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Marco Veronese Passarella, Hervé Baron

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CAPITAL'S HUMPBACK BRIDGE. 'FINANCIALISATION' AND THE RATE OF TURNOVER IN MARX'S ECONOMIC THEORY

Marco VERONESE PASSARELLA[*] and Hervé BARON[†]

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Abstract. The article aims to shed light on the role played by the 'rate of turnover' of capital in Karl Marx's economic theory. Oddly enough, such a concept has been neglected by the most part of Marx's scholars and exegetes, as it is demonstrated by the small number of scientific works dealing with it. Yet, the rate of turnover is a key-category in Marxian analysis, as it enables Marx to address the impact of the improvement in finance and other unproductive industries on the capitalist process of creation (and realisation) of surplus-value. The evidence from the new philological edition of Marx and Engel's writings (MEGA^2) further strengthens this insight. The main goal of the paper is, therefore, threefold: first, to bridge the gap in the literature dealing with the Volume Two of Capital; second, to provide a re-definition of several Marxian concepts in the light of the role played by the rate of turnover of capital; third, to analyse the effect of the developments in the banking & finance industry on the turnover rate and, thereby, on the general rate of profit.

Keywords: Marxian Economics, Turnover of Capital, Financialisation

JEL Classification: B24, B51, E11

[*] Corresponding author: University of Leeds. E-mail: M.Passarella@leeds.ac.uk..

[†] Università dell'Insubria & Université Paris 1 Panthéon-Sorbonne. E-mail: hbaron@libero.it.

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Introduction

> The chief means of reducing the time of circulation is improved communications. The last fifty years have brought about a revolution in this field, comparable only with the industrial revolution of the latter half of the 18th century.
>
> Friedrich Engels, in Karl Marx (1885)

It is said that the expression 'pons asinorum' (humpback bridge or 'bridge of asses') was coined by Scholastic philosophers in order to define the act of providing intuitive evidence for syllogisms (or for other abstract logical relationships) whose understanding was supposed to be necessary for the neophytes to prosecute their theological studies. In geometry, that definition was used by Roger Bacon to indicate highly disputed questions, such as the non-deducibility of the fifth postulate of (the first book of) The Elements of Euclid. Within common language, Scolastics' expression still designates a 'switch' which is quite problematic, but which is also necessary to achieve a given desired target. As we will argue, it is in this sense that we could regard the communication industry, the industrial logistics, the commercial sector, and especially today's hypertrophic banking & finance system, as the tumbledown 'bridge of asses' of advanced economies.

Yet, the strategic function of those sectors – the most part of which has generally been regarded as unproductive industries (as opposed to the productive manufacturing sector) by Classical and Marxist economists – is not an exclusive feature of today's advanced capitalistic economies. On the contrary, it has been a constant of capitalism since its dawn. In the history of economic thought of the last two centuries, there is, in fact, a vast crop of writings concerning the role of the transportation and communication industry, as well as the function of the banking & finance system and the commercial sector, within the whole process of social re-production. Among those contributions, Karl Marx's manuscripts of Volume Two ('V2' hereafter) of Capital, stand out both for their analytical accuracy and for their 'visionary' power. This sounds rather odd if one considers that a large part of V2 has been neglected for a long time by historians of economic ideas and even by the exegetes of Marx's writings. Apart from the chapters on the 'metamorphoses of capital' and the well-known 'reproduction schemes', the V2 of Capital is the least-known of the three books composing the great unfinished work of Marx.[1] It is therefore not surprising that there are only few scientific works dealing with the turnover of capital and its impact on the valorisation (and accumulation) process.

In this regard, we have to mention, first, the early contributions of Hourwich (1894), Lexis (1895) and Schmidt (1889). More precisely, Hourwich focused on the positive impact of the «rapidity of rotation» of capital on surplus-value and profits as being «the

outcome of improved machinery, [the] shortening [of] the period of production, and along with it the time spent in circulation» (Hourwich 1894, p. 247, 249-50). Lexis focused on the same topic, though stressing that «as a rule, individual capitalists get no offset for the decline in the rate from the increase in the [rate of turnover and hence in the annual mass] of capital [...]. Only a few great capitalists are able to maintain accumulation in the manner described by Marx» (Lexis 1895, p. 15). An identical result can be implicitly gathered from the work of Schmidt (1889), according to whom the rate of profit was «steadily sinking», whatever the historical trend in the rate of turnover of capital.

Besides these pioneering contributions, we have to mention also a number of recent works dealing with the role of the turnover of capital from different perspectives. Morishima (1973, ch. 13) provided a 'Marx-Von Neumann model' treating the time of turnover of capital as a variable which is endogenously set by capitalists' decisions. Desai (1979, p. 64-65) observed that «the rate of profit is calculated [by Marx] on total capital advanced, fixed as well as circulating [...]. Thus the rate of profit is not a mark-up above costs but above the total capacity advanced». Different sectors will employ capitals marked by different durability (i.e. of different rates of turnover). This contributes to make the prices of production diverge from the labour values of commodities. As it will turn out, the very removing of Marx's simplifying hypothesis that the time of turnover is an exogenous variable is of fundamental importance. Duménil (1975, p. 210) stressed that Engels' editorial work on V2 of Capital led to a substantial misunderstanding of Marx's analysis of the turnover (and the circuit) of capital, owing to the different viewpoints of the two authors. An empirical analysis of the turnover of capital has been provided by Webber and Rigby (1986): they found that, in Canadian manufacturing throughout 1950-1981, «turnover times were reduced slightly», whereas «the rate of profit was falling consistently». Yet, Fichtenbaum (1988, p. 221) complained that in «most of [the empirical studies on the profit rate] the issue of turnover has been ignored», and the same has occurred for «the cyclical role of turnover». Accordingly, he tried to «empirically incorporate estimates of turnover into Marx' definition of the rate of profit», in order to show that the turnover plays an important role in explaining the business cycle and cyclical crises in the US throughout 1949-1981. Similarly, Haass (1992) developed a model for the analysis of the US manufacturing sector which explicitly incorporates the turnover time.

