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A Marxist Modeling of Capitalism, Suggesting  
Theoretical Over-emphasis on Accumulation of Capital

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**Abstract:** In Volume I of *Capital*, Marx offers actual data from a Manchester spinning factory describing that business. In Volume II, he offers schemes of reproduction to help understand accumulation of capital while mentioning numbers which actually suggest correlation to the spinning factory data. Nevertheless, Marx seems to slide over the costs of new machinery when analyzing accumulation, instead focusing on wear and tear (depreciation). In this paper, we offer a modeling of accumulation that takes account of modern estimates of the composition of capital, i.e., the relation of labor time invested in constant capital compared to the labor time employed with that constant capital, relying principally upon U.S. and Canadian estimates.

We find empirically that the composition of capital fluctuates but does not show much trend. We also consider levels of the rate of exploitation and of utilization of surplus value required for achieving actual historical levels of accumulation of capital, and include consideration of the turnover of capital. We find that only a small portion of surplus value, perhaps ten percent, is required for actually achieved accumulation. This suggests that a focus on the utilization of surplus value for the accumulation of capital misses vast other terrains for the utilization of surplus value.

Our result is suggestive of an over-emphasis within Marxist political economy on accumulation of capital.

## I. Marx Estimating the Composition of Capital in Cotton Spinning

In *Capital, Volume I*, Chapter 9, Marx offers actual data from a Manchester spinning factory in which consumption of constant capital is reported to be £378 weekly compared to variable capital of £52 weekly, implying a ratio of 7.3 (Marx, 1867, p. 211).<sup>1</sup> Most of the constant capital consumed is for the cotton, i.e., £342 out of £378. Marx lists an additional £20 for wear and tear (depreciation) of spindles, £6 for building rental, and £10 for auxiliary materials. Fixed capital cost is therefore not listed as a major item. Yet, Marx additionally suggests £10,000 as the outlay for the 10,000 spindle factory for which he is providing data.

In Chapter 24, as he begins his well-known discussion of converting surplus value into capital, Marx suggests for cotton spinning a money advance of constant capital equal to £8000 for "cotton, machinery, &c." and of variable capital equal to £2000 for wages paid (Marx, 1867, p. 543). The ratio of the consumption of constant capital to variable capital is 4, rather than the 7.3 in Chapter 9. (Did Marx believe his particular spinning manufacturer not representative?). Marx does not label the ratio of consumed constant capital to variable as a composition of capital, perhaps on the reasonable grounds that the constant capital here refers to its consumption, not its level, while a composition of capital should refer to the level, the stock, of constant capital being utilized by workers. As we shall see shortly, this distinction is born out by Engels. Nevertheless, if the capitalist is expanding the business by converting surplus value into capital – the focus of Chapter 24, there must be investment in new machinery and it would be costly.

In *Volume 2*, Marx suggests levels of 2, 4 or 5 for the composition of capital in his well-known schemes of reproduction. For spinning specifically, and much earlier in this volume, he notes a consumption of constant capital of £372 and a variable capital of £50 (Marx, 1885, pp. 27 and 38ff), very close to the *Volume 1* data in Chapter 9 mentioned above.

*Volume 3* refers to the same spinning manufacturer's data that is presented in *Volume 1*, but the text (Marx, 1894, pp. 75-76) is by Engels, drafted when editing Marx's manuscript in the context of discussing the turnover of capital. Engels repeats the data Marx reported in *Volume 1*, including the installation cost for machinery consisting of 10,000 spindles at an "assumed" £1 for each spindle, a total cost of £10,000. Wear and tear is at £20 weekly (implying £1040 yearly, or about 10%). Building rent is £6 weekly (£312 yearly), along with £10 auxiliary materials costs weekly (£520 yearly). Engels offers his

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<sup>1</sup>Wages for a spinner were less than £1 per week, according to Marx's 1865 lecture (Marx, 1865, p. 21), a spinner being a rather skilled occupation, although here it could be averaging the spinner with an assistant. A very comprehensive study of British wages indicates 160 (old) pence or only £2/3 weekly for cotton factory operatives in 1871 (Wood, 1910, p. 587), which would imply 78 operatives earning £52 total on the 10,000 spindles. Robson (1957, p. 342) suggests about 150 spindles per operative around 1871, implying 67 operatives on 10,000 spindles. Incidentally, Marx indicates in the footnote on the following page that he assumes prices=values for this calculation. He calculates the rate of surplus value as 1.54.

own assumption that the unreported yearly level of circulating capital (constant and variable) is one-quarter of the level of £10,000 for the spindle machinery, i.e., £2500. He calculates £12,182 in constant capital: £10,000 for the stock of fixed capital, as well as £2182 circulating, i.e., £2500 yearly total circulating capital, variable included, less £318 as the portion of the circulating which is for wages (£318 obtained by using the same proportion of circulating capital which variable capital represents in Marx's data, while applying it to Engels' own total circulating capital of £2500). Note that the £52 weekly wage cost Marx provided and the £318 annual outlay for wages implies a turnover -- a recirculation of wages costs -- of 8.5 times in the year ( $52 \times £52 / £318 = 8.5$ ). Referring explicitly to "composition of capital", Engels obtains a remarkably high level for the composition of  $£12,182/£318 = 38.3$  (Marx, 1894, p. 76). Of course, Marx's assumed installation cost of £10,000 for the 10,000 spindle factory, as well as Engels' assumed £2500 level for total circulating capital, would need confirmation for accuracy.

There is a significant puzzle surrounding that £10,000 cost of the spindle factory: Why does not Marx pay more attention to the cost of the machinery, the cost of fixed constant capital, the cost which he explicitly states as early as Chapter 9 of *Volume 1* in his empirical example of cotton spinning? When he discusses the conversion of surplus value into capital beginning on p. 543 of Chapter 24, Marx does include costs of wear and tear of the machinery as part of constant capital consumption, but he slides over the required investment in the machinery itself? How is it possible to convert, in this later chapter, a £2000 level of surplus value for the year into £1600 constant capital and £400 variable capital? That is, a £400 expenditure for new variable capital would seem to require the purchase of new machinery totalling £15,320 to be able to successfully employ those workers (following Engels' calculation for the composition of capital). Where are the resources when surplus value totals only £2000 for the year?<sup>2</sup> (If

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<sup>2</sup>We can ask, if the composition of capital is 38.3 as reported by Engels, why did not Marx begin his Chapter 24 something like the following:

[What Marx could have written in Chapter 24:]

Recalling our data for mule spinning of cotton presented in Chapter 9, our capitalist receives £80 of surplus value weekly, which amounts to £4160 for the year. If expanded production is desired, we need first to note the fixed capital cost of £10,000 for spindles, since our capitalist is going to need to buy more spindles. In addition, let us assume £2500 as the level of circulating capital costs for the year, divided up into the same proportion which we described in Chapter 9, i.e., 6.9 to 1 (being £358/£52, weekly, before expansion). Then, the £2500 circulating costs are £2182 for the cotton, auxiliary materials and building rent, and £318 for variable capital. The composition of capital is then  $(£10,000 + £2,182)/£318 = 38.3$ . Note that £318 of variable capital over the year actually commands £2704 wage payments -- there are £52 wages weekly for 52 weeks. Products are being sold after about six weeks in the production cycle, so that the "turnover" is 8.5 times per year (more on turnover in *Volumes 2* and *3*). Our composition of capital is thus calculated on a ratio of the fixed capital plus flow of circulating constant capital to outlay on variable capital.

