets its limit. Therefore, he continued, the distribution of total surplus value "only represents the result of the *particular mode of calculation*", forced on capitalists because of "*competition of capitals* with each other" (Marx, 1991, pp.99-100, first emphasis added). That the key to the equalisation of the rate of profit was, therefore, that "individual capitalists … *calculate* the same … profit … in proportion to … production costs, so that the division of the total surplus value as it is present in empirical profit can take place" (Marx, 1991, p.103, emphasis added). In short, Marx says that under the pressure of competition individual capitalists calculate their results – keep accounts – according to the profit they realise, measured as a converted form of surplus value. The outcome, he claims, is that each capitalist's profit is a share of total surplus value proportional to the capital each advances.

Marx highlighted the importance of measurement and calculation in 1857-8 when he was writing the *Grundrisse*, where he first formulated the idea that competition distributed surplus value (Meek, 1977, pp.99-101) and proposed the solution that the capitalist transformed surplus value into profit by calculations. There he says, "The transformation of surplus value into the form of profit, *this method by which capital calculates surplus value*, is necessary from the standpoint of capital, regardless of how much it rests on an illusion about the nature of surplus value, or rather veils this nature" (Marx, 1973, p.767, emphasis added). In *Grundrisse* Marx does not say whether he thinks the redistribution of surplus value is consistent with the labour theory of value. In early August 1862, shortly before he worked out the theory of depreciation accounting, Marx wrote to Engels giving him a long example of the transformation of surplus values into profits. Again, "there is no reference whatever in this letter to the question of whether, after the transformation, one can say that the 'law of value' still remains operative" (Meek, 1977, p.102). This is interesting because in the later parts of the *Economic Manuscript of 1861-1863*, written shortly after Marx reached theoretical closure on depreciation accounting, he brings out for the first time the apparent complication that capitalist's acquire constant capital at cost prices including a profit, not at their values. Now, for the first time, Marx makes what Meek thinks is the "bald statement" that "this important deviation of cost-prices from values brought about by capitalist production does not alter the fact that cost-prices continue to be determined values" (Marx, 1972, pp.167-168). However, if Marx had recently worked out his theory of capitalist accounting we could read this statement,

not as 'bald', but confident. It is consistent with Marx now believing that capitalists accounted for costs and revenues using an inchoate labour theory of value, calculating their profits as though were the surplus value they had appropriated from their own workers.

Marx had spent Volume 1 and the first two parts of Volume 2 explaining the underlying principle for the individual (i.e., general) circuits of capital, so he did not need to repeat this in Volume 3 to deal with social capital and competition. As he said, immediately after presenting his solution, the average rates of profit shown for each sphere of production must "be deduced out of the values of the commodities" (Marx, 1998, p.156), that is, by using the accounting theory of capital in general developed in Volumes 1 and 2. This is consistent with the reason Marx gave for deferring competition to Volume 3, that first the reader must "have a clear conception of the inner nature of capital", the "laws immanent in capitalist production", that then "assert themselves as coercive laws of competition" (1996, p.321). In other words, to understand capitalist competition it was first necessary to know the rules of the game for capital in general, to understand the calculative mentality of the ideal-typical individual capitalist. Marx therefore dealt with capital in general, its circuit of capital, free from the complexities of the phenomenal forms of profit, interest and rent that arose in competition, in Volumes 1 and 2. In doing so, he did not neglect the individual capitalist. Marx said that he grasped the whole – "the aggregate capitalist" – by understanding its parts: "The aggregate capital appears as the capital stock of all individual capitalists combined" (Marx, 1997, p.432).

In *Grundrisse* Marx claimed, but had not demonstrated, "The fundamental law in competition … is that it [the commodity's price] is determined not by the labour contained in it, or by the labour time in which it is produced, but rather by the labour time in which it can be produced, or, the labour time necessary for production" (Marx, 1973, p.657). He also claimed in Volume 3 that capitalist competition works to create and then eliminate differences between the socially necessary costs of production (the money costs of socially necessary labour time embodied in a commodity) for the average capitalist and the cost to the individual capitalist (Marx, 1998, p.42).[61] Now, however, he knew he could back this up by using the 'general form of surplus value' he found in accounts to explain how the production of surplus value was its simultaneous distribution to capitalists (and then to landlords, shareholders and creditors) and workers. To simplify the presentation, therefore, Marx initially leaves competition to one side and assumes that value equals price to leave him free to focus on explaining the origin or production of surplus value (that here equals profit) as the money value of unpaid socially necessary labour time. Marx explained his decision to start with the situation where price equalled value, in a letter to Engels discussing a review of Volume 1:

> "Curiously, the fellow has not detected the … fundamentally new element … in the book … that in contrast to *all* previous political economy, which *from the outset* treated the particular fragments of surplus value with their fixed forms of rent, profit and interest as already given, I begin by dealing with the general form

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[61] For an individual capitalist to earn an excess return, the labour-time expended on his commodity must be less than the socially necessary time.

of surplus value, in which all these elements are undifferentiated, in solution as it were" (Marx and Engels, 1987, p.514).

He made the same point when he wrote explaining to Engels "the method by which the rate of profit is determined" (Marx and Engels, 1988, p.21) in Volume 3. Central to it was that in Volume 1 "Profit is for us, for the time being, only *another name* for or another category of *surplus* value" (1988, p.21). These explanations reinforce the view that Marx knew when he wrote Volumes 1 and 2 that the basis of capitalist accounting for profit under competition – the principles underlying the practical accounts of individual capitalists that he saw, discussed with Engels, and used – was accounting for the money value of socially necessary labour time. This was the 'general form of surplus value', the theoretical 'solution' into which Marx claimed he had dissolved the phenomenal forms. He claimed, in short, that he could explain the capitalist's calculation of profit – the major modern 'phenomenal form' – and show how under competition this distributed surplus value evenly across all capitals, using the labour theory of value.