A few years later, Arthur and Reuten (1998) edited a fundamental book which contains several essays on V2 of Capital. For many years, this book has been the only work specifically devoted to V2. From our viewpoint, the two chapters of Murray and Campbell, respectively, are the most interesting. Murray is one of the few authors who explicitly pointed out the possible link between the development of financial markets and the turnover time. He also clearly stressed the 'productive' nature of transportation and (some) storage activities. Campbell (1998, p. 145) implicitly pointed out the link

between finance and the turnover of capital when arguing that a given capital «may be made to function more effectively through 'technical arrangements' that increase the velocity of money». In the same period, Lapavitsas (2000, p. 226) argued that Marx's analysis of the turnover was «fallacious», as «there is an overlapping of the two parts of [capital's] circulation time with each other and with production time. [...] [The] turnover time of an individual capital is less than the sum of its circulation and production times. This is in sharp contrast with the turnover time of an individual dollar of capital value, which is the simple sum of these times».[2] More recently, Dos Santos (2011) has focused on the possible impact of the rate of turnover on realization and capital accumulation through the extension of 'consumption credit'. Yet, none of the works mentioned focuses extensively on the implications for the Marxian analytical core arising from the explicit consideration of the rate of turnover, the only exceptions being Foley (1986) and Saros (2008).[3] The way in which Foley treats the turnover of capital is akin to (and/or coherent with) our point. Saros, in turn, has stressed that «the turnover process of capital has the potential to make a subtle yet important contribution to the macroeconomic fluctuations [and] may have at times contributed significantly to the financial activities of industrial capitalists with all of the subsequent consequences of those activities for the credit system» (Saros 2008, p. 190). As we mentioned, the very accent on the possible link between finance and the turnover of capital is one of the main subjects of this paper.

Against this background, the aim of this article is three fold: first, to bridge the gap in the existing literature dealing with the V2 of Capital; second, to provide a rigorous re-definition of some of the chief Marxian concepts on the basis of the role played by the turnover of capital; third, to analyse the possible effect of 'financialisation' on the turnover time and, thereby, on the rate of profit. As we are going to show, the new philological edition of Marx and Engels' writings, i.e. the MEGA^2, may provide some useful insights. More precisely, the MEGA^2 calls attention to the ambivalences concerning some basic Marxian notions. In our opinion, these very ambivalences make different interpretations of Marx's work possible. Thus, to a certain degree at least, the MEGA^2 edition enables us to make a 'deconstruction' of traditional readings of Capital.[4] Accordingly, the rest of the article is organized as follows. Section 1 deals with some of the philological issues raised by the editorial work of Friedrich Engels on the original manuscripts of (what later became) V2 of Capital. Section 2 compares the concept of the mass of surplus-value as it was defined by Marx in Volume One and Volume Three ('V1' and 'V3', respectively, hereafter) of Capital to the formulation provided by Engels in Chapter 4 of V3. In Section 3 the concept of the 'rate of turnover' (or the 'rotation coefficient', as it is labelled in V2, chapters 1 to 4) of capital is introduced, as it was defined by Marx in V2 of Capital. Section 4 goes through the main components of the 'time of turnover' of capital, whereas in Section 5 we delve into the 'costs of circulation'. In Section 6 we refine the notion of the rate of turnover and we

introduce a new concept, the 'temporal composition of capital'. As we will argue in Section 7, the explicit consideration of this concept might allow Marxian scholars to revisit the vexata quaestio of the law of the tendential fall of the general rate of profit (and of its counter-tendencies) under a financially-advanced capitalistic economy. Some further remarks are provided in the final part of the paper.

1. Engels' editorial work on Volume 2 of Capital

As is well known, Engels' editorial work on V2 of Capital relied not only on seven out of eight preliminary manuscripts, but also on some other drafts of different lengths which were part of Marx's original plan.[5] It is starting from those manuscripts that Engels had been aiming to finish the work that Marx left undone. However, the very editing of Marx's rough drafts involved a (somewhat unavoidable) discretionary process of selection and 'translation'. This is the reason sometimes the traditional interpretation of Capital looks more in the spirit of the editor (Engels) than in the spirit of the author (Marx). Notice that Engels' editorial work on V2 is reported in the MEGA^2 (Volume II/12) under three different indexes, notably, 'The arrangement comparison', 'The provenance index' and 'The discrepancy index' (Hecker 2009, p 19). It is shown that Engels modified not only the structure, but also the subject of Marx's original manuscripts. Moreover, many sections, chapters and paragraphs have been obtained as syntheses of different Marx's manuscripts.