Without any allocation for capitalist consumption and focusing only upon expanded reproduction, the sum of £4160 in surplus value can be utilized during the next year as follows: £3324 buys new spindles on January 1 for the year's expanded operations. This represents 33% more spindles. During the year £730 is invested for the additional circulating portion of constant capital consumption needed (wear and tear of fixed capital ignored for the initial year) and £106 is invested for additional variable capital needed. Note that the composition of capital for the expanded production remains at 38, i.e.,  $(£3324 + £730)/£106$ . The ratio of

one should slip into thinking of borrowing the money for this spinning factory, do not forget that this problem would renew on an increasing scale every year thereafter! Furthermore, truly, we are discussing the entire economy, not just the spinning example.)

Engels asserts (Marx, 1894, p. 76) that the data of April 1871 used by Marx were particularly favorable for capitalist profits as cotton prices were particularly low and yarn prices particularly high.<sup>3</sup> Should the market price of yarn drop to the level in which surplus value is just £52, instead of £80, surplus value would equal variable capital and the rate of surplus value becomes unity, as Marx assumes in Chapter 24. Since annual surplus value now equals £2704 instead of £4160, growth falls from 33% to 22%. Alternatively, if yarn prices had not dropped, but cotton prices had risen by enough to raise cotton costs from £342 weekly to £370, then surplus value would still drop to £52 weekly. Growth would be somewhat less than 22% as somewhat more costs are drawn toward cotton. These levels of accumulation do contrast favorably with Marx's illustration of 20% growth when converting surplus value into capital. Nevertheless, the key question to ask is what sense can we make of Marx's spinning illustration in Chapter 24 in which the substantial fixed capital costs for new spindles are not even identified, let alone numerically incorporated into his illustration? While constant capital consumption relative to variable capital is less in Chapter 24 than in Chapter 9 (four times greater, instead of seven times), still this is insufficient as an explanation for the similarity of the growth rates. The larger reason is that Chapter 24, by ignoring turnover of capital, leads the reader to understand a turnover of unity. The significantly higher, and presumably much more accurate, composition of capital in Chapter 9 is 'compensated' by the high annual turnover of 8.5 for the circulating capital as compared to the illustration in Chapter 24. At best, Chapter 24 makes a theoretical point on an inadequate empirical base. More reasonably, the illustration in Chapter 24 can be considered simply misleading. While the actual illustration by Marx in his Chapter 24 is intended for theoretical understanding and not intended to duplicate the actual data provided in the earlier chapter, still, it is too far off the marker of his empirical work.

## II. Modern Estimates of the Composition of Capital

Now that we have explored Marx's empirical representations, we can turn to modern estimates of the composition of capital. These are typically undertaken as part of a project to determine the behavior of the rate of profit, rather than for a purpose such as ours of comprehending the level of accumulation of

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circulating portion of constant capital consumption to variable capital remains at 6.9, i.e., £730/£106. In our calculation, the rate of surplus value remains at 1.54.

Since the turnover of wages, as describe above, is 8.5 annually, the £109 yearly committed to variable capital actually represents an additional command over labor power of £901 compared to the £2704 before expansion which we have mentioned. We now have £3605 in wages paid annually. In other words, our capitalist friend has expanded the labor force also by 33%, even with the high relative cost of spindles.

<sup>3</sup>This would call into question whether prices=values but we leave this point aside.

capital. The level of the composition of capital is necessary in order to ascertain how much of the surplus value used for accumulation must go into constant capital as compared to variable capital. Major lines of demarcation for such empirical work include the conceptualization of constant capital in its fixed as well as its circulating component, turnover, the relation of values to prices, and whether unproductive labor needs to be distinguished from productive labor in the overall calculations leading up to the organic composition. Although turnover of capital is important for accurate discussion of the accumulation of capital, some modern authors ignore turnover altogether. Webber and Rigby (1986, pp. 37-38) offer the clearest exposition of turnover we have seen and include calculations of the level involved. In any event, we do know that the relevant calculation must be for the cost of newly produced constant capital, rather than what the elements of constant capital cost for previously purchased means of production.

As a first step recall that the organic composition confounds two factors -- technological requirements and the portion of the working day returned to workers captured in the rate of surplus value. That is, technology could remain unchanged, but the organic composition  $c/v$  rises as  $v$  falls when capital achieves a higher  $s/v$ . Clarity is therefore aided if we reformulate our empirical question in terms of the ratio of labor time invested in constant capital to the total labor time of workers working that constant capital (not simply the paid portion of the working day), i.e.,  $c/(v+s)$ . Shaikh (1987, p. 304) labels this ratio the **materialized composition of capital** and we will follow that language below. As such, the organic composition  $c/v = (1+s/v) c/(v+s)$ , and is of course greater in magnitude than the materialized composition.

Alberro-Semerena and Nieto-Ituarte's (1986) work on Mexico illustrates the importance of the distinction between the organic composition and the materialized composition of capital. They calculate an organic composition  $c/v$  of 5.40 in 1970, rising to 7.02 in 1976 (p. 37). However, with their calculated rate of surplus value rising from 2.17 to 2.92 in the same period, the materialized composition  $c/(v+s)$  is almost unchanged, moving only from 1.70 to 1.79. A focus on the organic composition would lead to discussion of the rise, while a focus on the materialized composition would not! We will focus on the materialized composition since it abstracts from the rate of surplus value.