In one sense Moseley is right that the "assumption throughout Volume 3, which is repeated many times, is that the total amount of surplus-value is determined prior to its division into individual parts" (2000, p.287). It is true, as Marx pointed out, that "What is available for them to divide among themselves is only determined by the absolute quantity of the total profit or surplus value" (1991, p.99), but capitalists did not first determine the total and then distribute it.[62] Rather, the production of surplus value was simultaneously its distribution as profit, as he concluded in Volume 3. Capitalist production and competition – and the calculations they stimulate – simultaneously determine, i.e., distribute, individual profits and total surplus value:

> "… a general rate of profit … presupposes that the rates of profit in every individual sphere of production taken by itself have previously been reduced to just as many average rates. These particular rates of profit = s/C in every sphere of production, and must … be deduced out of the values of commodities. Without such a deduction the general rate of profit (and consequently the price of production of commodities) remains a vague and senseless conception" (Marx, 1998, p.156).

To show that Marx's idea of prices of production is not vague or senseless we must understand his solution to the transformation problem for the individual capitalist firm. That is, his explanation of how "the laws, immanent in capitalist production … assert themselves as coercive laws of competition, and are brought home to the mind and consciousness of the individual capitalist as the directing motive of his operations". How "the laws of the production of value are … realised for the individual producer" (Marx, 1996, pp.321, 329). Given the importance of calculation to achieving the simultaneous

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[62] Kliman argues that Marx's insistence in Volume 3 that "Profit is produced before this division takes place" shows the "striking … temporalist character of Marx's reasoning", that is, is consistent with his view that "a commodity's price … is determined … before it goes to market", and so therefore is the profit (2007, p.142), but they are not the same. Capitalists cannot distribute profit until they realise it, but they know their commodity's price and calculate its costs in advance of production, as we will see in part 4.

production and distribution of surplus value as profit, his theory was that these laws are realised because individual capitalists keep their accounts as though socially necessary labour time is money.[63]

The cost of production

This key principle first appears in Volume 1 when Marx turns to "examine production as a creation of value", that is, the valorization process. His "first step is to calculate the quantity of labour realised" in production (Marx, 1996, pp.196-197). This, Marx says, is the significant common property of commodities that was "capable of expression in quantitative terms and w[as] 'contained in' and yet 'distinguishable from' the commodity", whereas "the utility of a commodity is not directly measurable" (Meek, 1973, p.161). To measure the labour contained in a commodity Marx reckons all the inputs to production in money valuations (costs) of socially necessary labour time, theorising the principle of capitalist accounting that 'costs attach'. This is the idea (also called 'full-absorption costing') that we should measure the cost of production by summing the costs of production workers, materials and production overheads. Wells noted that the 'costs attach' principle "bears a striking resemblance to that enunciated earlier by classical economists", particularly by Marx, in whose idea of socially necessary labour, he thought, we find its "ultimate expression" (1978, p.106). However, neither accountants nor accounting scholars have a theory that explains the "power of cohesion" (Paton and Littleton, 1940, p.13) of the costs of production. However, if we can operationalize it, Marx's 'money value of socially necessary labour time' does because it gives the capitalist something "cardinally measurable [that] can be added or subtracted to one another, not merely ranked" (Elson, 1979, p.137). Marx stressed this feature of his theory when he gave it its first public outing in *Value, Price and Profit* in 1865. To know whether such things as wages were 'high' or 'low', he said, we need a theory comparable to the theory of temperature that revealed their natural limits (Marx, 1985a, p.117).[64] In Marx's theory, costs 'attach' if we can reckon all the necessary costs of production – those that produce use-values for sale – as the money value of socially necessary labour time.

This is the lesson from the first example in Volume 1 in which the cost of materials and the wear and tear of a spindle used in yarn making "amounts to twelve shillings or the value of two day's work" (1996, p.199), assuming the cost of a day's labour power is 6s. Throughout his examples, Marx works from accounts to derive the equivalent socially

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[63] This tightening of the capitalist saying that 'time is money' – redefining 'time' to be 'socially necessary labour time' – follows from the NI's definition of the 'value of money' as the socially necessary time required to produce one monetary unit ($, £, etc) of value (Foley, 1986, p.15).

[64] The same applies to the question whether other costs and profits are 'high' or 'low', and when Marxist economists debate whether we can measure constant capital in labour time equivalents. Their worry is that "these measures will in general be equal neither to the historical labor embodied in the means of production, nor to the labor that would be required to reproduce them with contemporary technology" (Foley, 2000, p.24; Cohen, 1981, cf. Mohun, 2004). However, as we have seen, Marx agreed with capitalist accountants that when the input prices of constant capital change capitalists should use current cost accounting (Bryer, 1999b).

necessary labour time.[65] In his example, 10lbs of cotton cost 10s and the accountant calculates that the wear and tear of the spindle cost 2s which, given the money wage of 6s for a 12 hour day, "we have here … two day's labour already incorporated in yarn" (1996, p.197). These labour values together with the labour hours of spinning give the cost or money value of the labour time attaching to the yarn. Just like capitalist accountants, for Marx, "viewed as a *value-creating process*, the … labour process presents itself under its quantitative aspect alone", and the cost of labour, materials and wear and tear only count as "so many hours or days" useful labour, or so much money (1996, p.206). As he said, and we shall see below that capitalist accountants inchoately agree, it is only because all value-creating labour is equal that production costs attach, "that cotton planting, spindle making and spinning, are capable of forming the component parts, differing only quantitatively from each other, of one whole, namely, the value of the yarn" (Marx, 1996, p.199).

Foley is therefore right that "Marx's theory implies the existence of a quantitative equivalence in any particular period between the monetary unit and social labour time" (Foley, 2000, p.7), but he is wrong that "Marx constantly uses this conception to move back and forth between money and labour accounts" (Foley, 2000, p.7). In Volumes 1 and 2 Marx works *in* monetised labour time accounts, that is, with accounts based on the 'money value of socially necessary labour time'.[66] In Volume 3 he uses this approach to analyse 'cost price' and its relationship to 'value', to the money value of socially necessary labour time, and to analyse the effect of turnover on the rate of profit, which lead to his discovery of 'target cost', his and the accountant's solution to the transformation problem.

