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# **Productive force and the degree of intensity of labour**

## **Marx's concepts and formalizations in the middle part of *Capital I***

Geert Reuten<sup>\*</sup>

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### **Abstract**

Marx's account in *Capital* of the production of surplus-value is examined (Volume I, Parts Three to Five), especially his formalizations in relation to the conceptual progress in the book. It is indicated that his formulas convey theoretical results rather than explanatory processes/mechanisms. This becomes an obstacle particularly when Marx introduces the key concepts of 'productive force' (in modern jargon: technique of production) and 'intensity of labour', leaving behind any simple explanation of value in terms of labour-time. In face of this, the paper sets out an elementary and immanent reconstruction of Marx's formalization, in which the rate of surplus-value is cast in terms of all of Marx's main explanatory variables: extensity of labour, wages, productive force and intensity of labour.

### **Introduction**

The first volume of Marx's *Capital* (1867) is subtitled 'The production process of capital'. This reveals the twofold object of the book of, first, an outline of the capitalist *form* of production – i.e. in contradistinction to other modes of production – and, second, the production of capital itself – i.e. its continuity. There are again two aspects to this object. The one is highlighted in the 'middle part' of the book – Parts Three to Six – on the production of surplus-value. It sets out how the production of surplus-value (profit) is the motive force of capital, how surplus-value is actually produced and so how capital grows. The second aspect is the resulting process of accumulation of capital – treated in the 'end part' of the book.

In this chapter I survey the middle part of *Capital I*, therein especially focussing on Marx's formalizations. As will be seen, he formalizes explanatory *results* rather than either 'explanatory *processes*' or 'mechanisms'. Absent from the formalizations are Marx's key concepts such as: productive forces, labour productivity, extensity and intensity of labour, and the value of labour-power (or

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the wage rate). Therefore also, these formulas are deprived of heuristic inspiration.<sup>1</sup>

In section 2 I follow the text of this middle part and make some elementary beginnings for an immanent reconstruction of Marx's formalism. As to the content of this reconstruction I restrict myself to the key concepts mentioned in the previous paragraph. By 'immanent' reconstruction I mean that I base myself on Marx's concepts – that is qua intention: even an immanent reconstruction cannot be but interpretative. The idea of an immanent reconstruction is not to further develop the theory at hand, but to understand it better – thus my intentions are historiographic.<sup>2</sup>

The general conceptual terrain of the middle part of *Capital I* will briefly be surveyed in section 1 (only the first subsection goes beyond an immanent reconstruction).

Apart from 'normal' historiographic accounts of Marx's texts, the reader will find quite a bit of comparison between Marx's German text and its English translation by Ben Fowkes. Some of this comparison is critical of the translation. However, I should like to voice my high esteem for the translator. I know by experience how difficult it is to write in a foreign language. Translation, however, is a far more difficult task. It is just *inevitable* – especially with authors such as Marx – that the translator interprets the text. This may not be a problem so long as we have fairly standard interpretations on which the translator can rely. However, as soon as interpretations shift then the particular translation of key terms may no longer be obvious.

All page references to *Capital I* in the Fowkes translation of its fourth edition are denoted by an *F* followed by a page number. Those to the fourth German edition of *Das Kapital I* are denoted by a *G* and page number (*MEW* edition). Sometimes I also refer to the earlier English Moore and Aveling translation (of the third edition), as indicated by *MA* and page number. Throughout this chapter I insert quite a few footnotes. Of these, notes 3–4, 7, 13, 19, 37, 39, and 42 are introductory; the others are for the specialist.

## 1. The production of capital

### 1.1. A comment on dimensions: monetary value and labour-time

I begin with a brief comment on the 'dimensions' in which Marx casts his analysis of the process of production of capital. Note first his particular level of abstraction here: his analysis deals with an average production process – in regard to the

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<sup>1</sup> Other formalizations of Marx, such as his reproduction schemes, have been heuristically inspiring (see Reuten 1998). In effect, within the Marxian tradition the *Capital I* formulas have mostly been replicated instead of enriched. I make no plea for any formalism to dominate the enquiry or its presentation. Opting myself for a systematic-dialectical methodology, I believe nevertheless that, in many instances and *at one and the same* conceptual level (especially for the analysis of a dialectical 'moment'), formal treatments may provide helpful tools.

<sup>2</sup> Of course a better understanding might, next, play a role in the further development of a theory, or even a reconstruction in the sense of a new construction.

quantity and quality of both the means of production used and the labour used, and in regard to their organization.<sup>3</sup>

One of Marx's greatest insights, in my view, is that he comprehends the capitalist production process as a unity of labour process and of {ideal} valorization process.<sup>4</sup> In the opening Chapter 7 of the middle part Marx writes:

Just as the commodity itself is a \*unity of\* use-value and value, so the process of production must be a \*unity of labour process and process of creating value\*. (...)

The production process \*as a unity of labour process and process of creating value\*, is a process of production of commodities; \*as a unity of labour process and process of valorization\*, it is a capitalist process of production, or the capitalist form of the production of commodities.

(F, 293 and 304 – amended;<sup>5</sup> G, 201 and 211)

Thus Marx is pointing out here the specific capitalist value-form of production. Expressed otherwise, we have a unity of a process of physical production (labour process) and a process of {ideal} value augmentation (valorization process). We have two things coinciding, as unity. As simple as this may appear in practice (it is

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<sup>3</sup> In effect, he abstracts from intra-branch and inter-branch differences, including differing production periods and compositions of capital (dealt with in Volume III, Parts One and Two). He also assumes that the output produced will be sold – or at least that any discrepancy in this respect is the average one (the complications, especially in the context of accumulation of capital are dealt with in Volume II, Part Three). He assumes that there is no difference between production time and labour-time – or, he assumes that this difference indeed is the average one (further dealt with in Volume II, Part Two). Finally he abstracts from finance and banking – or he assumes that its functions are integrated into the average capital that he treats (explicitly dealt with in Volume III, Parts Four and Five).

At the current level of abstraction Marx achieves, in effect, similarities to a macroeconomic treatment (the concept of macroeconomics dates only from the 1930s), without however losing the connection to microeconomic processes. I say 'similarities' – it is not macroeconomic; if that term were applicable it would be for Part Three of Capital II when Marx explicitly considers 'the functioning of the social capital – that is of the total capital' (Marx, 1885: 468). (For the latter interpretation as the construction of a macroeconomics, see Reuten 1998, esp. pp. 190-5.)

One implication of dealing with the average production process is that 'labour' always means 'socially necessary labour', that is, (1) it is of average skill and dexterity; (2) it produces at the prevailing productive forces; (3) any supply/demand discrepancies are either abstracted from or considered to be the average ones.

<sup>4</sup> 'Valorization', i.e. value augmentation. The interpolation of 'ideal' will be explained later on.

<sup>5</sup> For the first starred text Fowkes has 'unity formed of' for 'Einheit von' ('formed of' has some connotation of separate elements); for the second starred text he has 'unity composed of the labour process and the process of creating value' for '*Einheit von Arbeitsprozeß und Wertbildungsprozeß*'. Fowkes makes better English, but it seems especially important here not to add 'the' before 'labour process' as this may suggest (as for my first amendment) that it is pre-given; Marx's view is that the character of the labour process itself is affected by it being a valorization process – thus the latter is not just added on to the first.

Similarly, for the first starred text after the ellipsis, Fowkes has ', considered as the unity of the labour process and the process of creating value' for '*Als Einheit von Arbeitsprozeß und Wertbildungsprozeß*'; the last amendment is alike.

happening all the time in capitalist enterprises), its analysis is complex especially dimensionally: we have value categories (homogenous); time (homogenous); heterogenous physical inputs and outputs; and labour that can be conceived of in terms of homogenous time, but that is itself heterogenous.