Secondly, it is rather easy to confuse the consumption of constant capital, which is a **flow** of used up constant capital, with its level, which is a stock and reflective of the labor time required for producing means of production. Only if the stock is turned over once a year would the two magnitudes be the same. In order to keep the distinction clear, we distinguish the flow from the level by referring to the level as the **outlay**. For example, an annual flow of circulating constant capital totaling four million dollars, with a turnover of circulating constant capital equal to four, would require an outlay of one million dollars -- once each quarter the products are sold and receipts used to renew that capital. In order to avoid confusion, from here on we will denote the stock of constant capital as  $C$ . Retaining  $c$  for the annual flow of

constant capital consumed, the organic composition is represented by  $C/v$  and the materialized composition, by  $C/(v+s)$ .

Thirdly, constant capital includes two basic components, fixed capital, lasting more than one year and representing the stock of equipment and buildings required for the production process, and circulating capital, representing the needs for raw materials, energy requirements and maintenance/depreciation requirements of fixed capital. Fixed capital can last for decades, maintenance being undertaken and included in the consumption of constant capital [???]. Circulating constant capital, however, can turn over much more quickly than one year, meaning that the outlay on it would be much less than the annual needed flow of circulating constant capital.<sup>4</sup>

There is quite a number of estimates of the composition of capital, often for the United States, but also for other countries. To help investigate the differing estimates, in Table X we report the manner by which these authors we cite differ in incorporating fixed and circulating capital in the calculation of constant capital. In Table Y, we then report three U.S. estimates and one Canadian. Since inclusion or exclusion of the level of unproductive labor is a basic distinction in these estimates, it is so indicated.

**Table X: Methodologies used for Estimates of Constant Capital**

	<i>Constant Capital</i>	<i>Fixed Capital</i>	<i>Circulating Capital</i>
Wolff	= fixed + circulating	"total capital stock owned by each input-output sector"	"intermediate inputs in the input-output tables"
Moseley	= fixed + circulating	"net stock of fixed non-residential private capital" - "net stock of unproductive fixed capital" + "net stock of fixed capital of government enterprises"	"value of total business inventories (current cost)"
Shaikh and Tonak	= fixed (adjusted for utilization)	"fixed nonresidential gross private capital"	(none)
Webber and Rigby	= fixed + circulating	"midyear net capital stock"	"constant capital share of the owned inventory"

Sources: Wolff (1986, p. 105, fn. 6, and 1987, pp. 186-188, utilizing Bureau of Labor Statistics, Bulletin 2034, *Capital Stock Estimates for Input-Output Industries: Methods and Data*, 1979), Moseley (1991, pp. 175-176, utilizing U.S. Department of Commerce, *Fixed Reproducible Tangible Wealth in the United States, 1929-85*, 1987), and Shaikh and Tonak (1994, p. 125, same data source as Moseley) and Webber and Rigby (1986, pp. 43 and 54, noting that "the measure of owned inventory includes both variable capital and circulating portion of constant capital").

<sup>4</sup>When calculating a composition of capital, an issue could arise as to whether the flow of circulating capital over the year or the outlay (a stock variable) should be considered.

**Table Y: Estimates of Organic and Materialized Compositions of Capital,  $C/v$  and  $C/(v+s)$**

Note: As indicated, circulating constant capital is either the annual flow or the outlay; except  $C/v$  for Canada, variable capital is always the annual flow. Depreciation costs are not included.

	<i>Unproductive labor not considered</i>				<i>Unproductive labor incorporated</i>			
	$C/v$	Turn-over	$s/v$	$C/(v+s)$	$C/v$	Turn-over	$s/v$	$C/(v+s)$
U.S. (Wolff)	circ. as flow			circ. as flow	circ. as flow (as outlay <sup>a</sup> )			circ. as flow (as outlay <sup>a</sup> )
1947	5.61		0.96	2.86	8.30 (5.88)		2.11	2.67 (1.89)
1958	5.98		1.01	2.98			2.60	
1967	5.38		1.08	2.58			2.72	
1976	5.16		0.75	2.95	9.22 (6.94)		2.27	2.82 (2.06)
U.S. (Moseley)					circ. as outlay			circ. as outlay
1947					3.58	3.27	1.40	1.49
1958					4.33	4.14	1.59	1.67
1967					4.03	4.29	1.72	1.48
1976					5.15	4.32	1.66	1.94
1981					5.76		1.81	2.05
1985					5.47		2.15	1.74
1989					5.03		2.28	1.53
1994					4.61		2.33	1.38
U.S. (S&T)					no circ.; adj. (no adj. <sup>b</sup> )			no circ.; adj. (no adj. <sup>b</sup> )
1948					3.27 (4.36)		1.70	1.21 (1.61)
1958					4.27 (5.55)		2.01	1.42 (1.84)
1967					5.00 (5.05)		2.10	1.61 (1.62)
1976					5.27 (6.35)		2.11	1.70 (2.05)
1981					5.95 (7.08)		2.16	1.88 (2.24)
1985					6.19 (6.96)		2.33	1.86 (2.09)
1989					6.20 (6.97)		2.44	1.80 (2.02)
Canada -- mfg. only (W&R)	circ. as outlay; v as outlay		v as flow	circ. as outlay; v as flow				
1950	14	3.9	1.7	1.3				
1958	18	4.1	1.8	1.6				
1967	20	4.4	1.6	1.7				
1976	22	4.7	1.4	1.9				
1981	26	4.8	1.6	2.1				

Sources: Wolff (1986, p. 95; 1987, p.133, Table 6.6, line 4--to calculate  $s/v$  required for  $C/v = (I+s/v) C/(v+s)$ ; and 1988, p. 306), Moseley (1991, p. 74 for turnover and 1997, pp. 25 and 33, for other data), Shaikh and Tonak (1994, pp. 125-127 and commentary on 200-202), and Webber and Rigby (1986, pp. 45--in which  $s/v = (1-\text{value of labor power}) \div (\text{value of labor power})$ , 47, 50; in which  $C/(v+s) = C/v \div \text{turnover} \div (1+s/v)$ ). Conceptually, Moseley's  $C/v$ ,

the traditional concept utilized also by Wolff and Shaikh and Tonak, is Webber and Rigby's  $C/v$  turnover, itself a measure of the ratio of constant capital to variable capital advanced (turned over enough times to imply a substantially lower measure than for variable capital costs). Shaikh and Tonak's adjustment for utilization to obtain operating fixed constant capital is to multiply capital stock figures as follows: 1948--0.75, 1958--0.77, 1967--0.99, 1976--0.83, 1981--0.84, 1985--0.89, and 1989--0.89.