Focusing on the structure of V2, Marx's formulation was initially split into three different chapters (or parts). More precisely, the 'Metamorphoses of Capital' and the related 'Circuit' were discussed in chapter 1, the 'Turnover of Capital' was discussed in chapter 2, and the 'Circulation and Reproduction of the Total Social Capital' was introduced in chapter 3. Although Marx used this arrangement from the Manuscript I onward, the contents and the structures of each single chapter, as well as the related theoretical concepts, remained essentially unfinished. For instance, the paragraph entitled (by Engels) 'The Time of Production' was initially placed, by Marx, in the analysis of the circuit of capital, before he relocated it into the analysis of the turnover of capital. We think that this should be regarded as a development in Marx's understanding of the physiology of the capitalistic system. The point is that the distinction between the pure 'working period' and the overall 'time of production' is linked to the concept of the 'time of turnover' of the individual capitals. Consequently, such a distinction should logically follow the study of the capital as a whole embedded in the analysis of the capitalistic circuit. Notice that, in this case, Engels maintained the final structure set up by Marx. However, he modified the terminology used in the original manuscripts. The most important change concerns the notion of the 'circulation capital' (as distinguished from the 'production capital'). This is a recurring key-word in what later became the second part of V2. Such a concept refers to the two different forms – namely, the 'money capital' form and the 'commodity capital' form – which are

assumed by a given capital in the sphere of circulation.[6] Yet, the definition of 'circulation capital' is an 'invention' of Engels: although it appears ten times in the published edition of V2, the term has never been used by Marx in his manuscripts. This issue has been already stressed by Hecker (2009), though he ambiguously refers to the 'circulating capital' (instead of the 'circulation capital'). In addition, Engels intervened on the core of Marx's theory, by providing some valuable but debatable contributions (we refer again to Duménil 1975). We will discuss this point in next sections.

To sum up, it is plain that the editorial work of Engels on V2 has not been restricted to «minor changes» (as Engels himself claimed) to Marx's original drafts. Rather, Engels' contribution must be considered as part of the Marxian work, especially if one refers to the published writings. It is starting from this awareness that in the next sections we deal with one of the least known and most under-estimated contributions of Marx's analysis: the concept of the 'turnover of capital' and the linked notion of the 'annual mass of surplus-value'.

2. The mass of surplus-value in Volume 1 and Volume 3 of Capital

The Marxian notion of the 'mass of surplus-value' is somewhat slippery. The reason is that it is used by Marx in different contexts and, outwardly at least, with different meanings. Sometimes it is used by Marx with reference to the amount of surplus-value, as opposed to its rate, whereas other times it is used to distinguish the single-period surplus-value to its annual amount. More precisely, in Chapter 9 of V1 of Capital, Marx defines, for the first time, the mass of surplus-value as the product between the whole variable capital advanced by 'capitalist firms'[7] in the i-th industry and the related rate of surplus-value (see Marx 1867, p. 320 ss.).[8] In simple algebraic terms, if s_i is the rate of surplus-value (or rate of exploitation) in the i-th sector, V_i is the variable capital invested in the i-th sector, and k is the number of sectors, then the mass of surplus-value created in the i-th industry is equal to $S_i = s_i V_i$ $\{\forall\ i = 1, 2, \ldots, k\}$. Furthermore, if we break down the amount of variable capital into its single components (namely, the number of living labour time units expended in the i-th industry, L_i, and the unit value of the labour-force, v_i), then we obtain:

$$(1) \qquad S_i = s_i L_i v_i = L_i \left(1 - v_i\right) \qquad \text{as: } s_i = S_i / V_i = \left(1 - v_i\right) / v_i$$

Equation (1) shows that the mass of surplus-value created in the i-th sector is the monetary expression of the quantity (say, the number of hours) of direct labour exceeding the time necessary to reproduce the wage-bill received by workers employed in that sector. It corresponds to the mass of gross profit created in the i-th industry at the end of each productive cycle.

Notice, in this regard, that we are implicitly adopting a 'simultaneous' and 'single-system interpretation' of the Marxian labour-theory of value, in the wake of Duménil and Foley (2008). The main implication is that we assume a fixed ratio between units of

money and units of direct social labour, which are linked together by 'the monetary expression of labour time'. This latter is defined as the ratio of the monetary value added of the economy (say, the domestic net product at current prices) to the direct productive labour expended in the production process over a period of time. For the sake of simplicity, we normalise this ratio to one hereafter (by choosing a proper unit of time measure). The main strength of such a take is that it enables us to equate the monetary accounting with the labour accounting, whatever the price-setting system. However, it deserves to be noticed that the choice of this specific interpretation of Marx's labour-theory of value is just an auxiliary hypothesis. In no way it affects the main conclusions of the paper about the role of the rate of turnover of capital.

Turning back to equation (1), the related definition of the mass of surplus-value corresponds to the one actually provided (and then implicitly employed) by Marx in V1 of Capital, namely, in his explanation of the origin of value and surplus-value from the exploitation of the living labour in the process of production. Yet, it is possible to find a further, different, definition of the mass of surplus-value in V3 of Capital. While the early three chapters of V3 deal with the so-called 'transformation problem', Chapter 4 deals with the analysis of the effect of the 'turnover of capital' on the rate of surplus-value and the general rate of profit. The reason is that:

> the time required for the turnover has the effect that the whole capital cannot be simultaneously employed in production. One part […] therefore always lies fallow, whether in the form of money capital, stocks of raw materials, finished but still unsold commodity capital, or outstanding debts that are not yet due for payment. The capital that is in active production, active in the production and appropriation of surplus-value, is always reduced by this amount, and the surplus-value that is produced and appropriated is reduced in the same proportion. The shorter the turnover time, the smaller is this idle portion of capital compared with the whole; the greater therefore is the surplus-value appropriated, other conditions being equal. ([Engels in] Marx 1894, p. 163)