Throughout this middle part Marx, as we will see, uses two dimensions for his analysis in general and his representations/equations in particular: a value dimension and a labour-time dimension. Without exception the value entities are expressed in *monetary* terms (£); the same applies to all numerical examples.<sup>6</sup> It is necessary to emphasize this since in some accounts of Marx's theory 'value' is itself taken to have a labour-time dimension. This is a wrong account of Marx's *Capital* (those same accounts often adopt the term 'labour values' – one that is never used in *Capital*). As we will see, Marx, at the level of abstraction of *Capital I*, aims to *explain* value (monetary dimension) in terms of labour-time – therewith, of course, value is not discarded of its monetary dimension. (Value is the abstract counterpart of price, at the level of abstraction – *Capital I* – where the distinction between surplus-value and profit is still implicit; the distinction is also not yet relevant – Marx reaches this by presenting the average capital.)

Besides the two dimensions mentioned, Marx adopts an intuitive notion of physical labour productivity increase: increases in the number of use-values (goods) produced by a unit of labour (but he always ends up by expressing these use-values in terms of price multiplied by quantity).<sup>7</sup>

The main problem in understanding Marx's texts (beginning with Part One of *Capital I*) is that he proceeds, step-wise, to find an endogenous dimensional reference point (or reference points), one that is (or are) *internal to his object of enquiry*, one that is (are) key to the functioning of his object of enquiry.<sup>8</sup> Its core terms, in Marx's view, are the monetary dimension and the time dimension. The early parts of each of the three volumes of *Capital* theorize the interconnection of these dimensions in increasing complexity and concretion (Volume I, Parts One and Two; Volume II, Part One; Volume III, Part One) ending up with *the* measure of capital, the rate of profit over time. Thus we end up with the connection of the monetary dimension with the time dimension in general, not the particular *labour-time* (of *Capital I*). However, that does not mean that labour-time becomes irrelevant at the *Capital III* level of analysis, just that we reach an overarching category.

The labour and labour-time category retains relevance at any level of abstraction in three respects. First, for the grand organization of the production process (the technique adopted) and, related, the planned organization of the intensity of labour (say 'speed'). Second, for the common day to day organization of production on the production floor, the management of output per labourer, i.e.

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<sup>6</sup> Elson (1979) pointed this out.

<sup>7</sup> Without value imputation (i.e. prices), the notion of physical productivity must of course be intuitive, because different use-values cannot be added up.

<sup>8</sup> In contradistinction to external constructs, such as – later on in history – Fisher's index numbers, or Sraffa's standard commodity (both analytical commodity baskets). These are measures or devices of the analyst; they do not actually play a role in the functioning of the object of enquiry. (Though for index numbers we have a case of reflexivity, in that after their 'invention' they may be adopted in practice – e.g. some consumer price index in wage bargaining.)

per unit of labour-time. Third, the remuneration of labour-time, i.e. the wage rate. With the first and third fixed for any time being, the second determines the level of output and so profits. Earlier I wrote that Marx adopts in his analysis an 'intuitive' notion of physical labour productivity increase. At the point of production there is nothing intuitive about it.

In Marx's choice of categories and dimensions, and especially in the particular way he phrases his theory, there are undoubtedly also other issues at stake. For one, Marx (1867) intervenes in the discourse of the Ricardian economics of his day (with its 'labour embodied' theory of value), at times radically breaking away from it (his value-form theory), at others operating within it or at least at its margins. An additional problem here is that Marx sometimes, misleadingly, speaks about values (the explanandum) as "expressions" of labour (the explanans). (In the same vein a neoclassical economist might, also misleadingly, speak about prices as "expressions" of utility or preferences.) Apart from the few remarks in the next paragraph, I will not comment on these aspects in the remainder of this chapter (for more see my 1993, Murray's 2000a comment on it, my 2000 reply, and Murray's 2002 rejoinder).

I take the circuit of capital  $\{M - C \dots P \dots C' - M'\}$ , i.e. its growth via the stages of investment (M-C), production (C-P-C') and sales (C'-M'), to be an interconnected process. From the perspective of the valorization (i.e. augmentation) of capital, the 'moments' of the circuit (M-C; C-P-C'; and C'-M') can be distinguished but not separated. Thus valorization of capital, the 'production' of capital, is the unity of this process. To stress this is in part a value-form theoretical development from Marx (i.e. with Marx beyond Marx – see e.g. Reuten & Williams 1989 and much of the work of Christopher Arthur, Tony Smith and Patrick Murray; see also Nicola Taylor, 2004).<sup>9</sup> This development builds on *one* of the theoretical lines in *Capital*. On the other hand Marx often tends, so it seems, to attribute a predominance to the 'moment' of production, especially when he is discussing production. His terminology of 'production' of surplus-value and 'production' of capital (apparently in abstraction from the other moments) seems to reflect this attributed predominance. In face of the unity of this process, I consider Marx's terminology misleading. For the value-form theoretical view, more specifically, there is properly speaking no production of 'value'; we have value inputs (M-C) and the valorization result in C'-M', i.e. when commodities are validated and commensurated in the market in terms of money. In between (C-P-C') this result is *anticipated* upon, hence in production we merely have an 'ideal' pre-commensuration, or an anticipated imputation of value.<sup>10</sup> Hence we have no production of value, but physical production *in terms of* value. Having said this, I will for the purposes of this chapter – and apart from a few reminders in footnotes – just report Marx's own terminology in this respect.

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<sup>9</sup> This does not imply that these authors agree with the particular way I briefly phrase this here.

<sup>10</sup> Usually capitalist firms, their management and their share holders and other financiers do not worry about this. It is especially in times of crises that balance sheets are shown to be 'anticipations'. The notion of 'anticipation' and 'ideal pre-commensuration' is amplified upon in Reuten 1988: 53-55 and Reuten & Williams 1989: 66-68. See also Taylor's chapter in this volume.

## 1.2. The terrain of the middle part of *Capital I*

In this subsection I briefly survey the general terrain of the middle part of *Capital I* (Parts Three to Six, over 400 pages), against the background of Part Two.<sup>11 12</sup>

Capital, writes Marx in Part Two of *Capital I*, is 'the unceasing movement of profit-making' (F, 254). We have a movement from money (M) into more money:  $M \dots M + \Delta M$ . But, 'unless it takes the form of some commodity, it does not become capital' (F, 256). Marx expresses this in the formula  $M - C - M'$  (where C is the value of a commodity, or of commodities, and  $M' = M + \Delta M$ ). This is a formula of exchange, derived from the simpler  $M - C - M$ . The latter is a strange act, namely buying ( $M - C$ ) in order to sell ( $C - M$ ). It is an 'inversion' of  $C_i - M - C_j$ , i.e. selling  $C_i$  in order to buy a qualitatively different  $C_j$  (F, 258). Here, money is merely a facilitator – it does not really matter. In the strange, inverted, form  $M - C - M$ , though, money is all that matters; however, it makes sense only as  $M - C - M'$ , that is, when the end result is an increment ( $\Delta M$ ), a 'surplus-value' as Marx calls it. In  $M - C - M'$  value is

the subject of a process in which, while constantly assuming the form in turn of money and commodities, it changes its own magnitude, throws off surplus-value from itself considered as original value, and thus valorizes itself independently. For the movement in the course of which it adds surplus-value is its own movement, its valorization is therefore self-valorization. (F, 255)

So capital is a movement of self-valorizing value, of throwing off surplus-value.<sup>13</sup> Part Two is closed off with the introduction of a particular commodity and commodity market, that of labour-power. The existence of this market is predicated on the workers' lack of means of production. We also have a brief introduction of the value of labour-power, i.e. the wage, which in principle should be sufficient to reproduce labour-power. How much is 'sufficient' depends on physical, historical and moral elements (F, 272-5).