<sup>a</sup>These numbers are obtained from Wolff's report (1988, p. 306) that the materialized compositions  $C/(v+s)$  are 1.54 for 1947 and 1.83 for 1976 when only fixed capital is included, then attributing his own circulating constant capital as the balance, i.e., 1.13 and 0.99, respectively, and dividing the resulting numbers by Moseley's calculated turnovers for those years of 3.27 and 4.32, and so obtaining 0.35 for 1947 and 0.23 for 1976 as the corrected circulating constant capital; these are added to the fixed capital figures and provide the figures in the table. Similarly, the numbers for the organic composition  $C/v$  were obtained in the manner described.

<sup>b</sup>Shaikh and Tonak adjust for the utilization levels of equipment, as we have noted. For comparability to the other estimates, the parenthetical figures are unadjusted for utilization.

First, it is important to acknowledge turnover of circulating constant capital because, as we have indicated, the invested outlay is distinct from the total annual costs; the outlay is much less. As displayed in Table Y, Webber and Rigby (1986, p. 50) calculate turnover for Canadian manufacturing at approximately four times annually between 1950 and 1981, trending upward, calculated as the ratio of annual costs of circulating constant capital to inventories of such capital.<sup>5</sup> Similarly, Moseley used some own data and some from Wolff and calculated turnover rising from 3.27 in 1947 to 4.32 in 1976 for the U.S. economy as a whole. In his work with such data, Wolff (1988, p. 305) defers to Moseley's calculations as "preferable" to his own, noting that, compared to his use of inter-industry flows for estimating such flow costs, only if turnover were one year would his estimates for circulating constant capital be "identical" with Moseley's; otherwise, he defers to Moseley's.<sup>6</sup> As described methodologically in Table Y's footnote a, we adjusted Wolff's figures on materialized composition reported in the table with calculations by Moseley regarding turnover. This correction suggests 1.89 as the composition for 1947 and 2.06 for 1976, with unproductive labor included.

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<sup>5</sup>Webber and Rigby are studying Canadian manufacturing only, not the entire economy, and calculate turnover of circulating capital -- both its variable and constant components. In the process, they explain turnover quite well, including how wage payments and circulating constant capital payments stretched out over time implies higher turnover.

<sup>6</sup>A year earlier, Wolff (1987, p. 82-83, fn. 21) had focused on the issue, and had estimated turnover to average just about one year from 1947 to 1976, i.e., 1.08, based the economywide estimate of the sales-to-inventory ratio. However, rather than annual costs of only circulating capital, Wolff's attempted use of sales in the numeraire included also fixed capital costs, wage costs, and profits, implying considerable overestimation [???]. He reports a ratio moving from 0.89 in 1947 to 1.19 in 1972, back to 1.04 in 1976, basing his numbers upon the inverse of the average yearly level of inventories (averaged from end of quarter data) to what he thought was annual sales. However, when he added the four quarterly numbers to obtain sales, he thought these were quarterly sales when in fact they were at "monthly rate" (same citation as his, p. 226, fn. 3). Thus, Wolff's calculated figures must be multiplied by a factor of three and become thereby not dissimilar to Moseley's or Webber and Rigby's.

We might add that the inverse of the "nonfarm inventories to final sales of goods and structures" data provided may be a better representation of turnover, of course corrected from the monthly rate to the annual. This inverse ratio is fairly stable from 1947 to 1997 as can be determined from *National Income and Product Accounts of the United States, 1929-97*, Volume 1, U.S. Department of Commerce, 2001, Tables 5.12 and 5.13, pp. 309-320. That inverse ratio, using current dollar data, trends only somewhat downward from 3.52 for the first quarter of 1947 to 3.26 for the last quarter of 1997 (jumping down as far as 2.59 in the second quarter of 1980).

Webber and Rigby (p. 42) state that the fixed capital costs are about three times greater than outlay on circulating constant capital costs, but they do not display the behavior over time. Moseley does and Table Z displays two calculations based upon estimates he has made, one based upon current dollars and the other adjusted for price changes (price changes for fixed capital are growing more rapidly than for circulating constant capital). Note the increasing relative importance of fixed capital for this period in the United States. But also note that if we multiply the outlay on circulating constant capital costs by the turnover to obtain the flow, fixed capital costs are, in fact, similar to annual circulating constant capital costs, i.e.,  $C \sim c$ .

Table Z also indicates the relation of the outlay on circulating constant capital costs to the flow of  $v+s$ , citing data from Moseley. However, none of our cited authors include depreciation within their calculations of circulating constant capital costs. If depreciation were roughly 10%, as in Marx's own example, its annual flow would be  $0.1C$ , so that for a  $C/(v+s) = 2$ , the required flow for depreciation would be  $0.2(v+s)$ . A turnover of four would thus imply an outlay of  $0.05(v+s)$  for depreciation. In other words, the last column ratio in Table Z would be increased somewhat to account for depreciation.

**Table Z: Cost Ratios**

	Fixed capital relative to outlay on circulating constant capital		Outlay on circulating constant capital relative to the flow of $v+s$
	Current dollars	1972 dollars	Current dollars
1947	2.07	3.14	0.49
1958	3.06	3.47	0.41
1967	3.08	3.28	0.36
1976	3.51	3.91	0.43
1981	3.72	4.37	
1985	4.15	4.89	
1987	4.18	4.88	

Source: Derived from Moseley (1991, pp. 51 and 163-164, noting that his FC for 1976 in Table A.3 should be 1662, not 662).

Wolff's work for the United States, based upon input-output techniques, show only a small increase over time in the materialized composition, but does report higher estimates for the materialized compositions than do Moseley or Shaikh and Tonak. Moseley's work, based upon national accounts, does not exhibit a trend. Shaikh and Tonak's work, based also upon national accounts, does show a trend

upward.<sup>7</sup> Shaikh and Tonak adjust for utilization levels which lowers the calculation of  $C$  for all the years listed except 1967; without that adjustment Shaikh and Tonak's estimates of the materialized composition of capital would be 1.61 in 1948 and rising to 2.02 in 1989, thus, uniformly exceeding Moseley's. This is all the more surprising in that Shaikh and Tonak exclude circulating constant capital altogether, while Moseley includes circulating constant capital, representing as much as 33% of his measure of constant capital in 1947, albeit down to 19% in 1985 (1991, p. 163). The origin of the significantly higher estimates by Shaikh and Tonak must be that Moseley utilizes net stock data while Shaikh and Tonak utilize gross stock.<sup>8</sup> If Moseley is correct that circulating capital becomes less important over time as a proportion, its inclusion in calculations similar to Shaikh and Tonak would imply that the reported rise of the materialized composition of capital in Shaikh and Tonak would be less than above and would likely disappear altogether by the end of Moseley's data in 1994.