Therefore, according to the text of Chapter 4, the reduction in the time of turnover of capital gives rise to an increase in the mass of surplus-value generated throughout a certain period of time. Moreover, since the rate of profit is calculated as the ratio between the mass of surplus-value and the total capital employed in the production process, it follows that any reduction in the turnover period involves a proportional increase in the rate of profit. Consequently, for a given rate of surplus-value and a given working day,[9] the two rates of profit accruing on two capitals characterized by the same 'organic composition' will be inversely proportional to the respective turnover times. More precisely – as it is clarified in Chapter 4 – the impact on the creation of surplus-value (and profit) of a reduction in the time of turnover of capital is linked to the higher valorisation of the variable part of capital per unit of time. In other words, the higher the turnover of variable capital, the higher will be the mass of surplus-value generated in a given period of time.

Yet, here comes an important issue: in his Preface to V3 of Capital, Engels points

out that, with regard to the original manuscript of Marx, «[t]here was no more to Chapter 4 than the title» ([Engels in] Marx 1894, p. 94). Therefore, it 'was left to' Engels himself to write that chapter, arguably in the wake of the other manuscripts sketched by Marx. Notice that Chapter 4 is of great importance, because it clarifies that the expression of the rate of profit should be modified on the basis of the impact of the turnover of capital on the mass of surplus-value. However, as we will show, the expression of the mass of surplus-value provided by Engels in Chapter 4 of V3 matches neither with the formula used by Marx in the early three chapters of the same book nor with the formula used in V1 of Capital. Looking at Engels' equation, the 'rate of turnover of capital' is explicitly included, whereas Marx never uses it in his equations. Thus, some questions arise: what is the reason the two expressions seem not to fit together? Is it possible to regard the expression used by Marx in V1 and in the early three chapters of V3 as a particular case of the general expression provided by Engels in Chapter 4 of V3? The answers to these questions should be researched in the words used by Engels to introduce 'his' Chapter 4, where he refers the reader to the analysis undertaken by Marx in V2 (see [Engels in] Marx 1894, p. 163 ss.). It is the very second section of V2 – that is to say, the least-known and the harshest part gleaned from the crop of manuscripts of Capital – that we will focus on in the next sections.

3. The rate of turnover in Volume 2 of Capital

In section 2 we stressed that, according to the text of Chapter 4 of V3 of Capital, every reduction in the time of turnover of capital involves a proportional increase in the annual mass of surplus-value and, thereby, in the rate of profit. More precisely, under a regime of simple reproduction, the mass of surplus-value appropriated by each single capitalist firm in a year is equal to «the mass of surplus value appropriated in one turnover period of the variable capital, multiplied by the number of such turnovers in a year» ([Engels in] Marx 1894, pp. 166-167). We also pointed out that Chapter 4 of V3 was written by Engels. By contrast, in the rest of V3 and in V1 of Capital Marx never explicitly refers to the turnover of capital. However, a thorough look at the whole crop of Marxian manuscripts reveals that it is just in later-called 'Chapter 16' of V2 that Marx provides a complete definition of the concept of the annual mass of surplus-value. It is in this chapter that the mass of surplus-value is explicitly defined as the product between the surplus-value generated in a single turnover period (of variable capital) and the number of annual turnovers (see Marx 1885, Ch. 16, pp. 369-393). Significantly enough, this formulation corresponds precisely to the expression used by Engels in 'his' Chapter 4 of V3.

Besides, in the self-same pages Marx re-defines the annual rate of surplus-value as either the ratio between the annual mass of surplus-value and the variable capital employed in a single turnover period or the product between the single-period rate of surplus-value (labelled the 'real rate of surplus-value' by Marx 1885, p. 305) and the

number of annual turnovers. This makes it clear that the annual rate of surplus-value is equal to the single-period rate of surplus-value if and only if the turnover period of capital is equal to one year. Obviously, if the turnover period is lower than one year, then the same capital may be re-invested several times over the year and, therefore, the annual rate of surplus-value will be higher than the single-period rate. If, by contrast, the turnover period is longer than one year, then the annual rate of surplus-value is lower than the single-period rate. The capital advanced will cover just a fraction of the turnover period. In Marx's own words, the point is that:

> [t]he earlier or later transformation of the replacement value into money, and hence into the form in which the variable capital is advanced, is evidently a circumstance quite immaterial to the production of surplus-value. The latter depends on the magnitude of the variable capital applied, and on the level of exploitation of labour. But the circumstance mentioned above does modify the size of the money capital that has to be advanced in order to set in motion a definite amount of labour-power in the course of the year, and in this way it does affects the annual rate of surplus-value. (Marx, 1885, p. 387)