Marx's accounting solution

Marx said the big change in Volume 3 was that whereas "In Books I and II we dealt only with the *value* of commodities", "the *cost price* has now been singled out as a part of this value, and … the *price of production* of commodities has been developed as its converted form" (Marx, 1959, p.163). If cost price (cost of production) is 'part of value' and prices of production are 'converted' values, it follows that profit is a converted value, a share of total surplus value. In *Grundrisse* Marx defined profit as simply "the excess over the advances made by capital"; "the excess of the price of the product over the price of the production costs", without spelling out what 'production costs' are exactly (1987, p.144). In *Capital* by contrast, while Marx says that an individual capitalist's "cost prices are

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[65] As Marx assumes in Volume 1 that the money value of socially necessary labour time equals price, he could have accounted wholly in imaginary labour times. He chooses to work from given values (prices) in the capitalist's accounts and derive from these the equivalent socially necessary labour time given the price of labour power. Marx does the same in Volume 3 when arguing that cost price is an element of the money value of socially necessary labour time and profit is a form or fragment of surplus value, as will see.

[66] Elson (1979) is right that the conventional wisdom incorrectly supposes that Marx operated two accounting systems, one in labour time and the other in market prices (e.g. Desai, 2002, p.61). Naturally, it concludes that we cannot (and capitalists do not) keep labour time accounts as these are 'invisible' and, in any event, the two sets of accounts are incommensurable (Elson, 1979, p.120; Desai, 2000). However, Elson is not right that Marx's "specific examples are always couched in money terms, *never* in terms of hours of labour-time" (1979, p.139).

specific" (1959, p.159), may be more or less than those socially necessary, he says that how capitalists account for the 'cost of production' is not specific to any particular capitalist; that the capitalist accounts for 'socially necessary costs'.

> "The real value of a commodity is … not its individual value but its social value; that is to say, the real value is not measured by the labour time that the article in each individual case cost the producer, but by the labour time socially required for its production" (Marx, 1996, p.322).

Foley is right that Marx does not "propose any particular method for the measurement of labor time" (2000, p.17). Marx defines socially necessary labour time in Volumes 1 and 2 as the production time required under the normal technical and social conditions of production (e.g., 1971, p.31). However, in Volume 3 of *Capital* Marx develops the idea in the *Grundrisse* that under competition total social capital imposed an overriding, specifically capitalist definition of 'socially necessary' to mean what accountants today call 'standard cost' or 'target cost', the level of cost necessary to give the capitalist the required return (e.g., Drury, 2000, p.891).[67] Today, the cost of production to accountants are not specific costs, but 'standard' or 'target' costs, predetermined maximum costs of production (Drury, 2000, p.671). Typically, accountants build up a standard cost from detailed study of the necessary technical and labour inputs using cost prices, using design and 'value engineering' studies, observation based on trial runs, and work-study. Most firms set standards that are 'difficult' but 'achievable' or base them on an average of past performance (Drury, 2000, p.680). However, as the historical averages must be such that the firms earned the required return on their capital, these averages are likely to be 'difficult' as well. Target costing takes standard costing to its logical conclusion that the commodity and capital markets determine what 'socially necessary labour' is because its "cardinal rule", "do not launch products that cannot be manufactured at their target cost", applies equally to existing products, which, like a new product project, "is scrapped" if they violate it (Cooper and Slagmulder, 1999, p.180).[68]

Marx had realised in *Grundrisse* that under competition with total social capital demanding a general rate of profit, the law of value apparently worked in reverse: in competition, it seemed, value did not determine price; price determined value:

> "[T]he individual capital is in reality only placed within the conditions of capital as such, although it seems as if the original law were overturned. *Necessary* labour time as determined by the movement of capital itself; but only in this way is it posited … [;] the positing of a general rate of profit. As a consequence of the market price, capitals then redistribute themselves among different branches. Reduction of production costs etc. In short, here all determinants appear in a

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[67] Another example of this overriding definition is Marx's insistence that capitalists should account for constant capital using current costs not the specific historically socially necessary costs.

[68] Japan was the first to use the label of 'target costing' as a recognised technique, but the idea is implicit in capitalist accounting's focus on the rate of profit, which, if insufficient, tells capitalists that the actual costs exceed the target. There is evidence of the idea in the mid-eighteenth century in the Scottish Carron Company (Bryer, 2006) and today target costing "is widely used among different industries round the world" (Horngren, et al, 1999, p.386).

position, which is the *inverse* of their position in capital in general. There price determined by labour, here labour determined by prices etc. etc" (1973, p.657).

In Volume 3, Marx considerably expanded on the idea that under competition "labour [was] determined by prices etc. etc", where "*Necessary* labour time [w]as determined by the movement of capital itself". There he says that to secure the general rate of profit the capitalist must take control of the valorisation process and engineer the costs down to the socially necessary level to earn the general rate of profit, to target cost, or if not the capital must exit the field:

> "In capitalist production it is not simply a matter of extracting, in return for the mass of value thrown into circulation in the commodity form, an equal mass in a different form – whether money or another commodity – but rather of extracting for the capital advanced in production the same surplus-value or profit as any other capital of the same size, or a profit proportionate to its size, no matter in what branch of production it may be applied. The problem therefore is to sell commodities, and this is a minimum requirement, at prices which deliver the average rate of profit, i.e. at prices of production" (Marx, 1981, p.297).

In other words, the individual capitalist must produce at a cost and sell at a price to deliver at least the average rate of profit, that is, produce at the standard or target cost. Target cost underlies Marx's analysis of the rate of profit and turnover. Given the market price of the commodity (S (t)) and the required return on capital (r), the maximum cost of production is that which gives the required return. The appendix shows Marx's decomposition of the rate of profit into sales margin and turnover of capital:

$$r = \frac{\dfrac{qS(t)}{[1+q]}}{C(t)[Tf + Tp + Tr + FC(t)]}$$

If r, S(t) and Tf, Tp and Tr are given, C(t) becomes the target cost:

As

$$\frac{qS(t)}{[1+q]} = S(t) - C(t)$$

$$r = \frac{S(t) - C(t)}{C(t)[Tf + Tp + Tr + FC(t)]}$$

$$C(t) = \frac{S(t) - rFC(t)}{1 + r[Tf + Tp + Tr]}$$

For example, if r = 0.2, S(t) = £12, FC(t) = 0, and Tf + Tp + Tr = 1 year, the target cost is:

$$C(t) = \frac{£12 - 0.2x0}{1 + 0.2x1} = £10$$

In general, the higher the required annual return and the longer the turnover period, the lower the required target cost.[69] Target cost is the 'cost price' (c + v) in Marx's solution to the transformation problem where the capitalist sees only market prices and the general rate of profit:[70]