**Our empirical conclusion from analyzing Wolff's, Moseley's, and Shaikh and Tonak's work for the U.S. economy is the absence of much support for a rising materialized composition of capital. A rising rate of surplus value, on the other hand, does seem supportable and would suggest some rise in the organic composition of capital.**

Webber and Rigby use net stock and do report a rising materialized composition of capital for Canadian manufacturing in the post-war period, at least up to 1981. If the U.S. economy is indicative and represented well enough by Moseley's work for which the composition peaked around that year, we would expect a falling off after 1981. In any case, we note that Webber and Rigby's calculation of constant capital relative to the outlay on variable capital represents a similar form of calculation to Engels' calculation of 38 for the composition of capital in cotton spinning, examined in Section I above.

### **III. An Improved Model of Capital Accumulation, correcting Marx's**

We have seen how the **stock** of fixed constant capital is quite distinct from the **consumption** of constant capital used in Marx's schemes of reproduction. Marx himself had been quite explicit at the beginning of his discussion of schemes of reproduction regarding how he delimits his study:

*Constant Capital.* This is the value of all the means of production employed for productive purposes in this branch. These, again, are divided into *fixed* capital, such as machines, instruments of labour,

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<sup>7</sup>Curiously, Shaikh and Tonak (1994) discuss the book by Wolff (1987), but not the follow-up article by Wolff (1988). Discussion of the latter would have given them an opportunity to explain the differing estimates for the materialized compositions of capital provided by Wolff in his 1988 article. Shaikh and Tonak do cite earlier work of Moseley (1986) in which Moseley had used the same methodology as for his estimates reported in the table. However, the lack of a trend was not yet apparent in those estimates by Moseley, in that article going only to 1977.

<sup>8</sup>Wolff refers to "capital coefficient matrix", yet, unclear as to meaning.

buildings, labouring animals, etc., and *circulating* constant capital, such as materials of production: raw and auxiliary materials, semi-finished products, etc....

Portion *c* of the value, representing the constant capital *consumed* in production, does not coincide with the value of the constant capital *employed* in production. True, the materials of production are entirely consumed and their values completely transferred to the product. But only a portion of the employed *fixed* capital is wholly consumed and its value thus transferred to the product. Another part of the fixed capital, such as machines, buildings, etc., continues to exist and function the same as before, though depreciated to the extent of the annual wear and tear.... At this point in the study of the total social product and of its value, however, we are compelled, at least for the present, to leave out of account that portion of value which is transferred from the fixed capital to the annual product by wear and tear, unless fixed capital is replaced in kind during the year. (Marx, 1885, p. 400)

In other words, he side-stepped depreciation. Yet he also simply ignored the outlay for fixed capital needed for accumulation. Therefore, we now develop a model which does incorporate the need for the production of new fixed constant capital in order to implement an accumulation of capital. This model will follow the long-run nature of Marx's exposition and will follow Marx's schemes of reproduction insofar as they exhibit a stable composition of capital that our empirical survey suggests is approximately the case. We depart, however, from Marx's modeling by taking the **materialized** composition as stable, rather than the **organic** composition; the later would be influenced by the behavior of the rate of surplus value.<sup>9</sup>

After an introductory discussion, Marx (1885) had developed two arithmetical "illustrations" for schemes of extended reproduction. Both have the rate of surplus value as having a unit value. Both have one-half of surplus value in Department I used for accumulation of capital (additional labor power as well as additional constant capital), with the other half used for luxury consumption of capitalists. Both keep the organic composition of capital  $c/v$  in each department as fixed as extended reproduction takes place. The First Illustration (pp. 514-517) takes the organic composition in means-of-production Department I to be 4:1, while the organic composition in consumption-goods Department II is taken to be 2:1. In the Second Illustration (pp. 518-523) both departments have the same organic composition of 5:1. Marx's two illustrations begin from the following numerical examples:

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<sup>9</sup>Although fixed capital has been included in the calculations of constant capital, the problems of identifying it are rarely described in the conceptual detail that is in the work of Swanson (1986). Shaikh and Tonak, for example, devote little attention to the problem. In any case, we will overlook Swanson in this discussion.

### **Marx's First Illustration**

Department I:  $4000 c + 1000 v + 1000 s = 6000$

Department II:  $1500 c + 750 v + 750 s = 3000$

### **Marx's Second Illustration**

Department I:  $5000 c + 1000 v + 1000 s = 7000$

Department II:  $1430 c + 285 v + 285 s = 2000$

Pannekoek's (1934, pp. 63-64) work is useful in this regard. He was interested in Marx's second illustration, the one with the same organic compositions in both departments, but used different numerical values which are easier to deal with. Taking the organic composition as 4:1 in both departments, with  $k$  indicating luxury consumption by capitalists at one half of surplus value in each department -- the other half being used for accumulation, Pannekoek's illustration for the first period is

### **Pannekoek's Illustration for Marx's Second Illustration**

Department I:  $4400 c + 1100 v + 1100 s = 6600$ ,

with  $1100 s = 550 k + (440 c + 110 v)$

Department II:  $1600 c + 400 v + 400 s = 2400$ ,

with  $400 s = 200 k + (160 c + 40 v)$

Given one half of surplus value being used for accumulation --  $550 + 200$  for the two departments and so totalling 750, after one period the accumulation of 750 is divided between 600 additional means of production ( $440+160$  for the two departments) and 150 additional means of subsistence for newly hired workers ( $110 + 40$  for the two departments). The other half of surplus value is used for capitalist consumption  $k$  ( $550 + 200 = 750$ ). Note that Department I needs  $4400 + 440$  means of production to begin the next period and thus has 1760 to sell from its 6600 total production. Department II needs  $400 + 200 + 40$  for its own consumption needs to begin the next period and thus has 1760 to sell from its total production.<sup>10</sup> The relevant numbers for Pannekoek's second period now become:

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<sup>10</sup>Bukharin (1924, pp. 154-159) formulated the schemes algebraically, and concluded with the same conditions for extended reproduction as had Luxemburg (1913, p. 127), albeit Luxemburg's condition refers to **increases** in constant capital in Department II equaling increases for variable capital plus increases for capitalist consumption in Department I, while Bukharin's condition refers to the **level** of the new constant capital in Department II equaling the level of the new variable capital and the capitalist consumption in Department I (p. 159).