In the middle part of *Capital I* (Parts Three to Six) we see 'not only how capital produces, but how capital is itself produced' (F, 280). That is, how surplus-value ( $\Delta M$ ) is produced – thus the (potential) expansion of capital. How can surplus-value be explained? Reconsider  $M - C - M'$ . 'The change in value of the money ... cannot take place in the money itself ... The change must therefore take place in the commodity ...' (F, 270). Hence the key to  $M - C - M'$  lies in C. In an analysis of the production process, Marx next shows how this is the site where the value of C is turned into  $C'$ .

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<sup>11</sup> However, for the purposes of this paper I abstain from a specific treatment of the relatively short Part Six on 'Wages' (chapters 19–22, together about 35 pages). See Bellofiore's Chapter 6 in this volume.

<sup>12</sup> The next three paragraphs of this subsection are adapted from Reuten (2003a).

<sup>13</sup> Note that the concept of 'profit' has been 'bracketed' – until Capital III – and replaced by the both simpler and more abstract notion of 'surplus-value'.

In the exchange M–C, capital in money-form is turned into capital in commodity-form: means of production and labour-power. Means of production bought are static elements; they have on average a fixed technical life time and have their value transferred to the product, whence Marx terms the part of capital laid out on it *constant capital* (F, 311-17).<sup>14</sup> Labour-power, or labour capacity, is exchanged against the wage; so the labourer sells its capacity to labour (for the time agreed by contract). A change in C can only be engendered by this *active* living element, labour. And since this capacity is in principle variable, both in time (length of the working day) and in intensity – as we will see in more detail later on – Marx terms the part of capital laid out on it *variable capital*. During production labour is 'subordinated' to capital: 'the worker works under the control of the capitalist ... the product is the property of the capitalist and not that of the worker.' (F, 291-2). In labour resides the potential to produce a surplus-product, or, in value-terms: surplus-value. Thus labour potentially generates a surplus-value beyond the wage – or, from the point of view of the capitalist, a surplus-value beyond the capital advanced. Marx calls the ratio between the amount of surplus-value and the capital laid out in wages the 'rate of surplus-value' or the 'degree of exploitation of labour-power by capital' (F, 320-7).

Part Three is on 'The production of absolute surplus-value' (Chapters 7–11, about 150 pages). Central to it is the increase in the rate of surplus-value through extension of the working day. In my view this part serves didactic purposes, similarly to Marx's recurrent procedure of starting with 'simple reproduction' (stationary state) before setting out 'expanding reproduction'. In this case it allows Marx to introduce systematically both the concept of 'the value of labour-power' and the drive for increase in the rate of surplus-value. This didactic procedure of Marx's also has a surprise effect. How could we still have – as happened in Marx's day – an increase in the rate of surplus-value, or perhaps a constant rate, when we have a decrease of the working day?

This question is the core issue treated in Part Four on 'The production of relative surplus-value' (Chapters 12–15, some 215 pages). Both regular 'revolutions in the productive forces' and increases in the intensity of labour (each with very different effects as we will see in section 2) allow for a constant or even an increasing rate of surplus-value along with a decreasing length of the working day. Both of these are core to the capitalist mode of production.

The synthetic Part Five bears the dull but appropriate title of 'The production of absolute and relative surplus-value' (Chapters 16–18; it is a relatively short part, extending to 30 pages).

In sum, for the explanation of surplus-value (and the rate of surplus-value), Marx posits four factors:

1. The magnitude of the value of labour-power;
2. The length of the working day;
3. The productive force of labour;

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<sup>14</sup> Means of production derive their value – we might add – not from the process of production in which they figure as means of production, but from the process of production in which they were produced; labour-power is not produced for sale in a capitalist process of production (Reuten 1988 and Reuten & Williams 1989, ch. 1, §9; see also Taylor's chapter in this volume).



#### 4. The intensity of labour.

He deals with the first two in Part Three (see section 2.1 below) and the next two in Part Four (see sections 2.2 and 2.4). Sections 2.3 and 2.5 provide reconstructions of Marx's formal explanatory treatment.

## 2. Determinants of (the rate of) surplus-value

### 2.1. The rate of surplus-value

Part Three, 'The production of absolute surplus-value', begins with two chapters setting out the distinctions between the 'Labour process and the valorization process' (Chapter 7) and between 'Constant capital and variable capital' (Chapter 8) – briefly discussed in section 1.2 above.<sup>15</sup> In Chapter 9 Marx formalizes these distinctions, decomposing capital advanced ( $\mathbf{Z}$ ) into constant capital ( $c$ ) laid out on means of production, and variable capital ( $v$ ) expended on labour-power (F, 320-1).<sup>16</sup> The starting point for his formalization (equations M-1 to M-5 below) is a (stylized) empirical reference:

The surplus-value generated in the production process by  $\mathbf{Z}$ , the capital advanced, i.e. the valorization of the value of the capital  $\mathbf{Z}$ , presents itself to us first as the amount by which the value of the product exceeds the value of its constituent elements.

(F, 320 – C amended into  $\mathbf{Z}$ , cf. the previous note)

Capturing this, Marx *formally* starts with a number of identities and definitions.

$$\mathbf{Z} = c + v \quad \text{[accounting identity] (M-1)}$$

As valorized  $\mathbf{Z}$  is 'transformed' into:

$$\mathbf{Z}' = (c + v) + s \quad \text{[accounting identity] (M-2)}$$

where  $s$  is surplus-value. Thus in  $\mathbf{Z}-\mathbf{Z}'$  we have the abbreviated formula of the production by and of capital.

Henceforth all of Marx's equations/representations are indicated with M-. Unless made explicit otherwise, the dimension of all equations is monetary (as

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<sup>15</sup> All chapter indications refer to the English editions of Capital I. The English editions break up the German 4th chapter into three (Chapters 4-6). Hence from Chapter 7 onwards, the equivalent German chapter should be counted two back.

<sup>16</sup> Fowkes uses the symbol C for capital advanced (instead of my  $\mathbf{Z}$ ). This is confusing because the German M-C-M' formula is G-W-G'. In the chapter at hand Marx uses for 'capital advanced' the symbol C in German (i.e. not 'W', see G, 226 ff.) – which, if it were related to the formula, would seem nearer to the (English) M than to C. This makes a difference which actually gets lost in both the translations (cf. MA, 204 ff.).

indeed Marx has it explicitly in terms of pounds, £; cf. also pp. F 327-29 where Marx, using empirical cases, derives  $s$  from business accounts.). All equations apply to a definite time period (a production period); I have refrained from adding on time subscripts as these would be uniform for all equations (up to equation 14). For each equation I indicate their analytical status in square brackets; the particular terms are mine (M-2, for example, is named 'a tautology' by Marx – F, 320).

Marx calls 'the new value created' ( $y$ ) 'the value-product' and the output ( $x$ ) 'the value of the product'.<sup>17</sup>

$$y \equiv v + s \quad \text{[definition] (M-3)}$$

$$x \equiv (c + v) + s \quad \text{[definition] (M-4)}$$

The  $s$  over  $v$  proportion is called 'the rate of surplus-value' ( $e$ ).

$$e \equiv s/v \quad \text{[definition] (M-5)}$$

As a ratio of equal dimensions  $e \equiv s/v$  is of course a dimensionless number. Crucially from a theoretical point of view Marx (F, 324-6) casts the "same" ratio (F, 326) in terms of 'surplus labour' ( $SL$ ) and 'necessary labour' ( $NL$ ).<sup>18</sup>

$$e^* \equiv SL/NL \quad \text{[definition] (M-6)}$$

$$e = e^* \quad \text{[explanatory device] (M-7)}$$

Thus he posits  $e^*$  as an explanation for  $e$ . There is a difficulty here. So far, there is nothing in itself wrong with positing the one ratio as an explanation for the other, or with positing surplus labour(-time) as an explanation for surplus-value. There is a problem, however, if the explanans ( $e^*$ , or  $SL$ ) cannot be measured

<sup>17</sup> The right hand sides of (M-3) to (M-6) are Marx's (the symbols  $y$ ,  $x$ ,  $e$ , and  $e^*$  are mine). Although it is not important in the context of the problematic of the current paper, it should be noted that soon in this Chapter 9 Marx abstracts from fixed capital, thus interprets both  $Z$  and  $c$  as circulating capital (F, 321). Next, and until the second section of Chapter 15, Marx also sets  $c=0$  (F, 324). However, the context here and in the Chapters 10-14 rather points at moving 'constant capital' to the background: 'In order that variable capital may perform its function, constant capital must be advanced ... appropriate to the special technical conditions of each labour process.' (F, 323).