On the one hand, given the amount of surplus-value generated within each productive cycle, the increase in the speed of turnover (that is, the reduction in the turnover time) involves an increase in the annual rate of the surplus-value. On the other hand, the faster is the turnover of (variable) capital, the higher will be the annual mass of surplus-value, given the rate of surplus-value.[10] In simple algebraic terms, if we call S_i' the mass of surplus-value extracted in one year,[11] S_i the amount of surplus-value realized by capitalist firms at the end of each single turnover period in the i-th industry, and n_i the number of annual turnovers of capital, then the annual mass of surplus-value amounts to:

$$(2) \qquad S_i' = n_i S_i = n_i s_i V_i$$

and the annual rate of surplus-value of the i-th industry is given by:

$$(3) \qquad s_i' = \frac{S_i'}{V_i} = n_i s_i$$

Equation (3) defines the annual rate of surplus-value when the length of the whole cycle of production and exchange (i.e. the turnover time) does not correspond to one year. But what about the annual rate of profit? In order to answer this question, notice that in V3 of Capital Marx calculates the rate of profit as the ratio between the surplus-value created in a single turnover and the total amount of (constant and variable) capital, or, to put it differently, as the ratio between the single-period rate of surplus-value and the organic composition of capital. In formal terms, if we call r_i the single-period rate of profit of the i-th industry, we can write:

$$(4) \qquad r_i = \frac{s_i}{\frac{C_i}{V_i} + 1} = \frac{s_i}{q_i + 1}$$

where C_i is the so-called 'constant capital', and q_i is the 'organic composition of capital'.[12] By replacing the single-period rate of surplus-value in equation (4) with the annual rate of surplus-value indicated in equation (3), we obtain:

$$(5) \qquad r_i' = \frac{s_i'}{q_i + 1} = n_i \cdot \frac{s_i}{q_i + 1}$$

Equation (5) provides the annual rate of profit realized by the i-th industry under a simple reproduction regime in a non-fully competitive economy, and corresponds to the formula actually used by Engels in Chapter 4 of V3. Although it has never been explicitly provided by Marx, it can easily be derived by crossing the formula of the single-period general rate of profit provided by Marx in V3 with the formula of the annual rate of surplus-value provided in V2. Notice, however, that, according to Marx, the competition between capitals leads to the 'equalisation' (or 'perequation') of the sectoral rates of profit, in the 'long run' at least. Consequently, the formula provided by equation (5) should be further modified in order to consider the effect of competition between capitals. The annual general rate of profit is therefore:

$$(5\text{bis}) \quad r' = \hat{n} \cdot \frac{s}{q + 1} \qquad \text{with: } \hat{n} = \frac{\sum_{i=1}^{k} n_i V_i}{\sum_{i=1}^{k} V_i},\ s = \frac{\sum_{i=1}^{k} n_i s_i V_i}{\sum_{i=1}^{k} n_i V_i},\ \text{and } q = \frac{\sum_{i=1}^{k} C_i}{\sum_{i=1}^{k} V_i}$$

where $\hat{n}$ is the average rate of turnover, q is the overall organic composition of capital, and s can be defined as the 'single-cycle average rate of surplus-value' (accounting for the idiosyncratic turnover times required by the different sectors). Notice, in this regard, that the average rate of turnover can be obtained as the weighted mean of the sectoral rates. Notice, in addition, that the turnover rate is only defined by the variable part of capital, as the constant capital does not 'valorise' in the process of production and, therefore, does not affect the annual mass of surplus-value – as shown by equation (2). Plainly, the following additional proposition holds:

> **Proposition 1** If every industry shares the same turnover time (and, thereby, the same turnover rate), then the annual rate of surplus-value, s', is a simple multiple of the (average) single-period rate of surplus-value, s, as stated by Engels.
>
> **PROOF**. From equations (2) and (5bis) we can derive the annual rate of surplus-value of the economy as a whole, that is: $s' = \hat{n}s = \sum_{i=1}^{k}(n_i s_i V_i) / \sum_{i=1}^{k} V_i$. Given $\bar{n} > 0$, it is trivial to check that if $n_i = \bar{n}\ \{\forall\, i = 1, 2, ..., k\}$ then $s' = \bar{n}s = \bar{n}\sum_{i=1}^{k}(s_i V_i) / \sum_{i=1}^{k} V_i$.

Yet, this could happen just by chance. Besides, given the organic composition of capital, the same consideration has to be extended to the annual general rate of profit.

This is the reason equation (5bis), instead of equation (5), should be regarded as the general expression of the annual rate of profit (under a simple reproduction regime). We think that this is the equation that Marx would have provided if he could complete V3 of Capital.[13]

4. Time of production, time of circulation and time of turnover

So far we have been focusing on the Marxian definition of the rate of turnover of capital without analysing the main components of the time-length of turnover. It is time to bridge this gap. For Marx, the time-length of turnover covers the total cycle (or circuit) of capital from the circulation sphere to the production sphere, and from this latter again to the circulation. Accordingly, it is possible to split the whole logical-time sequence into: the 'time of production' of the commodities; and the two phases (notably, C - M, M′ - C′, from the viewpoint of the commodity capital; and M - C, C′ - M′ from the viewpoint of the money capital) which compose the 'time of circulation'. As it will be argued in Section 5, both changes of form of capital have to be taken net of transportation and some kinds of maintenance of commodities, as these activities must be considered as autonomous spheres of production.