For Pannekoek's example above, Bukharin's condition (at the end of the first period ready for use at the beginning of the second period) is that constant capital for Department II, i.e. 1760 (=  $1600 + 160$ ), must equal variable capital for Department I, i.e. 1210 (=  $1100 + 110$ ), plus the capitalist consumption during the first period,

### **Pannekoek: Second Period**

Department I:  $4840 c + 1210 v + 1210 s = 7260$ ,

with  $1210 s = 605 k + (484 c + 121 v)$

Department II:  $1760 c + 440 v + 440 s = 2640$ ,

with  $440 s = 220 k + (176 c + 44 v)$

In other words, the total value of production has grown 10% from 9000 to 9900, with 10% more workers hired and 10% more means of production being used in addition to the 6000 which were originally required. Pannekoek goes on to comment that either allowing for differing organic compositions or rates of accumulation in the two departments, or allowing for organic compositions to grow, would bring the schemes closer to reality, but would not change basic results since the proportion of Department I to II could always be adjusted as needed to establish equilibrium (at least in theory, if not always in reality). Although Pannekoek doesn't write it down, the next period would be

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i.e. 550. In fact, this obtains,  $1760 = 1210 + 550$ . For the following period, Bukharin's figures are  $1936 = 1331 + 605$ . Luxemburg's condition, on the other hand, refers to the corresponding **changes** in each of the magnitudes. In other words,  $176 (= 1936 - 1760)$  must equal the sum of  $121 (= 1331 - 1100) + 55 (= 605 - 550)$ . In the example, it does.

Although he does not mention conditions for extended reproduction, Tarbuck (1972, Appendix I, pp. 271-274) lays out Marx's second scheme showing the process step-by-step and may aid in understanding. Kuehne (1972, pp. 107-108) does lay out both Bukharin's and Luxemburg's conditions for extended reproduction and seems to prefer the greater simplicity of Luxemburg's.

Bukharin's algebraic formulation was criticized by Sweezy (1942, pp. 162-168) who thought that Bukharin had not included increasing capitalist consumption during accumulation. Sweezy added a term for that increase. Sweezy's point is difficult to understand, however, since Bukharin's condition refers to levels, not changes in levels. Furthermore, Marx had assumed that the rate of surplus value as well as the proportion of surplus value used for capitalist consumption remain fixed so that capitalist consumption does necessarily increase over time. Kuehne ignores Sweezy's criticism of Bukharin, while Tarbuck (1972, Appendix II) defends Bukharin, saying that the latter had only excluded increasing capitalist consumption in the first period, not for later periods. Tarbuck goes on to say that if changes in levels of capitalist consumption are to be included, other changes in levels should also be included and he modifies Sweezy accordingly. Such a defense of Bukharin seems unnecessary as Bukharin was discussing levels, and levels can increase over time.

With the help of a statistician H. Chester, Rosdolsky (1968, pp. 448-449) elaborates on the equilibrium condition offered by Bukharin to include the case in which the organic compositions in the two departments are distinct (although remaining unchanged). Tarbuck does not indicate that he had seen Rosdolsky's work (perhaps because the English translation was not to appear until 1977). Kuehne (1972, pp. 105-107) seems unimpressed by Rosdolsky's equilibrium condition and provides an alternative interpretation. In any case, on his following page Rosdolsky indicates that he accepts Sweezy's criticism of Bukharin even if, for Rosdolsky, the problem does not seem to involve Bukharin's basic condition for equilibrium under extended reproduction, but rather two derived conditions. To this reader the relevant passage in Bukharin (p. 158) does not in fact pose such supposedly derived conditions that Rosdolsky lists. This controversy does not seem worth further discussion.

We should note that in Appendix I to Sweezy's work, pp. 365-374, Shigeto Tsuru offers his own explanation of Marx's reproduction schemes and indicates their relationship to Keynesian categories.

### **Pannekoek: Third Period**

Department I:  $5324 c + 1331 v + 1331 s = 7986$ ,  
with  $1331 s = 665.5 k + (532.4 c + 133.1 v)$

Department II:  $1936 c + 484 v + 484 s = 2904$ ,  
with  $484 s = 242 k + (193.6 c + 48.4 v)$

Let us return to the Pannekoek's first period, i.e.,

Department I:  $4400 c + 1100 v + 1100 s = 6600$ ,  
with  $1100 s = 550 k + (440 c + 110 v)$

Department II:  $1600 c + 400 v + 400 s = 2400$ ,  
with  $400 s = 200 k + (160 c + 40 v)$

Were the  $c$  above to refer to the stock of fixed constant and the outlay on circulating constant capital, the materialized composition of capital would be two --  $4400/(1100+1100)$  or  $1600/(400+400)$  -- quite in line with the empirical work we have summarized. In fact, however, in Pannekoek, as in Marx,  $c$  seems to refer only to the outlay on circulating constant capital with its turnover not indicated to be anything other than unity so that its flow has the same magnitude.

Removing Marx's delimitation regarding fixed capital, we must reformulate the equations to include the need for additional fixed capital with which the laborers will work under extended reproduction (capital accumulation), along with the circulating capital to be needed. If we follow the suggestion of Shaikh and Tonak's empirical work utilizing gross, rather than net, estimates of fixed stock (see Table X and Y) and maintain materialized compositions of capital at two in both departments, with  $C$  the stock of means of production, then the portion of surplus value to be used for accumulation is allocated in the ratio of  $C : (v+s) = 2$  for fixed capital in each department. The surplus value allocated for additional fixed capital can be represented by  $i$ . Additional circulating constant capital to be consumed at the higher level of production will be needed as well, and Moseley's work suggests an upper limit of one-half of newly created value,  $v+s$ , as its outlay. Introducing a turnover of four, then,  $c : (v+s) = 2$ . This, in turn, requires additional subsistence needs for additional workers to be engaged in new production. (Investment of circulating constant capital -- at least represented in Moseley's calculations, pp. 161 and 163 -- is roughly equal to variable capital. If we multiple that level by the turnover, the resulting annual consumption of circulating constant capital would be some four times larger than variable capital and quite in line Marx's numbers more than a century earlier.)

With the rate of surplus value at unity and one-half of surplus value used for accumulation (the

other half used for capitalist luxury consumption  $k$ ), the representation, although absent in Marx and in Pannekoek, must include the surplus value used for **production of new items of fixed capital**. In the following illustration, we illustrate this additional requirement  $i$  for additional fixed capital, in addition to requirements for additional circulating constant capital and variable capital to be in place as the next period begins. We assume a turnover of circulating constant capital of four, while the gestation for the new fixed capital is one year. Only one turnover of  $c$  and  $v$  is needed to put into place the raw materials, etc., which must be ready for the expanded reproduction of the next year, this turnover presumably in the last quarter.