<sup>18</sup> 'Surplus labour' and 'necessary labour' are 'the labour expended' during 'surplus labour-time' and 'necessary labour-time' (F, 325). Thus we see Marx making the distinction of 'labour' and 'labour-time', anticipating his discussion of 'intensity of labour' in later chapters (see section 2.4 below). It seems, though, that for the time being we can treat the concepts as similar, especially for a discussion of the average capital.

The term 'necessary labour' should be distinguished from the term 'socially necessary labour' as referred to in note 3; the similarities of these terms is 'inconvenient', as Marx remarks in a footnote (F, 325, n5).

independently of the explanandum ( $e$ , or  $s$ ). This is not uncommon in science, but it is nevertheless a problem and far from a perfect situation.<sup>19</sup>

So far we have entities ( $c$ ,  $v$ ,  $s$ ) that are, in principle, observable and measurable. However, *by themselves* (in isolation from the already known  $s/v$  ratio, one that can be measured)  $SL$  and  $NL$  cannot be measured. Another observable and measurable entity might be the labour-time of workers, e.g. 10 hours a day. Given a particular length of the working day we could, analytically, divide that up into one part in which an amount of value is produced equivalent to wages (equivalent to variable capital,  $v$ ) and call this 'necessary labour(-time)' ( $NL$ ), and another part in which an amount of value is produced equivalent to the surplus-value ( $s$ ) and call this 'surplus labour(-time)' ( $SL$ ). This is in fact what Marx does (pp. F, 329-31).<sup>20</sup>

Another way to think about this is that (M-6) together with (M-7) simply makes explicit the idea that at a given wage per day, an extension of the working day results, in general, in an increased value-product. On this account (M-6) with (M-7) have elementary explanatory meaning.<sup>21</sup>

Early on in the last chapter of Part Three, Chapter 11, Marx provides a decomposition of the surplus-value in his earlier representations.<sup>22</sup>

$$s = (s/v)v \quad \text{[definition] (M-8)}$$

$$s = \underline{x}(a'/a)n \quad \text{[explanatory device] (M-9)}$$

where:

$s$  = the mass of surplus-value;

$v$  = variable capital;

$\underline{x}$  = surplus-value per worker per average day;

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<sup>19</sup> Incidentally it may be noted that for the present day mainstream in economics, a paradigm emerging soon after 1867, and aiming to explain prices or demand in terms of utility – and later on in terms of preferences – a similar problem applies: the explanans cannot be measured independently of the explanandum (of course this does not make Marx's problem more comforting).

<sup>20</sup> Possibly one could argue that in this respect Marx is near to an abductive (Pierce) or a retroductive (Lawson) proceeding. An uncompromising empiricist would consider it doubtful if (M-6) adds anything explanatory to (M-5). What it achieves, in effect, is to breach the idea that the wage is the equivalent of the labour delivered. In whatever way this may be appraised – and in reference back to the misconceived notion of 'labour values' (see section 1.1, just after note 6) – Marx endeavors to provide an explanation of surplus-value in terms of labour(-time). To conceive of value itself in terms of labour(-time) is to collapse the explanation – and Marx definitely does not do this.

<sup>21</sup> Though it is either analytical or largely intuitive. Let  $TL$  be total labour-time. Then we can rewrite (M-6) into:  $e^* \equiv (TL - NL)/NL$ , with  $TL$  in principle observable and  $NL$  unobservable. Now we could posit:  $s$  varies with  $TL$ , *ceteris paribus*. This may make analytical sense if the theory makes sense. However, Marx has yet to unpack a host of other factors affecting  $s$  (in all the rest of *Capital* at least), so that the 'ceteris paribus' makes no empirical sense.

<sup>22</sup> Marx in a change of notation has  $S = (s/v)V$  and  $S = P(a'/a)n$  where  $P$  is the wage rate per day (=  $\underline{x}$  in my notation).

$v$  = variable capital advanced per worker per day (hence in fact the equivalent of the wage rate per day);  
 $w$  = the wage rate per day ('the value of one individual labour-power');  
 $a'$  = surplus labour (surplus labour-time);  
 $a$  = necessary labour (necessary labour-time);  
 $a'/a$  = the average 'degree of exploitation';  
 $n$  = the number of workers employed (i.e. measured in days);  
 $s/v$  = the average rate of exploitation per worker per day (but as this is a dimensionless ratio it may as well be applied to any other time unit).

(Hence the underlined symbols in M-8 and M-9 are in value per time dimension;  $a'$  and  $a$  in time dimension. This way we end up with the monetary value dimension for  $s$  – at least if we interpret Marx's 'the number of workers employed' for  $n$  (F, 418) as workers days, which can readily be inferred from the context.)

Note that as ratios we have the equalities of

$$e \equiv s/v = s/v = a'/a \quad \text{[recapitulation of explanatory device] (10)}$$

The  $s$  in the  $s/v$  of (M-8) cannot be measured independently of  $s$  and  $v$ . Similarly the  $a'/a$  of (M-9) cannot be measured independently of  $s$  and  $v$ . (See the comment on (M-6) and (M-7) above.)

Anticipating Marx's discussion of absolute and relative surplus-value in Part Five, I add on a definition here (equations 11 or 12 are not Marx's):

$$wL \equiv v \quad \text{[definition] (11)}$$

where  $w$  is the wage rate per hour and  $L$  the amount of *labour hours hired*. Hence we may rewrite (M-9) as

$$s = e*(wL) \quad \text{[explanatory device] (12)}$$

Marx writes: 'the mass of surplus-value  $\{s\}$  is determined [*bestimmt*] by the product of the number of labour-powers  $\{L\}$  and the degree of exploitation of each individual labour-power  $\{e^*\}$  ... We assume throughout, not only that the value of an average labour-power  $\{w\}$  is constant, but that the workers employed by a capitalist are reduced to average workers' (F, 418; G, 322; symbols in curled brackets added).

The advantage of this notation (12) is that the number of hours hired ( $L$ ) – as well as their remuneration ( $w$ ) – has been made explicit. It seems that in his representation (M-9) Marx tried to bring this in – unsuccessfully though, since the working day itself is a variable (cf. Marx's  $w$  and  $n$ ). On the other hand, in equation (12) we seem to have lost Marx's distinction between labour-power ( $L$ )

and labour ( $L$ ).<sup>23</sup> Or at least, this is now merely implicit.<sup>24</sup> In that respect, representation (12) – to be found in much of contemporary Marxian theory – is defective.<sup>25</sup> Later on we will retrieve Marx's labour–labour-power distinction (sections 2.3 and 2.5).