4.1 The time of production

The time-length of production includes, first of all, the stricto sensu 'working time', namely, the period of time during which the workers employed in the production process provide 'living labour'. It is during this period that the anticipated variable capital valorises. However, only a portion of the time of production is also working time. The time of production also includes those possible periods in which the productive process is interrupted. Think of breaks, delays and other periods during which, as in the case of the stock of raw materials, the means of production «are held in reserve as conditions of the process, and thus already represent productive capital, but are not yet engaged in the production process» (Marx 1885, p. 200-201). Moreover, the productive process «may itself involve interruptions of the labour process and hence of working time, intervals in which the object of labour is exposed to the action of physical process, without further addition of human labour» (Marx 1885, p. 201). This means that the time of production is usually higher than the working time. To put it differently, the time of production usually exceeds the time that is necessary for the creation of the surplus-value to take place. In Marx's own words, the general rule is that:

> Working time is always production time, i.e. time during which capital is confined to the production sphere. But is not true, conversely, that the entire time for which capital exists in the production process is necessarily therefore working time. (Marx 1885, p. 316)

Consequently, the lower the gap between the time of production and the working time,

the greater will be the capital valorisation in a given period of time. This is the reason capitalist firms always try to avoid (or to reduce) any interruption of the time of production. Interestingly enough, the «saving of the time which is commonly lost in passing from one species of work to another» is one of the three strengths of the division of labour mentioned by Adam Smith – the other two being «the increase of dexterity in every particular workman» and «the invention of a great number of machines which facilitate and abridge labour, and enable one man to do the work of many» (Smith 1776: 21-22).

4.2 The time of circulation

The time of circulation includes both the time that the capital needs to turn from the 'commodity' form into the 'money' form (i.e. the time of sale of the produced commodities) and the time that the capital needs to turn from the 'money' form into the 'commodity' form (i.e. the time of purchase of productive factors). It is about simple 'metamorphoses' of the capital's 'form of value' which do not affect the process of valorisation. Notice that the time of circulation (as defined above) and the time of production (including both the strictly-defined production and the transportation time) are mutually exclusive as, «[d]uring its circulation time, capital does not function as productive capital, and therefore produces neither commodities nor surplus-value» (Marx 1885, p. 203). The expansion/contraction of the period of circulation is the negative limit of the expansion/contraction of the production time. In other words, the time of circulation constitutes a constraint to the creation of surplus-value. This is the reason (manufacturing) capitalist firms always try to reduce the time of circulation (compared to the time of production) as much as they can.

As we mentioned, from the 'commodity capital' viewpoint, the circulation time can be split into the time of sale (which is necessary to convert output-commodities into an equivalent amount of money) and the time of purchase (which is necessary to allow capitalist firms to turn their money capital into input-commodities, particularly labour-force). According to Marx, the sale of the produced commodities and, hence, the monetary realization of the created value constitute the preponderant part of the time of circulation. The movement C′ - M′ would be, therefore, the most important phase of the process of circulation – in the short run at least. The time of sale is the time required for the social 'monetary validation' of the potential surplus-value that has been (already) created in the production sphere.[14] The extent of this period depends on a number of different factors, such as the efficiency of the commercial sector and the effective demand level. By contrast, it is rather controversial if «the distance of the market where the commodities are sold from their place of production» (Marx 1885, p. 327), and hence the delivery time, have to be regarded as components of the time of circulation. The point is that, as Marx himself clarifies, the transportation industry (along with other

activities of conservation of commodities) has to be regarded as productive. As such, it is part of the sphere of production. This is the reason we do not comprise the transportation time into the strictly-defined circulation time hereafter.

Turning to the time of purchase, it is the length of time that capitalist firms need in order to turn their monetary resources (that is, the initial finance required to start the production process) into a productive capital (that is to say, into the required quantity of labour-force and the other means of production). In this regard, it is worth noting that 'the remittance of money' takes a period of time that must be added to the period of purchase of commodities. Even though the innovations in the means of payment can reduce sharply this period of time (think of modern electronic systems of payment), the time of financing is doomed to increase during the periods of crisis and economic instability. As Marx noticed in the Grundrisse, by quoting Henry Thornton, «Guineas are hoarded in times of distrust» (Marx 1857-58, p. 816, italics in the original). By contrast, the time of financing is likely to reduce during the upswing – as it is argued in the next sections. In any case, the greater the distance of raw materials from the place of production, the greater will be the quantity of raw materials purchased, and hence the longer the period of time during which the capital will stay in the form of 'latent capital'. Finally, a longer distance entails a greater «mass of capital that must be advanced at one stroke, and [a longer] time for which it must be advanced, the scale of production being otherwise the same» (Marx 1885, pp. 331-332).

4.3 The total time of turnover

To sum up, the time of turnover is the sum of the time of circulation (i.e. the time of purchase of inputs plus the time of sale of output) and the time of production (including both the working time and pauses/interruptions in the process of production). In simple algebraic terms, the total time of turnover of the i-th industry is therefore:

$$(6) \qquad t_i^R = t_i^C + t_i^P \qquad \text{where: } t_i^C \geq 0,\ t_i^P > 0$$

The longer the time of circulation, given the time-length of production, the longer will be the overall period of turnover of capital. To put it differently, the lowest theoretical limit of the period of turnover is given by the minimum time of production allowed by the historically-determined technology level.

Finally, notice that the time of circulation, t^C, can be further split into the time of realisation (i.e. the time-length of delay in selling the commodities, call it t^S) and the time of financing (i.e. the time-delay in re-investing money capital, call it t^F, with $t^C = t^S + t^F$) (see Foley 1986). Analogously, the time of production can be split into the working time (that is, L) and the break time (call it, t^B, with $t^P = L + t^B$). However, for the sake of simplicity, we neglect these additional distinctions hereafter.