Capitals	Organic composition of capitals of 100	Rate of surplus value %	Surplus value (s = 100% x v)	Rate of profit %	Used up c (c)	Value of commodities (c+ v + s)	Cost price (c + v)	Price of commodities [1 + r](c + v)	Profit (price – cost)	Rate of profit (r)
I	80c + 20v				50		70	92	22	22
II	70c + 30v				51		81	103	22	22
III	60c + 40v				51		91	113	22	22
IV	85c + 15v				40		55	77	22	22
V	95c + 5v				10		15	37	22	22
Totals	390c + 110v						312	422	110	

For example, the target cost price for capital I:

$$(c + v) = \frac{92 - 0.22 x 30}{1.22} = 70$$

Under developed capitalism, dominated by total social capital and competition, neither individual capitalists nor anyone else can see or work out the original surplus value, the rate of surplus value, or the value rate of profit. Nobody can calculate these values because they are hypothetical, the values that would exist assuming the absence of total social capital, competition and the general rate of profit.[71] Kliman's refutation of Bortkiewicz's proof of internal inconsistency using a two period example with three departments (constant capital, means of subsistence and luxury) calculates surplus values and value rates of profit in periods 1 and 2 (2007, see Table 8, p.150). However, these values are redundant in the calculations of the 'equilibrium' general rate of profit, and the departmental values for c, v, and p (prices of production) in period 2. Capitalists in each department could derive these values from the accounts of period 1, from the totals for c, v, π (profit), the departmental prices of production, and from the fixed physical relationships between the three departments. From the starting values for c and v in each department and their totals, and the general rate of profit, Kliman's Table 8 (2007, p.150) calculates the prices of production for each department and the profits. From the differences between the totals of prices paid for c and v and the prices at which they sell at the end of period 1, capitalists in general could calculate the total c, v and π in year 2,

[69] For example, if the required annual rate of profit increased to a 30% return, the target cost must fall to $C(t) = \frac{£12}{1 + 0.3 x1} = £9.23$. For turnover periods greater than one year, the required rate of profit equals the turnover period multiplied by the required annual return, further reducing the target cost. For example, if the turnover period was three years and the required annual rate of profit was 20%, the total required rate of profit is 60% over the three years and the target cost falls to: $C(t) = \frac{£12}{1 + 0.6 x3} = £4.29$

[70] Marx gives the formula p = k + kp′, where p = the price of production, k = cost price and p′ = the required return (1981, p.265), i.e., k = p/[1 + p′].

[71] However, this does not mean, as Kliman puts it, "Of course, capitalist businesses do not know or care about value or surplus value as measured in labor time. They know about and care about money prices and money profits" (2011, p.15).

which gives the new general rate of profit. Using the known physical relations between departments, each department could then calculate the new values for c and v and use the new general rate of profit to calculate the new prices of production. However, without all this information only competition and a commitment to the evolving general rate of profit, prices of production, and targets costs, can produce a solution, but assuming it, while valid as a refutation of Bortkiewicz's charge of internal contradiction, strips the TSSI's refutation of empirical relevance. Like the accounting interpretation, according to the single system interpretation "values and prices are determined interdependently" because "prices of production and average profit depend on the general rate of profit, s/C", and "prices influence value magnitudes" (Kliman, 2007, p.33), but how, through social practice, Kliman leaves unclear.

Under total social capital, the "form in which capital becomes conscious of itself as a *social power*", "with the capitalist as its functionary", "which confronts society as a thing" (Marx, 1981, pp.297, 373), the individual capitalist neither cares for, nor needs to calculate, these hypothetical values. This is because, given the general rate of profit and market prices, "The cost price is a given precondition, independent of his, the capitalist's, production" (Marx, 1981, p.265). Capitalists see only the market prices of commodities (prices of production), costs (variable capital and used up c), profit, and the general rate of profit. In Marx's solution, therefore, total social capital and the commodity markets effectively hand down the maximum cost price to the individual capitalist through the required general rate of profit that implies the maximum standard or target cost given the market price of the commodities. Target cost is the maximum cost of production because capitalists seek an excess rate of profit by cost cutting (Marx, 1981, p.373). Thus, Marx argued, not simply competition enforced the cost price, but active management by the capitalist to hit or beat targets:

> "The rule, that the labour time expended on a commodity should not exceed that which is socially necessary for its production, appears, in the production of commodities generally, to be established by the mere effect of competition; since to express ourselves superficially each single producer is obliged to sell his commodity at its market price. In manufacture, on the contrary, the turning out of a given quantum of product in a given time is a technical law of the process of production itself" (Marx, 1996, p.350).

Accounting enforces this 'technical law' by controlling the production of value through a budgeted profit and loss account and balance sheet based on standard or target costs (Bryer, 2006a; 2013a). Consistent with this, Marx thought, "the cost price of the commodity is by no means simply a category that exists only in capitalist bookkeeping", even though the specific costs the capitalist incurs do not create value. "The category of cost price has nothing to do with the formation of a commodity value or the process of capital's valorization … [but,] cost price does none the less, in the economy of capital, present the false semblance of an actual category of value production" (Marx, 1981, pp.118-119). For Marx, cost is the 'false semblance' of value production because as a category it hides the origin of surplus value, disguising it as profit produced by the total capital advanced. However, he thought that cost is nonetheless an "actual category of

value production" because costs are outlays of *capital*, money advanced by total social capital to finance production and return with at least the average rate of profit. "The capitalist cost of the commodity is measured by the expenditure of *capital*, while the actual cost of the commodity is measured by the expenditure of *labour*" (Marx, 1998, p.28). Like accountants today, Marx thought the capitalist saw cost price as "part of the commodity value" (1998, p.32), because like them he measured capital at the 'money value of socially necessary labour time', at standard or target cost. As accounts holds the capitalist accountable for profit measured using rules consistent with this, under competition the capitalist not surprisingly sees

> "Profit … [as] the excess of the value of the product or rather the amount of money realised in circulation for the product … *above* the value of the capital that entered the formation of the product … [which] appears as *costs of production of the commodity*" (1991, p.81).