## 2.2. The 'productive force' of labour

Part Four of *Capital I* presents 'The production of relative surplus-value'. In its first Chapter 12 Marx introduces a key factor into his presentation: 'change in the productive force of labour'.<sup>26</sup> Before going into this, a note on translation is required. In the context of production we will generally need to differentiate between changes that have to do with the exertion of labour only or mainly, and changes that have to do with the interconnection of changes in the means of production, technology and the exertion of labour. It seems to me that in the German text Marx makes important differentiations in this respect. Fowkes translates the German *Produktivkraft* by 'productivity'.<sup>27</sup> This is unfortunate, as Marx sometimes also uses the term *Arbeitsproduktivität* (labour productivity) – this will be seen to be especially important in the context of his presentation of 'intensity' of labour, discussed in the next subsection. In all of the following texts I will amend the translation for *Produktivkraft* into 'productive force' (marked \*...\* – I use the same mark for any other amendments, as specified in footnotes).<sup>28</sup>

In Chapter 12 Marx writes:

Hitherto, in dealing with the production of surplus-value ... we have assumed that the mode of production is given and invariable. ... The technical and social conditions of the process and consequently the mode of production

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<sup>23</sup> In fact Marx's  $s = \frac{v}{a/a}n$  also does not bring out the distinction between labour and labour-power (the same applies to all of Marx's equations in *Capital*) although this one does make explicit the *value* of (a day's) labour-power.

<sup>24</sup> The reader may observe that the same happens in Sraffian types of approach.

<sup>25</sup> As including some of my own earlier work.

<sup>26</sup> Earlier on it was sometimes briefly anticipated.

<sup>27</sup> Most of the time at least – e.g. on page F, 453 2nd paragraph, Fowkes translates *Produktivkraft* into 'productive power' and on page F, 508 it is translated into 'productive forces' (cf. G, 407). Not only do we lose terminological connections, the English text also makes connections that are absent from the German (esp. with the German term *Produktivität der Arbeit* and when Fowkes translates this into 'productivity of labour', 'productivity' being his most frequent translation for '*Produktivkraft*'). We have the same problem in the *Results* (translated by Livingstone). Moore & Aveling (*Capital I*) translate *Produktivkraft* into 'productiveness' (at least those instances I have checked).

Generally there are two translation options for the term *Kraft* as in *Produktivkraft*: power and force. The former is adopted in the *Grundrisse* translation (productive power) and the latter in the *The German Ideology* and the 1859 *Critique* Introduction (productive force).

<sup>28</sup> Note that I do not claim to make better English than Fowkes.

itself must be revolutionized \*so as to increase the productive force of labour\* ... (F, 431-2 amended;<sup>29</sup> G, 333-4).

Introducing this by way of an example Marx wrote:

increase in the \*productive force\* of labour ... cannot be done except by an alteration in his [the labourer's] tools or in his mode of working [*Arbeitsmethode*], or both. Hence the conditions of production of his labour, i.e. his mode of production, and the labour process itself, must be revolutionized. By an increase in the \*productive force\* of labour, we mean an alteration in the labour process of such a kind as to shorten the labour-time socially necessary for the production of a commodity, \*hence a smaller quantity of labour acquires the force\* of producing a greater quantity of use-value.

(F, 431 amended;<sup>30</sup> G, 333)

Productivity (it seems to me) has an imprecise meaning.<sup>31</sup> I am pretty sure that Marx always reserves his term *Produktivkraft* (productive force) for – as he says in this quotation – the production of a greater quantity of use-value by a smaller (or by the same) quantity of labour (and it usually goes along with price decrease). My hypothesis is that the notion of 'socially necessary labour-time' – see the quotation – is associated with this notion of productive force and that, in this context, 'productive force' must be taken as average.

In the subsequent chapters of Part Four (13-15) Marx further conceptualizes the development of productive force by way of a historical description of the development of 'tools', via manufacture, into (Chapter 15, section 1) 'machinery and large-scale industry'. Generally Marx associates an increase in productive force with changes in the organization of the labour process (e.g. related to scale and division of labour and to changes in the composition of capital).<sup>32</sup>

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<sup>29</sup> For the starred text Fowkes has 'before the productivity of labour can be increased' for 'um die Produktivkraft der Arbeit zu erhöhen'.

<sup>30</sup> For the first and second starred text Fowkes has 'productivity' for 'Produktivkraft'. For the third he has 'and to endow a given quantity of labour with the power ...' for '*ein kleinres Quantum Arbeit also die Kraft erwirbt*'. My point for this amendment is not only the reference to shortening of the labour day, but foremost the *reversion* of the apparently active element – with Fowkes's 'endow', labour seems to be put in the passive position.

<sup>31</sup> In both mainstream and in much of Marxian economics it loosely refers to a combination of effects of technological change and effectiveness of labour. (I will come back to this in §2.4.)

<sup>32</sup> The concept of the 'composition of capital', the *c/v* ratio, is mostly only implicit in Part Four (it is alluded to in Chapter 15 (F, 571 and 577-8). It makes proper appearance in Part Seven. See my Chapter 10 in this volume.

### 2.3. A formal and immanent-reconstructive intermezzo on capitalist revolutions in the productive force of labour

It is not until Chapter 18 (i.e. the last chapter of Part Five) that Marx returns to his formulas for the rate of surplus-value, however, without improving on the previous ones – i.e. those discussed in section 2.1 above. Nevertheless, in view of the conceptual progress made by Marx so far (Chapter 11 to Chapter 15, section 2), there is reason to do so. (Marx does not do it here, and does not return to it in similar contexts later on.)

We saw that the potential of labour for producing use-values (the potential use-value productivity) is affected by the productive force; today economists would say: the state of technology and its implementation. Thus given that state, any labour is potentially exerted at a particular productive force.

A revolution in the productive force of labour can be envisaged as a change in technological trajectory ( $T$ ) – think of grand technologies such as that of steam engine, electricity, petrol motor, computer. They get started in particular branches and then are gradually diffused throughout all or most of the branches in the economy. Let us simplify a trajectory ( $i$ ) into a certain value  $c$  of specific means of production that could potentially be worked up by an amount of average labour (measured in time).

$$T_i \supseteq \ll c/L \gg \quad [\text{definition of approximation}] \quad (13)$$

Thus  $c/L$  stands for a certain value (£) of means of production that could be worked up by a particular amount of labour in a definite period of time. (*Analytically* we might put  $L$  to unity, e.g. an hour, whence we have, e.g., £10 per labour hour.) The guillemets here, indicate the specificity of means of production and labour;  $\supseteq$  is the sign for 'contains or equals'. Within a trajectory we have bounded variations in  $c/L$  ratio's coming about in tranches (blocks) of diffusion (variations say of a range of 40% – in the analytical example ranging from £10/hr to £14/hr, coming about in e.g. 5 tranches). We call any one such tranche a *state* of the technological trajectory ( $ST$ ), or a *state* of the development of the productive forces:<sup>33</sup>

$$ST_{i(t)} \supseteq \ll c/L \gg_{(t)} \quad [\text{definition}] \quad (14)$$

The subscript ( $t$ ) stands for that particular state of trajectory ( $i$ ) – it also stands for a definite period in time (e.g. 1850-1860) in a region (e.g. Great Britain and France).

Let us now consider production (recall that the accounting dimension of the production process is a monetary one).<sup>34</sup>

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<sup>33</sup> The 40% range is one in the absence of inflation or deflation of prices. Remember that  $c$  is in value terms. States of the trajectory are associated with a dissemination of the technology over a new tranche of branches in the economy.