**Illustration 1a: Accumulation with  $s/v = 1$ ,  $k = \frac{1}{2} s$ ,  $C/(v+s) = 2$ , and  $c/(v+s) = 2$**

$$\begin{aligned} \text{Department I: } & 4476 c + 1119 v + 1119 s = 6714, \\ & \text{with } 1119 s = 559.5 k + (426.3 i + 106.6 c + 26.6 v) \end{aligned}$$

$$\begin{aligned} \text{Department II: } & 1524 c + 381 v + 381 s = 2286, \\ & \text{with } 381 s = 190.5 k + (145.1 i + 36.3 c + 9.1 v) \end{aligned}$$

Growth of 9.5 percent has occurred. Employment represented by variable capital increases also by 9.5 percent during the expansion. The next period will then read:

$$\text{Department I: } 4901 c + 1225 v + 1225 s = 7352$$

$$\text{Department II: } 1668 c + 417 v + 417 s = 2503$$

Were the process to continue, the following allocation would obtain for the use of surplus value in the next period:

$$\text{Allocation of surplus value in Department I: } 1225 s = 612.5 k + (466.7 i + 116.7 c + 29.2 v)$$

$$\text{Allocation of surplus value in Department II: } 417 s = 208.5 k + (158.9 i + 39.7 c + 9.9 v)$$

Another 9.5 percent growth would occur then.

In order to drive home the importance of the level of surplus value which is accumulated, as opposed to being consumed by capitalists, the next illustration presumes no luxury consumption and all surplus value is used for accumulation. Note that, compared to the previous illustration, Department I expands and Department II contracts in order that the exchange between the departments balance.

**Illustration 1b: Accumulation with  $s/v = 1$ ,  $k = 0$  (only accumulation),  $C/(v+s) = 2$ , and  $c/(v+s) = 2$**

$$\begin{aligned} \text{Department I: } & 4952 c + 1238 v + 1238 s = 7428, \\ & \text{with } 1238 s = (943.2 i + 235.8 c + 59.0 v) \end{aligned}$$

$$\begin{aligned} \text{Department II: } & 1048 c + 262 v + 262 s = 1572, \\ & \text{with } 262 s = (199.6 i + 49.9 c + 12.5 v) \end{aligned}$$

Growth of 19.1 percent has occurred. The next period will read

$$\text{Department I: } 5898 c + 1474 v + 1474 s = 8847,$$

$$\text{Department II: } 1248 c + 312 v + 312 s = 1872$$

The following illustration presumes no accumulation and all of surplus value being used for capitalist consumption. This is nothing other than simple reproduction and Department I is relatively less important compared to Department II as compared to our two preceding cases.

**Illustration 1c: Accumulation with  $s/v = 1$ ,  $k = s$  (no accumulation),  $C/(v+s) = 2$ , and  $c/(v+s) = 2$**

$$\text{Department I: } 4000 c + 1000 v + 1000 s = 6000,$$

$$\text{with } 1000 s = 1000 k$$

$$\text{Department II: } 2000 c + 500 v + 500 s = 3000,$$

$$\text{with } 500 s = 500 k$$

No growth has occurred and the next period will read the same.

Table XX displays these illustrations. They have been designed to help understand the impact of the proportion of surplus value being used for accumulation versus consumption by capitalists.

**Table XX: Illustrations allocating Surplus Value to Accumulation when  $s/v=1$ ,  $C/(v+s)=2$ , and  $c/(v+s)=2$ , with turnover of annual circulating-capital costs = 4**

		<i>s only for accumulation</i>	<i>s=½ consumption, ½ accumulation</i>	<i>s only for consumption</i>
<b>Department I</b>				
value of output		7428	6714	6000
<i>C</i> and <i>c</i>		4952	4476	4000
<i>v</i>		1238	1119	1000
<i>S</i>		1238	1119	1000
<i>k</i> , i.e., <i>s</i> for consumption		0	559.5	1000
<i>s</i> for accumulation		1238	559.5	0
of which	<i>i</i> for fixed capital	943.2	426.3	
	<i>c</i> for circ. capital	235.8	106.6	
	<i>v</i> for circ. capital	59.0	26.6	
<b>next period output value</b>		8847	7352	6000
<b>Department II</b>				
value of output		1572	2286	3000
<i>c</i>		1048	1524	2000
<i>v</i>		262	381	500
<i>s</i>		262	381	500
<i>k</i> , i.e., <i>s</i> for consumption		0	190.5	500
<i>s</i> for accumulation		262	190.5	0
of which	<i>i</i> for fixed capital	199.6	145.1	
	<i>c</i> for circ. capital	49.9	36.3	
	<i>v</i> for circ. capital	12.5	9.1	
<b>next period output value</b>		1872	2503	3000
<b>sales bet. departments</b>		1297	1705	2000
<b>growth</b>		19.1%	9.5%	0%

These limited presentations encourage us to develop a rather more general model. That is, we permit the rate of surplus value  $s/v$  to be other than unity. The allocation of surplus value between capitalist consumption and accumulation is also parameterized, with  $\lambda$  representing the proportion of surplus value devoted to accumulation so that  $1 - \lambda$  is the proportion consumed by capitalists. We have already defined  $k$  as the level of capitalist consumption, and it is therefore  $(1-\lambda)s$ . In this illustration, we retain the empirical suggestion that  $C/(v+s) = 2$ , but we allow circulating constant capital to be a constant fraction  $f$  of new value created, i.e.,  $c/(v+s) = f$ . We maintain the turnover of circulating capital equal to

four times yearly. Since  $C/(v+s) = 2$ , then  $C/v = 2(1+s/v)$ . The latter represents the relationship between the stock of fixed capital to variable capital only and becomes useful.