5. The costs of circulation

As Marx observed, the circulation of capital entails some costs (i.e. the 'costs of circulation') which reduce the profitability of the sum invested. This means, inter alia, that the reduction in the time of circulation through technological or institutional innovations is worthwhile only if their cost is lower than the revenue due to the higher (i.e. faster) valorisation of capital. In this regard, Marx distinguishes the expenses for the maintenance of commodities and the transportation costs from the 'pure costs of circulation'.

5.1 The expenses of maintenance and storage of commodities

The costs of maintenance and storage of commodities can originate from productive processes which continue in the circulation sphere. Their «productive character is thus merely hidden by the circulation form» (Marx 1885, p. 214). Even though these costs

> make commodities dearer without increasing their use-value [and, therefore, they] are faux frais of production from the social point of view, for the individual capitalist [firm] they can constitute sources of enrichment. On the other hand, in so far as what they add to the price of the commodity merely distributes these circulation costs equally, they do not thereby cease to be unproductive in character. (Marx 1885, pp. 214-215)

All of the expenses linked to the stock of commodities are an example of costs of maintenance and storage. The accumulation of large stocks of unsold commodities might be, in turn, the result of the lack of demand. If commodities are produced 'to order', the lack of demand entails a slow-down, or even a stop, in the productive process, until new orders come. By contrast, if the production process cannot be interrupted, the inventories of capitalist firms will increase. Obviously, the period over which the capital stays in the form of stock of commodities represents a negative standstill for the process of production (unless it is the result of a free choice of the capitalist firm). The point is that, the later the output is sold (that is, the later the commodity capital is turned into a sum of money), the lower will be, ceteris paribus, the speed of turnover of capital and, thereby, the higher will be the charge of maintenance and storage. In fact, the increase in inventories, be they either unsold commodities or raw materials, makes capitalist firms incur additional costs. The status of these costs in Marx's analysis is, however, uncertain.

First, the expenses for commodity maintenance and storage affect the unit price set by the single capitalist firm, as they are linked to the need to preserve the 'use value' of the commodity capital. This is the reason maintenance and storage costs are never pure costs of circulation.[15] Insofar as a given quantity of labour-power and other means of production are employed in the maintenance and storage of inventories, these resources are subtracted from the production process. Maintenance and storage expenditures represent, therefore, an 'opportunity cost' for the individual capitalist firm. As such, this

cost will be added to the final price of commodities.

Second, turning to the capitalist class as a whole, some maintenance and storage costs directly affect the value of commodities produced (and can be likened to the transportation costs), whereas others do not. Consequently, the latter should be regarded as faux frais of production, whereas the former are 'productive' costs. As stressed by Murray, in Chapter 6 of V2 «Marx distinguishes between circulatory functions that are necessitated strictly by the peculiar formal properties of capital, that is, function performed strictly to accomplish the metamorphosis of capital, and other functions». Notice that the production functions, including transportation, are included by Marx in the 'other functions'. Similarly, the maintenance and storage costs «are productive insofar as they are necessary, from the use-value point of view, for the free flow of industrial capital, but unproductive when they result from interruptions of the formal changes from commodities to money». The point is that «when Marx says that circulation excludes production, he means circulation in a restricted sense that pertains only to the formal changes capital must undergo; the broader, everyday understanding of circulation includes productive expenditures» (Murray, 1998, p. 45-46).

5.2 The pure costs of circulation: purchase, sale and financing

Turning to the 'pure' costs of circulation, the period of time that is necessary for the transformation of capital from money to commodities, and then from commodities to money, is 'time of sale' and 'time of purchase' for the individual firm (see Marx 1885, p. 207 ss.). If one supposes that commodities are traded at prices which correspond to their individual labour-value, then it is plain to conclude that the time of trading entails only a change in the form of value. But even if one assumes that the commodities are exchanged at unit prices which do not correspond to the unit labour-values, the whole mass of value created in the production process is unaffected by this circumstance. This is about a zero-sum game, which does not change the aggregate value of commodities. Plainly, the two metamorphoses, M - C and C′ - M′, involve time-consuming transactions. For instance, a change in contractual conditions «costs time and labour-power, not [in order] to create value, but rather to bring about the conversion of the value from one form into the other, and so the reciprocal attempt to use this opportunity to appropriate an excess quantity of value does not change anything» (Marx 1885, pp. 207-208). If the producers were not capitalist firms but, say, direct producers or artisans, they would then deduct the time of trading from their working time. This is the reason they have always tried «to defer such operations to feast days» (Marx 1885, p. 208). By contrast, industrial firms usually devolve that function to other commercial firms for which «buying and selling is a major function. Since [the industrial firm] appropriates the product of many people, on a larger social scale, so [it] has also to sell on such a scale, and later to transform money back again into the elements of production» (Marx

1885, pp. 208-209). However, once again the time of trading does not add any value to the commodities produced, in spite of the illusion generated by the function of commercial capital. In fact, it is plain that:

> if we have a function which, although in and for itself unproductive, is nevertheless a necessary moment of reproduction, then when this is transformed, through the division of labour, from the secondary activity of many into the exclusive activity of a few, into their special business, this does not change the character of the function itself. One merchant (considered here merely as the agent of the formal transformation of commodities, as mere buyer and seller) may, by way of his operations, shorten the buying and selling time for many producers. He should then be considered as a machine that reduces the expenditure of useless energy, or helps to set free production time. (Marx 1885, p. 209)