<sup>34</sup> In this accounting the management of firms anticipates sales and so carries out a commensuration of heterogeneous entities (means of production, labour in process) before the deed

$$x = \llbracket c/L \rrbracket_{(t)} L^\beta \quad [\beta > 1]^{35}$$

[determination; step of heuristic approximation] (15)

Hence, as before,  $x$  is the gross output in value terms (e.g. £).  $\llbracket c/L \rrbracket$  is the quantity of means of production in value terms *that could, potentially, be worked up* by a quantity of labour (hours). The  $c$  is some value of means of production *at the point when workers enter the business gate* (at the point where they enter 'the hidden abode of production' – F, 280). Thus  $\llbracket c/L \rrbracket$  is for example (£40mln)/(4mln potential labour hours).<sup>36</sup> The outer right-hand  $L$  in representation (15) is the actual labour employed (measured in hours), i.e. actual labour-time. The factor  $\beta$  in  $L^\beta$  is *the actual exerting power* of labour (per hour). For the time being we take  $\beta$  to be a (stylized) *constant*, as attached to the productive force  $\llbracket c/L \rrbracket_{(t)}$ .

I make a strict distinction between, first, the productive force of labour ( $\llbracket c/L \rrbracket_{(t)}$ ), second, labour-power in the conventional sense (the  $L$  in  $\llbracket c/L \rrbracket$ ), i.e. a potential, and third, the 'actual exerting power of labour' ( $L^\beta$ ) – this distinction is returned to in section 2.5.<sup>37</sup> Apart from the value of labour-power (see section 2.5) we have herewith collected all of the main variables that Marx adopts in his Part Four analysis of relative surplus-value.

Before further commenting on  $\beta$  in the next subsection, we may proceed with a simple example (simple purely illustrative numbers). Let  $\llbracket c/L \rrbracket = \text{£}40\text{mln}/(4\text{mln}$  (. . . continued)

so to speak, and thus carries out 'an ideal pre-commensuration'. Cf. the last paragraph of section 1.1 above.

<sup>35</sup> Obviously for  $\beta=1$  we would merely have a reproduction of the value of means of production, i.e. without any value added.

<sup>36</sup> It may be misleading to add: (£40mln)/(4mln potential labour hours) = £10 per potential labour hour, as we did in the analytical example.  $\llbracket c/L \rrbracket$  is fixed plant-wise, hence the average or modal  $\llbracket c/L \rrbracket$  is fixed. Underlying  $L$  is a technical matrix with in its column the number of workers simultaneously required to operate the means of production at a point in time, and with in the rows of the matrix the duration of the production process (in hours). (Of course  $\llbracket c/L \rrbracket$  is only relatively 'fixed'. We may have major restructuring/reorganizations of capital – i.e. of plants or clusters of plants – which in effect introduce new states of the trajectory.)

<sup>37</sup> I have been following so far (and will below) Marx's Capital I simplification (generally) of abstracting from means of production that last beyond the production period. (Including those we would simply have  $\llbracket K/L \rrbracket_{(t)} L^\beta$  – see Reuten 2002.) For readers familiar with Neoclassical economics, it should be noted that representation (15) may look like a particular 'production function'. However, its conceptualization (especially as to what are variables and as to how a 'technique' is defined) is different from orthodox meanings:

➤  $c$  are *specific* means of production (measured in monetary terms: prices times quantities);

➤ the concept of  $c/L$  is that of a plant (or plants), and thus is incompatible with marginalist notions as including marginal productivity (see also the previous footnote);

➤  $c/L$  is taken to be 'almost' fixed in the short run:  $\llbracket c/L \rrbracket$  (the guillemets should be warning for that); thus we are within a particular *state* of a technological trajectory – in which only moderate variations in  $c/L$  (say within a 8% bound) can be profitably applied (that is macro-economically; micro variations may be larger).

➤ there is no blue book of techniques that can profitably be used – no substitution in the orthodox sense – we are on a one way trajectory.

(For some other differences in this respect between the Neoclassical and the Marxian approach see Smith 1997. See also his Chapter 8 in this volume for contrasts with Neo-Schumpeterian views.)



labour hrs). Let  $\beta=1.16$  (at  $L=4\text{mln}$  hrs). Then, because  $4^{1.16}=5$ ,  $x = \text{£}50\text{mln}$ . Assume the average wage rate to be  $\text{£}1.50$ . From Marx's equation (M-4) and definition (11) we have the accounting identity:

$$s = x - (c + wL)$$

$$s = \text{£}50\text{m} - [\text{£}40\text{m} + (\text{£}1.50)(4\text{m})] = \text{£}50\text{m} - [\text{£}40\text{m} + \text{£}6\text{m}] = \text{£}4\text{m}$$

$$x = c + wL + s = \text{£}60\text{m} + \text{£}6\text{m} + \text{£}4\text{m}$$

So this gets us back to Marx's type of example. In fact my statement 'let  $\beta=1.16$ ' is analogous to statements of his, such as 'if 1 hour's labour is exhibited in  $6d$ ', where  $d$  is a monetary unit.<sup>38</sup>

Indeed all of Marx's formulas are *results*. The advantage of a representation such as (15) is that we see some more of the explanatory dynamic behind those results; an explanatory dynamic that Marx sets out in his text.

As indicated, in Parts Three to Six of *Capital I* all of Marx's focus is on the rate of surplus-value. In terms of the formalization of the current subsection we have for that rate:<sup>39</sup>

$$e = \frac{s}{v} = \frac{\{«c/L»_{(t)}\} \{L^{\beta-1} - 1\}}{w} - 1 \quad \text{[explanatory device] (16)}$$

Thus at the *prevailing* productive force of labour  $«c/L»_{(t)}$ , the rate of surplus-value depends positively on the 'actual exerting power of labour'  $\beta$  and negatively on the wage rate  $w$ . So far  $\beta$  is a constant power. Note that it cannot be directly measured independently of surplus-value ( $s$ ).<sup>40</sup>

According to Marx the main concomitant of revolutions in the productive forces is a decrease in the value of commodities. To the extent that these are wage goods, such revolutions allow for nominal wage decrease at any level of real

<sup>38</sup> E.g. F, 433. Instead of 'exhibited' Fowkes has 'embodied' for 'stellt sich dar' (G, 335). 'Embodied' rings of course Ricardian bells (perhaps it should, perhaps not; in some contexts Marx uses the term *verkörpert*, i.e. embodied).

<sup>39</sup> Representation (16) is derived as follows:

$$x = «c/L»_{(t)} L^{\beta}$$

$$s = x - (c + v)$$

$$s = \{«c/L»_{(t)} L^{\beta}\} - \{c + wL\}$$

$$e = \frac{s}{v} = \frac{\{«c/L»_{(t)} L^{\beta}\} - \{c + wL\}}{wL} = \frac{\{«c/L»_{(t)} L^{\beta-1} - c/L\}}{w} - 1$$

<sup>40</sup> Though one might devise experiments ('slow down'), or adopt indirect measures for changes in  $\beta$ .

wages. Thus *between states* of technological trajectories we have, *ceteris paribus* (specifically the factors affecting the subsumption of labour), the rate of surplus-value pushed up. Indeed this, for Marx, is the heart of the production of relative surplus-value. Thus we have

$$w = w^* + f(\Delta ST_{(t)}) \quad [f < 0] \quad (17)$$

where  $w^*$  summarizes the labour market aspects of the general state of subsumption of labour.<sup>41</sup>

#### 2.4. Degree of intensity of labour

We now proceed from the point where we left Marx's text prior to the reconstructive intermezzo of the previous subsection. Note first that Marx *up to this point* – as he reminds us early on in the section now under discussion – conceptualized increase in the production of relative surplus-value as being engendered by increase in the use-value productivity of labour. '*The same amount of labour-time adds the same value* as before to the total product, but ... is spread over more use-values. Hence the value of each single commodity falls.' (F, 534 – italics added).<sup>42</sup>

In section 3(c) of Chapter 15, Marx presents the concept of 'intensity of labour'.<sup>43</sup>

... something we have already met with, namely the intensity of labour, develops into a phenomenon of decisive importance. Our analysis of absolute surplus-value dealt primarily with the extensive magnitude of labour, its duration, while \*the degree of its intensity\* was treated as a given factor. We now have to consider the inversion [*Umschlag*] of extensive magnitude into intensive magnitude, or magnitude of degree.