Like the accountant today, Marx thought the "capitalist is inclined to regard the cost price as the true *inner* value of the commodity, because it is the price required for bare conservation of his capital" (Marx, 1998, p.42, emphasis added), that is, the price required for what accountants call 'capital maintenance':

> "But there is also this, that the cost price of a commodity is the purchase price paid by the capitalist himself for its production, therefore the purchase price determined by the production process itself. For this reason, the excess value, or the surplus value, realised in the sale of a commodity *appears to the capitalist an excess of its selling price value over its value*, instead of an excess of its value over its cost price, so that accordingly the surplus incorporated in a commodity is not realised through its sale, but springs out of the sale itself" (1998, p.42, emphasis added).

Like the accountant, Marx's capitalist regards cost price as 'value' and "a certain value is capital when it is invested with a view to producing profit" (Marx, 1998, p.41), that is, in short, 'value' equals standard or target cost. This explains why Marx defines profit as "the excess of the money recovered at the end of the circulation of capital over and above the cost price that is 'presupposed' …" (Moseley, 2000a, p.298), and is why capitalists account for costs over standard cost as a loss, as a 'period cost' (Drury, 2000, p.680), not as a value-creating cost of production.

Understood as standard or target costs, Marx had no need to transform either variable or constant capital. Marx knew that when capitalists bought their inputs at prices of production, value and cost would diverge.[72] However, he argued that "the most

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[72] Moseley (2000) also argues that Marx takes constant and variable capital as givens from Volumes 1 and 2 to solve the transformation problem in Volume 3, but on the erroneous ground that Marx does this because for him 'capital' was only ever money capital that carried its nominal aggregate values into competition unchanged. Moseley argues that Marx takes the general rate of profit as given because total surplus value "is determined prior to its division into individual parts" (2000, p.287), but we have seen that Marx takes the notion of the general rate of profit and its impact on market prices as given products of history. Once these become established, capitalism functions by presupposing and changing them based on

important thing in determining surplus value is not whether these figures are expressions of actual values, but how they are related to one another, i.e., whether v = 1/5 of the total capital, and c = 4/5" (1998, p.205). In other words, as an accountant would argue today, what matters to the capitalist is not the 'value' of constant capital before its transformation into the price of production, or its components, but its cost that the capitalist treats as value; and, therefore, the profits that the capitalist treats as surplus value. If the capitalist treats profit as surplus value "the price of production = cost price + profit = k + p = k + s; i.e., in practice it is equal to the value of the commodity" (Marx, 1998, p.205). This is Marx's accounting solution to the transformation problem. With it, he did not need to perform a mathematical transformation to know that under total social capital and competition capitalists would value constant and variable capital at the cost price necessary to equalise the required return on capital. In short, by accounting for standard or target cost, Marx's theory was that capitalists would transform the general rate of profit and prices of production into the money value of socially necessary labour in production.

The 'law of one cost'

Standard and target costing is only one manifestation of what we could call Marx's 'law of one cost'. This is the accounting principle that, assuming constant prices, the costs of production of all identical commodities must be equal, both across and within firms. This follows from the conclusion that if "the magnitude of the value of a commodity represents only the quantity of labour embodied in it, it follows that all commodities, when taken in certain proportions, must be equal in value" (Marx, 1996, p.55). The same must therefore be true of their components, costs on one side, and profit on the other. On the cost side, the long-run average socially necessary cost of production of each identical commodity must therefore be equal. Accountants agree by valuing commodities at standard or target cost, which (assuming constant prices) requires that the cost of each identical commodity must be equal. This is clearly the case for the costs of productive labour and materials, but it also applies to accounting for production overheads, fixed capital and joint costs, all unnecessary sources of theoretical difficulty for Marxist economists.

In calculating the cost of production, accountants distinguish between 'production overheads' – expenditures that produce the use-values embodied in commodities or services – and 'non-production overheads', those necessary for capital to function, but which do not produce use-values for sale. Accountants call expenditures on factory buildings, machinery, rent, etc., 'production overheads' because they provide use-values for production. They add these costs to the cost of production, even though they do not necessarily create embodied use-values in the commodity or service. Factory buildings, for example, provide shelter and other use-values for production. Administering workers' pay is a cost of the use-value of productive labour. Clearly, as a classic accounting text puts it, "The making of goods would be impossible without the incurrence of such overhead costs as depreciation, material handling, janitorial services, repairs, property taxes, heat, light, and so on" (Horngren, 1977, p.87).

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experience.

Consistent with Marx's definition of the cost price as the socially necessary cost, accountants allocate production overheads to the cost of production using the principle that each use-value (commodity or service) produced has the same cost regardless of the actual pattern of expenditure. They study the consumption of production overheads (called 'activity-based-costing') and allocate expenditures evenly according to the use-values they provide (Drury, 2000, p.23).[73] This is why the full costs of production "are more properly called *normal* costs, rather than actual costs, because they include an average or normalized chunk of overhead" (Horngren, 1977, p.89). Accountants do not count as the cost of production the actual (Marx's 'specific') expenditures on productive use-values, but calculate the average cost of a planned mass of commodities. If, for example, "management has committed itself to a specific level of fixed costs in the light of foreseeable needs far beyond the next thirty days …[, f]ew people support the contention that an identical product should be inventoried … [with] different overhead rates … not representative of typical, normal production conditions" (Horngren, 1977, p.89). Similarly, "[i]t would be illogical to load any single month with costs that are caused by several months operations" (Horngren, 1977, p.90), for example, expenditures on repairs, just as it would be illogical to charge heating expenditures only to winter production. Instead, to calculate the full cost of productive labour, the accountant's allocations apply Marx's law of one cost.

Productive fixed assets are prominent production overheads. These are problematic for economists because they appear to involve 'joint costs' (or 'joint production'). In other words, because their use produces two or more use-values, the commodities it co-produces, and the now partly worn fixed asset. Simply because "inventories can be carried over from one production period to another has long been a source of great trouble for Marxist economists" (Duménil, 1983, p.442). This causes no trouble for capitalists who account for fixed assets according to Marx's law of one cost by allocating the total costs of acquiring and using it equally across all use-values (Bryer, 1991, 1994, 1999a). The total costs of providing the services of a fixed asset over its useful economic life are (a) the initial outlay (purchase price or production cost) less the residual value at the end of its useful life (at today's current prices). In addition, (b) the total operating expenditures for maintenance, repairs, fuel, etc., and any effects the age of the asset may have on deterioration in product or service quality (e.g., depress selling prices). The depreciation method must result in a constant total charge per unit of service over the asset's useful economic life (Baxter, 1971, p.26). For the straight-line method (i) operating costs for maintenance etc., per period must be constant, and (ii) the services provided by the asset must be equal each period (either because the units of output are equal, or because the asset's services available each period are equal). If, as its usual for machines, other costs increase over the asset's useful life, a declining balance method is

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[73] Despite the fact that, under the influence of economists, "For decades, textbooks used in cost and managerial accounting courses have pointed out the fallacies in relying on full cost numbers for any purpose" (Hemmer, 1996, p.419). Given these supposed 'fallacies' of traditional accounting, at least some in the accounting community have begun to wonder why, in the face of "such criticism, traditional practices of cost allocation appear to have remained in use" (Hemmer, 1996, p.419). Bryer (2006) argues they do because accountants continue unconsciously to base their accounting systems on the labour theory of value.

appropriate.