Accumulation  $\dot{a}$ s requires investment in new fixed capital, new circulating constant capital, and new variable capital. We are taking the gestation of new fixed capital as the full year, i.e., it takes a year to construct and put into place the new fixed capital. However, new circulating constant capital (much of which is raw materials) and new variable capital requires only on turnover period, i.e., the last quarter, given that turnover is quarterly. Recall that variable capital  $v$  always represents yearly flow, as does circulating constant capital  $c$ . Therefore, accumulation, in each department, is

$$C + c/4 + v/4$$

so that, dividing by  $v$ , we obtain

$$C/v + \frac{1}{4} c/v + \frac{1}{4} .$$

Given that  $c = f(v+s)$ , so that  $c/v = f(1+s/v)$ , this expression becomes

$$2(1+s/v) + \frac{1}{4} f(1+s/v) + \frac{1}{4} = (2 + \frac{1}{4} f)(1+s/v) + \frac{1}{4} .$$

For convenience, Let

$$D = (2 + \frac{1}{4} f)(1+s/v) + \frac{1}{4} .$$

Both fixed and circulating capital come from Department I. The proportion of accumulation coming from that department is therefore

$$(2 + \frac{1}{4} f)(1+s/v) \div D$$

and the proportion of accumulation coming from Department II is

$$\frac{1}{4} \div D.$$

Thus, it can be shown<sup>11</sup> that

**Illustration 2: Accumulation with  $s/v$  variable, capital accumulation =  $\dot{a}$ s and  $k = (1-\dot{a})s$ ,  $C/(v+s) = 2$ , and  $c/(v+s) = f$ .**

The value of the output levels for Department II relative to Department I is

$$\{1 + s/v[1 - \dot{a} (2 + f/4)(1 + s/v)]/D\} \div \{f(1+s/v) + \frac{1}{4} \dot{a} s/v/D\}.$$

In other words, balance between the departments requires that the ratio Department II output to Department I output be given by the formula above.

The growth rate of the value of outputs and employment can also be shown<sup>12</sup> to be

$$\text{output growth rate} = \dot{a} s/v \div D .$$

For example, if one half of surplus value is used for accumulation so that  $\dot{a}$  is one-half, the rate of surplus value is one and  $f$ , the ratio of flow of circulating constant capital to new value created, is two, then the

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<sup>11</sup>To be shown later.

<sup>12</sup>To be shown later.

growth rate is 9.5%, i.e., the value in our Illustration 1a. But if the rate of surplus value were two, i.e., the value suggested by the empirical work summarized in Table Y, then the growth rate would rise to 12.9%.

**Table YY: Sample growth rates under differing values for  $\dot{a}$ ,  $s/v$ , and  $f$**

	$\dot{a} = 0.40$		$\dot{a} = 0.20$		$\dot{a} = 0.10$		$\dot{a} = 0.05$	
$s/v$	$f = 2$	$f = 1$	$f = 2$	$f = 1$	$f = 2$	$f = 1$	$f = 2$	$f = 1$
<b>1</b>	7.6%	8.4%	3.8%	4.2%	1.9%	2.1%	0.9%	1.1%
<b>2</b>	10.3%	11.4%	5.2%	5.7%	2.6%	2.8%	1.3%	1.4%
<b>4</b>	12.5%	13.9%	6.3%	7.0%	3.1%	3.5%	1.6%	1.7%

Table YY provides growth rates in the two departments under our representation of balance between the departments being maintained. We have not introduced any discussion of technological changes, which would only increase output growth rates, but not necessarily for the labor force requirements. Indeed, since our interest is primarily on accumulation of capital as it affects the labor-power requirements, it is perhaps more useful as presented. We learn, even with only 10% of surplus value being allocated for accumulation, still the growth rates exceed the recent high levels of population growth worldwide. Such employment growth could only be sustained over a longer period by the penetration of non-capitalist modes of production and conversion of populations into wage laborers. As Rosa Luxemburg had already been aware a century ago, this potential source declines as the very result of capitalist expansion continues. **Capitalist accumulation is ever more difficult. Therefore, the rate of accumulation  $\dot{a}$  must decline and alternative uses of surplus value employed.**

#### IV. Population Increase and Accumulation

According to United Nations figures, in 1850, of the total world population of 1,262 million 64.1% was in Asia, 21.9% in Europe, 8.8% in Africa, 3.0% in Latin America and the Caribbean, 2.1% in Northern America, and 0.2% in Oceania (Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, "The World at Six Billion". (ESA/P/WP.154), 12 October 1999, Table 2. [www.un.org/esa/population/publications/sixbillion/sixbilpart1.pdf](http://www.un.org/esa/population/publications/sixbillion/sixbilpart1.pdf)). In 1850, only Europe with its 276 million persons had a significant working class of wage-laborers.

By 1900 the world is estimated to have had 1,650 million persons, representing an annual growth rate of 0.54% since 1850. And, by 1999, the world is estimated to have arrived at 6 billion persons, an overall growth rate since 1850 of 1.05%, but 0.85% annually between 1900 and 1950, and 1.78% between 1950 and 1999. Thus, Marx was writing at a time of much lower levels of world population growth, albeit around 1% in England (migration not accounted for -- see ???).

If the world in 1850 had 3% of its population as working class -- i.e., 38 million -- and in 1900

had 10% its population of 1650 million as working class, the growth rate of the working class from 38 million to 165 million is 3.0% annually. This could represent accumulation of capital if all of the working class were producing value and surplus value, unproductive wage-labor not involved (the issue of unproductive labor does not seem to be a substantial phenomenon until the 20<sup>th</sup> century). We can see from our previous section that such a 3% growth rate could correspond to merely 10-15% of surplus value being utilized by capitalists for accumulation of constant and variable capital (see Table YY, interpolating between 10% and 20%). The balance of surplus value at a 85-90% level being used for luxury consumption would be much too high and higher rates of surplus value would only suggest a more severe problem for the utilization of surplus value.

The difficulty can also be illustrated by focusing upon the United States where data are available and the United States became the leading industrial power by the 20th century. The decade of 1860 to 1870 represents conversion of slaves into share croppers, tenant farmers, or wage laborers. The period thereafter includes massive immigration into the country. The U.S. census population in 1870 was ???, and in 1920 was ???, a ???% rate of increase.

As reported by Weinberg (2002, p. 185), the number of wage laborers increased from 5,600,000 to 23,300,000 from 1870 to 1920, representing a growth rate of 2.9% annually. These figures do not include 'clerical' workers which moved from 260,000 to 3,715,000. If the clerical were included, the growth rate would be somewhat higher at 3.1%. On the other hand, if the reduction in hours in the workweek were included, the increase in produced value would be less and the growth rate of total workhours, and thus value produced, would be somewhat lower.

Even with a fast developing capitalist economy, represented by U. S. history, approximately 15% of surplus value would only be needed to sustain the employment rise. We are therefore compelled to ask as to the destination of a major portion of surplus, the portion neither used for capitalist luxury consumption nor accumulation of capital. Indeed, this is the third, yet very large, portion of surplus value which Marx did not focus upon.

**Drawing to a conclusion, we are compelled to ask nothing less than at what level the accumulation of capital plays a role in the dynamics of the capitalist mode of production.**

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