(F, 533 amended;<sup>44</sup> G, 431)

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<sup>41</sup> The further determination of the state of subsumption is beyond the confines of this paper (see Murray 2000b and his Chapter 7 in this volume). The prevailing rate of unemployment is merely one obvious factor affecting  $w^*$ .

<sup>42</sup> This is based on a number of assumptions that Marx repeats over and over again. Next to the three assumptions associated with the concept of 'socially necessary labour' (see note 3) it is assumed that competition results in the pushing down of prices when productivity rises spread over branches of production.

<sup>43</sup> Here he introduces it systematically – the term was used five times before in passing: in Chapter 1 (F, 129; G, 153), Chapter 7 (F, 303; G, 210), Chapter 11 (F, 424; G, 328) and Chapter 14 (F, 460; G, 361 and F, 465; G, 365). In two other instances Marx uses in German the term 'potenzierte Arbeit' which both Moore & Aveling and Fowkes render into 'intensified labour' (F, 135; MA, 51; G, 59; and F, 435; MA, 302; G, 337).

<sup>44</sup> For the starred text Fowkes has 'its intensity' for 'der Grad ihrer Intensität'. The insertion of the German for 'inversion' is by Fowkes. It seems to me that *Umschlag* is a quite heavy term, pointing to a new moment. Other candidates for the translation would be 'break' (as in 'break in the weather') or 'turn' (as in 'turn in relationship').

Marx directs our attention here both by the terms 'decisive importance' and 'inversion/break' [*Umschlag*]. Thus next to the magnitude of labour ( $L$ ), Marx introduces its degree of intensity. In fact part of my reason for introducing the formalization of section 2.3 is to be able to put sharp focus on this. In terms of my representation (15) or (16) a change in the 'actual exerting power of labour', the  $\beta$  in  $L^\beta$ , is at stake. Henceforth I will call this the 'degree of intensity of labour'.<sup>45</sup> Marx – as he does often when introducing an important new concept – uses a number of adjectives to stress the concept. Here is a key formulation – it is also a key citation for the current paper:

... the development of \*the productive force and the economization of the conditions of production\* imposes on the worker an increased expenditure of labour within a time ... This compression of a greater mass of labour into a given period now *counts for what it really is, namely an increase of the quantity of labour*. In addition to the measure of its 'extensive magnitude', *labour-time now acquires a measure of its \*degree of density\**. ... The same mass of value is now produced for the capitalist by, say, 3\_ hours of surplus labour and 6\_ hours of necessary labour, as was previously produced by 4 hours of surplus labour and 8 hours of necessary labour.

(F, 534 amended and italics added;<sup>46</sup> G, 432-3)

Thus we see a crucial conceptual progress (concretization) in comparison with the earlier simpler (more abstract) conception summarized at the opening of this subsection: *no longer do we have the simple parallel between value and labour-time*.<sup>47</sup>

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<sup>45</sup> I challenge the reader that is not convinced by my  $L^\beta$  representation to come up with an alternative representation for the italicized text in the next quote.

<sup>46</sup> For the first starred text Fowkes has 'the development of productivity and the more economical use of the conditions of production' for 'der Entwicklung der Produktivkraft und der Ökonomisierung der Produktionsbedingungen'. For the second he has 'intensity, or degree of density' for '*das Maß ihres Verdichtungsgrads*'.

Concerning the term 'measure' a general warning – for all of *Capital* – is appropriate. The meaning of the German term 'Maß' is complicated. The relevant meaning *here* seems near to 'grade' or 'degree' – or 'measure' as in the phrase 'to considerable measure'. (For at least some explication of the term see Inwood (1992: 240).)

<sup>47</sup> Or 'socially necessary labour-time' (see note 3). For the purposes of the current paper I will not quarrel with historiographers who argue that *Capital* is based on a linear logic (instead of a systematic-dialectical) and that already in the first section of Chapter 1 Marx writes: 'Socially necessary labour-time is the labour-time required to produce any use-value under the conditions of production normal for a given society and with the average degree of skill and intensity of labour prevalent in that society.' (F, 129; G, 53). At that point we cannot know what he means by 'degree of intensity'; he subsequently 'blends out' the intensity issue and returns to it systematically in Chapter 15.

I just wrote 'no longer do we have the simple parallel between value and labour-time'. In fact we see breaks in this parallel (conceptual progress) here in *Capital I* and in all the volumes of *Capital* (particularly also in Parts Two and Three of *Capital II*). There is no particular dichotomy in this respect between Volumes I and III (and even less so two algorithms). Nevertheless, as

Marx indicates as main factors bringing about this intensity increase, an increase in the speed of the machines, and the same worker having to supervise or operate a greater quantity of machinery (F, 536). In the remainder of the section he cites reports as evidence for this process.

The issue is taken up further in the synthetic Part Five – apart from a brief passage in Chapter 16 (F, 646) mainly in its Chapter 17. Note that all along Marx's primary problematic is not so much the determination of the magnitude of value, but rather the relative magnitudes of surplus-value and the price of labour-power.<sup>48</sup> At a given average real wage rate per 'normal working day', the latter relative magnitudes depend on:

(1) the length of the working day, or the extensive magnitude of labour, (2) the normal intensity of labour, or its intensive magnitude, whereby a given quantity of labour is expended in a given time and (3) the \*productive force\* of labour, whereby the same quantity of labour yields, in a given time, a greater or a smaller quantity of the product, depending on the degree of development attained by the conditions of production.

(F, 655 amended;<sup>49</sup> G, 542)

All these three are variable, and next Marx analyses their variation in turn. I focus on the intensity of labour (section 2 of Chapter 17).

... if the length of the working day remains constant, a day's labour of increased intensity will be incorporated *in an increased amount of value*, and, assuming no change in the value of money, in an increased amount of money. ... A given working day, therefore, no longer creates a constant value, but a variable one ... .

(F, 661 – italics added;<sup>50</sup> G, 547)

So far this repeats – though in a very clear formulation – the inversion/break indicated above. However, in two subsequent statements Marx (I think) muddles the issue for the inattentive (preoccupied?) reader. Here is the first one.

Whether the magnitude of the labour changes in extent or in intensity, there is always a corresponding change in the magnitude of the value created, independently of the nature of the article in which that value is \*exhibited\*.

(F, 661 amended;<sup>51</sup> G, 548)

(. . .continued)

indicated in section 1.1, labour-time for Marx remains all along an important reference point for the analysis of (changes in) the capitalist production process.

<sup>48</sup> The upshot of this is, in my view, that when we have reached the introduction of the concept of profit (in Volume III), profit/wage ratio's are affected by the factors mentioned in the next quote.

<sup>49</sup> For the starred text Fowkes has 'productivity' for 'Produktivkraft'.

<sup>50</sup> The italicized text reads in German: 'in höherem Wertprodukt' – literally: in an increased value-product' ( $y$  in equation M-3). The same for 'value' in the next sentence. The same for the *first* term 'value' in the next citation.

<sup>51</sup> For the starred text Fowkes has 'embodied' for 'sich darstellen'.

Although to the letter of the text there is nothing to complain about, it might (carelessly) be read as a repetition of the conceptualization cited at the very opening of this sub-section. In fact the 'magnitude of labour' has now been cut loose from labour-time; labour-time no longer 'corresponds' to value (at least not diachronically).

Such a (careless) reading and its implication might be reinforced by the next, and final, text of this section in Chapter 17:

If the intensity of labour were to increase simultaneously and equally in every branch of industry, then the new and higher degree of intensity would become the normal social degree of intensity, and would therefore cease to count as an extensive magnitude. (F, 661-2; G, 548)

Again, to the letter this is fair enough – as well as consistent with Marx's general approach. However, it seems to de-emphasize the conceptual progress 'of decisive importance'.<sup>52</sup> To the extent that over time (diachronically) we have recurrent increases in the 'normal social degree of intensity', the value-producing potential of labour cannot be measured diachronically by labour-time independently of the value produced.<sup>53</sup> (By itself this does not make the explanatory power of the theory useless; it makes it more problematical.)