Marx understood depreciation accounting (Bryer, 1994), but Marxist economists do not. A common mistake is to say that Marx "assume[s] … that machines retain equal efficiency throughout their lives so that the same number of use-values is produced in each period of their operation" (Armstrong, et al, 1994, p.106). Marx often assumes equal efficiency meaning equal operating costs in each period, or producing the same number of use-values for the same cost in each period. The absurdity of neglecting operating costs becomes immediately apparent when we drop the assumption of equal efficiency because "the total value of each unit of the commodity produced on some machines would exceed that of each unit produced on others. This would be at odds with the fundamental idea that all units of a commodity have equal values" (Armstrong, et al, 1994, p.106). Capitalist accountants would not find it acceptable to treat "labour operating old machines … as creating less value than that operating new machines … [because] it permits a straightforward and intuitive treatment of fixed assets" (Armstrong, et al, 1994, p.108)! It is not intuitive to assume the worker transfers the use-value of the machine to the finished commodity, rather than its socially necessary value. However, this does not mean, as Perelman claims, that it is "impossib[le to] … correctly measur[e]…the transfer of value from constant capital to the final products" (1999, p.719). Like a neoclassical economist, he thinks we "require knowledge about future economic conditions before we could calculate the amount of abstract labour transferred from constant capital to the final commodity" (Perelman, 1999, p.721). It is true that "Reproduction costs shift in unpredictable patterns" (1999, p.723), but Perelman makes the elementary mistake of believing that capitalists hold management accountable according to their expectations of future prices, obsolescence, etc., rather than using current evidence and prices (Bryer, 1999b).

The 'joint cost' problem of allocating the cost of one production process to multiple outputs exists only in the minds of neoclassical economists for whom value means economic value (present value). For them, joint costs raise the incorrigible problem of allocating cash flows to use-values. This is also true for some Marxist economists (e.g., Itoh, 1981; Armstrong, et al, 1994, p.102; Foley, 2000, p.16). Although Marx was aware of 'joint costs' (1976, p.313; 1981, chapter 5), he did not explicitly deal with them (Armstrong, et at., 1994, p.126), perhaps because he knew that the solution comes straightforwardly from his theory once we understand that its aim is to explain how capitalists control the valorisation process.[74] If we think of costs in the way that Marx and accountants do, they are not 'joint' at all, but socially necessary costs of production, and this is how capitalists account for them. It is obvious to a capitalist that if a production process produces two or more use-values, the capital (variable and constant capital) embedded in each use-value is the target cost. With joint production, we cannot say that production consumes the use-values required equally, but, from the control viewpoint, we can say that each use-value produced consumes capital. Capitalists are indifferent to the technical processes underlying production (except when they reduce the cost of production). As Marx put it, "the use-value of labour-power to the capitalist as a

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[74] The New Interpretation has nothing to say about joint costs because it does not concern itself with the level of the firm (Mohun, 1994a, p.409).

capitalist does not consist of its *actual* use-value, in the usefulness of this particular concrete labour …. What interests him in the commodity is that it has more exchange-value than he paid for it; and therefore the use-value of the labour is, for him, that he gets back a greater quantity of labour-time than he has paid out in the form of wages" (Marx, 1963, p.156). In short, the value of any commodity to a capitalist is its value as capital, a sum of money to return with the average profit.

Take the classic example of sheep, from which the farmer gets both meat and wool. The cost of the meat and wool will be the socially necessary cost of their production in that combination that produces the maximum rate of return on capital. Suppose that the variable and constant capital required to produce one sheep ready for market in one year is £10, and the required return on capital is 20%. It costs the farmer £2 per sheep to process the wool for market (shearing, cleaning, etc) and £3 to send the sheep to market for meat. The capital of £15 produces two commodities. To earn the required return the selling prices of the meat and the wool together must be £18. Say the market price of wool is £3 and the market price of the meat is £15, and the farmer has the wool at the financial year-end. The accountant's 'net realisable method' allocates the joint cost of £10 using the actual or estimated net realisable values (or market prices) at the split off point and assigns the further costs to each product to calculate the profit from each:

Product	Sales value	Costs beyond split off point	Net realisable value at split-off point	Proportion to total	Joint costs allocated	Profit	Gross profit
	£	£	£	%	£	£	%
Meat	15	3	12	0.9230	9.23	2.77	18.40
Wool	3	2	1	0.0769	0.77	0.23	7.66
Totals	18	5	13	1.0000	10.00	3.00	16.66

The relevance of these calculations to controlling the valorization process is that they show, in these circumstances, that the farmer should not incur the extra costs, but should sell the sheep on his farm unshorn for £13 and earn a return of 30% on his capital of £10. If the required return from processing meat and wool is also 20%, assuming (for simplicity) it takes a year to complete the work and realise the processed meat and wool, the purchasers of the sheep would have to do the processing for £2 instead of the £5 it costs the farmer, inputting a capital of £15 and selling for £18.[75] If the farmer had no choice but to incur the extra costs (e.g., if no market existed for the commodities at the split-off point), then all costs would become joint costs and there would be no point in calculating a profit margin for each individual output. If so, accountants simplify the calculations by allocating the total costs such that each commodity earns the required return.

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[75] The rate of return on capital depends on the turnover time of capital (Marx, 1981, chapter 4). If the turnover time were, say, six months so the processors' capital turned over two times in a year, the processors would only need to reduce processing costs to £3.36, making two separate profits of £1.64 on a capital of £16.36 [£13 + £3.36]. In general, if the turnover rate (n) is given, the maximum cost of processing (£x) is given by $r = [£5 - £x]n/[£13 + £x] = 0.2$.