As indicated, Marx returns to his formula for the rate of surplus-value in the final Chapter, 18, of Part Five. It is a mystery why he, after making subtle distinctions in the previous chapters, relapses into the simple  $s/v$  result and its 'surplus-labour' over 'necessary labour' counterpart.

The intensity matter is returned to in Chapter 25 of Part Seven, 'The general law of capitalist accumulation', however, without much further development (F, 788-9 and 793).<sup>54</sup>

It is obvious that in terms of the reconstructive formalization of the previous sub-section Marx's new 'normal social degree of intensity' of labour would be posited in terms of changes in the degree  $\beta$  in  $L^\beta$  associated with a state of the 'productive forces' or the state of a trajectory. Of course this does not increase the explanatory power of the theory; it does focus, though, on the conceptual development (and it may help developing it further).

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<sup>52</sup> Marx continues immediately after the text just quoted: 'But even so, the intensity of labour would still be different in different countries, and would modify the application of the law of value to the working days of different nations. The more intensive working day of one nation would be represented by a greater sum of money than the less intensive day of another nation' (F, 662). Systematically this international context is irrelevant here. Relevant would be to say that 'the law of value' does not apply, generally, over time (i.e. not diachronically).

<sup>53</sup> Thus 1 hour of  $SNLT_{(t)} \neq SNLT_{(t+1)}$  (where SNLT is socially necessary labour-time).

<sup>54</sup> There are also a couple of related passages in the Results (included in Marx 1867F: 987, 991-2, 1021, 1024-6; cf. 1034-5).

## 2.5. Once again the value of labour-power and the wage rate

From all of the middle part of *Capital I* – indeed all of the book – it is obvious that Marx always conceives of wages, and the value of labour-power, in terms of *days* or *weeks*. Indeed this directs all his theorizing about absolute and relative surplus-value. Theoretically this seems as poignant as an engraved *Gestalt* (in the sense of Kuhn). On the one hand this is understandable historically, that is from the perspective of the practice of the second half of the 19th century (including struggles over the length of the working day and the working week); the perspective of if, and how well, one can live off a day's or a week's wage. On the other hand, however, this is difficult to understand given that it is Marx's aim to set out 'capital' and its development from *its* perspective, i.e. immanently.

Whereas Marx's conceptualization of labour-power is fine as and when he introduces it in Part Three (absolute surplus-value), there is a problem when he moves to Part Four (relative surplus-value) and introduces shortening of the working day. The daily value of labour-power is by itself not of interest to capital, but rather the value of labour-power per hour of labour-time (that is the value of labour-power relative to the actual time of employment).

Reconsider Marx's equations (cf. section 2.1)

$$s = (\underline{s}/\underline{v})v \quad (\text{M-8})$$

$$s = \underline{w}(a'/a)n \quad (\text{M-9})$$

and the added

$$wL \equiv v \quad (11)$$

$$s = e^*(wL) \quad (12)$$

Remember that the underlined symbols are in per day terms, and  $w$  and  $L$  in per hour terms. If  $s$  would be measured over a year (for example),  $n$  would have to be the 'number of workers times the number of labour days in a year'. (If  $s$  would be measured over one turn-over time of capital,  $n$  would have to be the 'number of workers times the number of days of turn-over time'.)<sup>55</sup>

Let the value of labour-power per day,  $VLP-d = \underline{w}$ ; the length of the working day =  $WD$  (i.e. a number of hours). Recall that  $w$  = the wage per hour, and  $L$  the number of hours worked. Thus we have:

$$w \equiv \underline{w}/WD \quad [\text{definition}] (18)$$

$$L \equiv n(WD) \quad [\text{definition}] (19)$$

hence

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<sup>55</sup> Of course, relevant for capital is the investment of (variable) capital including Sundays so to speak.

$$wL = \underline{wn}$$

[implication] (20)

Thus there is no problem to translate  $wL$  into Marx's terminology of 'the value of labour-power'. But what is labour-power in these "different" frames? Labour-power is the potential to perform labour (for a day says Marx) at some definite extensity (i.e. a number of clock hours) and intensity. What do we lose if we reduce this to intensity per hour? Nothing (note that for Marx a substitution between extensity and intensity is possible). Then we can interpret  $L$  as a number of labour-power per hour (labour potential) and  $L^B$  as labour actually exerted at some degree of intensity.

Here is the rephrase. Workers sell their labour-potential  $L$  (= labour-power) by the hour.<sup>56</sup> In production it is exerted *at* a prevailing productive force (*Produktivkraft*) with a certain degree of intensity  $L^B$  (= labour).

All this merely makes more explicit what is in Marx's text. It also makes more explicit that the only directly measurable entities are all value entities, as well as total labour-time (extensity). All other 'labour' entities, including the intensity of labour ( $L^B$ ) cannot be directly measured independently of the value entities and of labour extensity.

## Summary and conclusions

Key to the production process of capital – the subject of *Capital I* – is the production of surplus-value. The middle part of the book explains how it is produced. Marx comprehends the capitalist production process as a unity of labour process and of valorization process – this sets the frame for his analysis, including its dimensions. He starts from value entities, always in monetary dimension, and aims to explain these in terms of: (1) productive forces ('techniques of production' – this term is anachronistic); (2) extensity of labour; (3) intensity of labour; (4) the value of labour-power. The point of the 'unity' view is the interaction, the melding, of the two processes – the valorization process affects the content of the labour process and this works back again on valorization.

In line with his general method, Marx starts this middle part with an abstract and simple account – the production of absolute surplus-value. In effect this means that he treats all but factor (2), the extensity of labour, as constant. Next – under the head of the production of relative surplus-value – he brings in variations in the other three factors mentioned.

Unfortunately, when it comes to Marx's formalization of his analysis – the main subject of this chapter – he sticks *in effect* to the simple account ( $e = e^*$ , i.e.  $s/v = SL/NL$  – section 2.1). It is not obvious that he sticks to the simple account, because once we accept  $e = e^*$  as a useful explanation it remains in force after the complications have been brought in – now other variables have an effect *on* the  $e^*$

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<sup>56</sup> Irrespective of the fact that depending on labour contracts this may go in packages (e.g. 40 hours a week).

ratio. This is why I have complained that Marx formalizes results instead of explanatory processes (or mechanisms).

I have shown that it is not too difficult to 'immanently reconstruct' Marx's formalization such that all four factors are captured (see equation 16 in section 2.3). Its upshot is a reconceptualization of Marx's 'value of labour-power' into a value per unit of time, a wage rate (section 2.5). The corollary advantage of the latter concept is that it matches the perspective of capital – which fits Marx's general approach in *Capital* of presenting an immanent analysis of capital.

Comments on the secondary literature have been beyond the confines of this chapter. Some of that literature misconceives Marx in making 'him' identify value with a labour(-time) dimension (hence the collapse of any explanatory force of his theory in this respect). Perhaps Marx mislead the superficial reader with his, in effect, dimensionless ratio's. However, he *always* casts value in monetary terms.

As to the explanatory force of  $e = e^*$  (in either its simple or its complex representation) I indicated that the explanans ( $e^*$ , or surplus labour in relation to total labour) cannot be measured independently of the explanandum ( $e$ , or surplus-value in relation to the value-product). Marx was well aware of this measurement problem – highlighted in the variability of labour intensity – as well as of course the main further inversions/breaks to come in the later volumes of *Capital* (much of which had been drafted before 1867).

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