Using this 'constant gross profit percentage method' the farmer allocates £15/£18x£15 = £12.50 of the total cost to the meat and £3/£18x£15 = £2.5 to the wool so that when the farmer sells them he reports profits of 20% on the cost for each commodity. To limit the costs of accounting, accountants often allow the 'physical measures method'. In our example, the farmer could allocate the £10 cost of the sheep equally to wool and meat (£5 each), clearly wildly inaccurate here, although it may not be in practice, or according to the relative weight of the wool and the meat, which may not be far out in the circumstances. Theoretically, the best we can say of the physical measures method is that it is simple (Drury, 2000, p.177). Accountants agree that market based measures of joint costs are theoretically correct. Hemmer (1996), for example, concludes that "in settings where joint products result in fixed expected proportions from a common input, the optimal method of allocating joint costs is based on the net realizable values of the final products" (Hemmer, 1996, p.429).

Concluding comments

To rescue Marx's labour theory of value from Marxist economists we must not understand him as simply an economist, even a political economist, and not even as this plus a historian, philosopher and sociologist. He was all of these, but to understand the generality, rigour, and relevance of his theory, we must see Marx as a theoriser of the capitalist business reality he confronted, particularly its preoccupation with accounts, and understand that he theorised capitalism by first theorising capitalist accounting. Although the NI is an advance on the neo-Ricardian approach, it fails to deal consistently with constant capital, a limitation imposed by its commitment to modelling physical production systems (Moseley, 2000a; Kliman, 2007), rather than modelling social control systems. Marx's accounting theory supports the TSSI's rejection of the dual-system and simultaneous valuation interpretations of his value theory. However, to understand Marx's solution to the 'transformation problem', Marxists must understand history and his theory of accounting. Only then can they follow him into production, out to the market and to total social capital, and back, over the tough intellectual terrains that he takes us in *Capital*, and fully appreciate the views.

Marx's accounting solution to the 'transformation problem' is that because the market price of all identical commodities is equal, for the labour theory of value to work the same must be true of its components, socially demanded profit and socially necessary cost. Marx certainly 'asserted' that what was equal between commodities was the 'money value of the socially necessary labour time' they contained. However, as this principle underlies capitalist accounting practices, scholars need look no further for a rich source of evidence in support of his theory of value, and Marx had no need to provide any more. Understanding the importance of accounting in Marx's theory could help to resolve other apparent weaknesses in his theory, particularly the controversies surrounding the primacy of the material or social, the distinction between 'productive' and 'unproductive' labour, and its implications for the transition to socialism.[76] It could

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[76] Marx's accounting theory supports those reject the "hegemonic interpretation" of capitalism versus socialism as "private property and markets versus … socialized property and planning" who focus "instead on the production, appropriation and distribution of surpluses" (Wolff, 2009, p.421). See Bryer, 2014.

form the foundation of a critical social and economic research programme with radical intent that would demonstrate what Marxists often take as self-evident, that profit is evidence of exploitation. Accounting is conspicuous by its absence in the discussions and empirical research of Marxist scholars, yet it holds out the prospect of clarifying and articulating Marx's theory of capitalism in modern conditions, and the promise that this understanding will help to construct the radical critiques necessary to abolish it. It is time therefore that Marxists took accounting seriously, as Marx did.

Appendix

Accounting for the circuits of capital

Adapted from Foley (1986, pp.69-77).

Turnover and the rate of profit

Marx defines the rate of profit "as $\dfrac{s}{C} = \dfrac{s}{c+v}$, as distinct from the rate of surplus value $\dfrac{s}{v}$ " (1959, p.42),

where:

s	= surplus value;
C	= total capital;
c	= constant capital;
v	= variable capital.

For one turnover of circulating capital and no fixed capital, the amount of capital advanced as constant and variable capital equals the amount consumed: $C = c + v$. With fixed capital and/or more than one turnover of circulating capital, we must distinguish between the rate of profit on sales (sales margin), the mark-up on the cost of production (cost margin), and the rate of profit on total capital employed, including fixed capital. We first consider the effect of turnover on the rate of profit (i.e., no fixed capital), and then turn to fixed capital, dealing finally with the measurement of the capital in the denominator of s/C.

The circuit of capital starts with expenditures (F(t)) on constant and variable capital (C(t)) Tp periods before time t that reappear in the cost of the finished product (P(t)) at time t:

$$P(t) = C(t - Tp)$$

Sales of finished products in time t (S(t)) occur Tr periods after their production as finished stock. The capitalist gets a profit by marking up q% on cost:

$$S(t) = [1 + q]P(t - Tr)$$

The profit at time t (s(t)) is therefore:

$$s(t) = [1 + q]P(t - Tr) - P(t - Tr)$$
$$s(t) = qP(t - Tr)$$
$$s(t) = \frac{qS(t)}{1 + q}$$

The stock of productive capital at time t (N(t)), e.g., raw materials, work-in-progress) is the capital

advanced less the capital withdrawn from production as finished stocks at time t:

$$N(t) = C(t) - P(t)$$

The stock of finished goods at time t is the flow of capital arriving from production (P(t)), the finished stock, less cost of those sold:

$$X(t) = P(t) - \frac{S(t)}{[1+q]}$$

Assuming the circuit is in motion, and that sales are for cash, the stock of money at time t (F(t)) is the difference between the money recovered from sales less any the distributions to the capitalist (p is the proportion reinvested) and the money re-advanced to production (C(t)):

$$F(t) = S(t) - (1-p)s(t) - C(t)$$

Assuming no external finance, the capital returned from sales in t (P(t − Tf)) plus the proportion of any surplus (s(t)) the capitalist reinvests (p), after a lag of Tf periods, provides the capital advanced to production in time t, C(t):

$$C(t) = P(t - Tf) + ps(t)$$

In simple reproduction, p = 0, and C(t) = P(t) = X(t) = S(t) − s(t) = F(t). The total capital (TC(t)) reported in the balance sheet is therefore the sum of the capital in the means of production (N(t)), finished stocks (X(t)) and money (F(t)), each for their turnover time:

$$N(t) = C(t)Tp$$
$$X(t) = P(t)Tr = C(t)Tr$$
$$F(t) = S(t) - s(t) = C(t)Tf$$

Marx decomposed the rate of profit into the mark-up on cost (cost margin) and the turnovers of capital measured as cost of production in chapter 4 of Volume 3:

$$r = \frac{qC(t)}{C(t)[Tf + Tp + Tr]}$$

$$r = \frac{q}{Tf + Tp + Tr}$$

As $Tf = \dfrac{F(t)}{C(t)}$, $Tr = \dfrac{X(t)}{C(t)}$, $Tp = \dfrac{N(t)}{C(t)}$, and $q = \dfrac{s(t)}{C(t)}$

$$r = \frac{s(t)}{C(t)} \, x \, \frac{1}{\dfrac{F(t)}{C(t)} + \dfrac{X(t)}{C(t)} + \dfrac{N(t)}{C(t)}}$$

$$r = \frac{s(t)}{C(t)} \, x \, \frac{C(t)}{TC(t)}$$

Capitalists usually decompose the rate of profit into the sales margin and the turnover of capital measured as sales, the 'Du Pont' formula:

$$r = \dfrac{\dfrac{qS(t)}{[1+q]}}{C(t)[Tf + Tp + Tr]}$$

$$r = \dfrac{\dfrac{q}{[1+q]}}{\dfrac{C(t)Tf}{S(t)} + \dfrac{C(t)Tp}{S(t)} + \dfrac{C(t)Tr}{S(t)}}$$

As

$$\dfrac{q}{[1+q]} = \dfrac{s(t)}{S(t)}$$

$$r = \dfrac{s(t)}{S(t)} \, x \, \dfrac{S(t)}{TC(t)}$$

Fixed capital

To adjust the formulae for fixed capital (FC), Marx includes depreciation (an additional source of constant capital) in C(t) and in (P(t)) and deducts it from FC to give the net FC(t) in TC(t):

$$r = \dfrac{\dfrac{q}{[1+q]} \, xS(t)}{C(t)[Tf + Tp + Tr] + FC(t)}$$

$$r = \dfrac{\dfrac{q}{[1+q]}}{\dfrac{C(t)Tf}{S(t)} + \dfrac{C(t)Tp}{S(t)} + \dfrac{C(t)Tr}{S(t)} + \dfrac{FC(t)}{S(t)}}$$

$$r = \dfrac{s(t)}{S(t)} \, x \, \dfrac{S(t)}{TC(t)}$$

In simple reproduction, the balance stocks remain constant when the capitalist uses fixed capital because the capitalist must either withdraw the capital recovered from wear and tear and TC falls as FC falls, but the capitalist's TC is constant, or invest it and consume any returns and the TC of the enterprise remains constant. As Marx said in Volume 3,

> "The actual value of the product depends on how large the fixed part of constant capital is and on how much of it goes into the product as depreciation. But…this fact is completely immaterial so far as the rate of profit is concerned…" (1981, p.254).

Alternatively, if the capitalist reinvests the capital from recovered wear and tear and/or some of the surplus in the enterprise TC(t) and s(t) increase through time, but Foley shows that expanded reproduction leads to the same decomposition of the rate of profit (1986, p.pp.76-77).

Calculating turnover

Marx uses the cost of production rather than sales in calculating turnover, but if we are consistent in the definition of the margin (cost or sales) and the definition of the capital turnover (cost of production or sales), we arrive at the same return on capital and proportional margins and turnovers. This is textbook wisdom. For example,

> "Return on capital employed is frequently used as a measure of profitability …. Should we use opening balance sheet figures, closing balance sheet figures or some average for the year? Many combinations are possible … [but] [i]t is essential … that the numerator and denominator of each ratio are logically consistent" (Lewis and Pendrill, 1996, p.378).

Consider Marx's second example in chapter 4 of Volume 3 that includes fixed capital, where $FC(t) = £10,000$, $C(t) = £2,500$, $S(t) = £26,520$, $s(t) = £4,160$, $TC(t) = £12,500$. We can either calculate the cost margin and the turnover on cost of production (£26,520 - £4,160 = £22,360):

$$r = \frac{£4,160}{£22,360} x \frac{£22,360}{£12,500}$$

$$r = 0.186046511 x 1.7888$$

$$r = 33.28\%$$

Alternatively, using the sales margin and the turnover on sales:

$$r = \frac{£4,160}{£26,520} x \frac{£26,520}{£12,500}$$

$$r = 0.156862745 x 2.1216$$

$$r = 33.28\%$$

The difference is not relevant mathematically as the ratio of the margins (0.186046511/0.156862745) equals the inverse of the ratio of the turnovers (2.1216/1.7888) = 1.186046512.

Within Marx's theory of capitalist control, choosing between the different turnover figures could be rationalised as choosing different measures of accountability for capital. That is, holding management accountable for cost or for profit as well, even in production and the warehouse, presumably to generate 'profit consciousness' (like allocating non-production overheads to production to generate 'cost consciousness', see Bryer 2006), and even though managers and workers in production and the warehouse control costs only and therefore only one side of profit.

Calculating the denominator

As Marx assumes simple reproduction where the capitalist withdraws the surplus when it is realised, and realisation occurs at the end of the turnover period, it would be wrong for him to calculate the rate of profit including the profit in the capital. Marx's first example in chapter III of Volume 3 of *Capital* therefore excludes the profit from TC(t):

> "Now let us take a capital A composed of 80c+20v = 100C, which makes two turnovers yearly at a rate of surplus value of 100%. The annual product is then: 160c+40v+40s. However, to determine the rate of profit we do not calculate the 40s on the turned-over capital of 100, and obtain a capital value of 200, but on the capital advanced of 100, and obtain p' = 40%" (1959, pp71-72).

Marx assumes that the capitalist withdraws the surplus at the end of each turnover when realised.

If profit is realised evenly throughout the year and the capitalist does not distribute it as it is realised, we should calculate the denominator in the rate of profit as the average of the opening capital and the closing capital including the retained profit, a view apparently shared by at least some in conventional accounting (I suspect the majority). For example: Spiller says the "commonly used formulas … define … investment as average total assets" (1977, p.653) and Drury says the "accounting rate of return (also known as the return on investment and return on capital employed) is calculated by dividing the average annual profits from a project into the average investment cost" (2000, p.474).

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