Finally, among the pure costs of circulation, Marx includes also the costs of financing. According to Marx, the big corporation that chooses to satisfy its own needs of liquidity by borrowing from the banking system does not usually affect the time-length of turnover of capital. However, this is true only during 'normal times'. As we have already mentioned, Marx is perfectly aware that, 'in times of distrust', the access to finance, and hence the accumulation of that part of money capital which exceeds the current internal funds of the capitalist firm (and which is necessary to start the process of production) is doomed to reduce sharply. Hence, although Marx has never explicitly referred to this, *the conditions of financing and the 'state of confidence' of* banks and financial markets may affect the turnover process (and, therefore, the annual profitability) of a certain capital.[16] In any case, even the big corporation that borrows from banks will sustain some additional costs in terms of passive interest-payments, fees, commissions and other financial burdens. These are pure deductions from the surplus-value, which can be likened to the pure costs of circulation, as they do not add any value to the commodities. They represent a mere subtraction from the social surplus-value or, in other words, a 'tax on profit'. In this regard, notice that it is Marx who recalls, in the very V2, that the surplus-value «which must always exist initially in the hands of the industrial capitalist [is then split] into different categories, the bearers of which appear alongside the industrial capitalist as the landlord (for ground-rent), the money-lender (for interest), etc.» (Marx, 1885, p. 497). Therefore, even though the concept of the 'interest-bearing capital' is only developed by Marx in V3 (see Marx 1894, pp. 499-500), the nature of interests, fees, and commissions, as 'pure costs of circulation' (for industrial capitalist firms) can be consistently gathered from the text of V2. In fact, a thorough analysis of this part of V2 of Capital could provide some further insights about the role of credit and interest-bearing capital in Marx's analysis of laws of motion of capitalism.

5.3 The costs of transportation

We mentioned that the vast majority of the costs of circulation is subject to the general law according to which they do not add any value to the commodities. An important exception to this general rule, as Marx points out, is represented by the costs of transportation. More precisely, «[w]ithin the circuit of capital and the commodity metamorphoses that form a section of it, the metabolism of social labour takes place» (Marx 1885, p. 226). Such a change usually entails the transfer of commodities in space. In this regard, the industry of transportation involves a number of circulation costs whose specific phenomenal form cannot be inferred from the general law of circulation. Although the transportation does not affect the physical properties of commodities, the use-value of commodities arises only in the act of final consumption. This latter usually requires the transportation of commodities from one place to another (for instance, from the factory to the market). As a result, the industry of transportation is subject to the general law of production, according to which the productivity of labour is inversely related to the (potential) value of commodities.

As Marx points out, there are some «modifying circumstances» to take into account, when analysing this topic. The most important circumstance is that, thanks to the development of the capitalistic economies, the cost of transportation per unit of output tends to reduce over time. This is the result of both the progress in the system of communication and the increasing degree of concentration of the industry of transportation. These factors could reduce the portion of social (both 'direct' and 'objectified') labour spent in the transportation of commodities, thereby reducing the time of turnover. Yet, this is not the result of the reduction in the time of circulation, but the result of the increase in the productivity of the transportation sector (i.e. of the reduction in the time of production). To sum up, on the one hand, the transportation sector must be regarded as «an independent branch of production, and hence a particular sphere for the investment of productive capital; on the other hand, it is distinguished by its appearance as the continuation of a production process within the circulation process and for the circulation process» (Marx 1885, p. 229).

6. The temporal composition of capital

In section 3 we provided the general definition of the annual rate of turnover of capital: it is the number of times in which a certain amount of (variable) capital is re-invested in the production process over one year. In section 4 we showed that, according to Marx, the time of turnover of capital can be split into the time of circulation and the time of production. Both of them are expressed as annual fractions. Consequently, the annual rate of turnover of capital can be expressed as follows:

$$(7) \qquad n_i = \frac{1}{t_i^R} = \frac{1}{t_i^P(\tau_i + 1)} \qquad \text{where: } \tau_i = \frac{t_i^C}{t_i^P} \text{ and } t_i^P > 0, t_i^C \geq 0$$

where τ_i is the ratio of the circulation-time to the production-time of the i-th industry.

We propose to label τ_i as the 'temporal composition' of the capital invested by firms operating in the i-th industry.[17] If the organic composition of capital is the ratio between the 'living' component of capital (corresponding to living labour) and the 'dead' components of capital (i.e. intermediate goods resulting from past labour), the temporal composition of capital can be defined as the ratio between the time in which the capital remains unproductive in the circulation sphere and the time in which the same capital takes the form of means of production and labour-force in the production sphere. If we assume that the time of production of each sector is set by the available technology,[18] and that the labour productivity is given (i.e. we abstract from the dynamics triggered by the class struggle in the production sphere), then it is the temporal composition that determines the rate of turnover of capital of the single firm in the short-run. This point is portrayed in Diagram 1. The diagram also shows that the theoretical upper limit of the rate of turnover is approximately fixed by the inverse of the length of working time (if breaks and interruptions of the production process are negligible).

[INSERT HERE DIAGRAM 1]

Both the circulation time and τ_i depend, in turn, «on improved [...] communication in the long run, and in the short run (over the course of the business cycle) on the ability to sell or realize the commodities which have been produced» (Fichtenbaum 1988, p. 222, who refers to Marx 1885, p. 317). Significantly, the few scholars who have analysed the role of the turnover of capital have focused just on its short-run real determiners[19] – that is to say, on the possible decrease in the rate of turnover owing to the lack of 'effective' demand. This is certainly an important point because it allows Marx to account for the real causes of the business cycle. However, we think that the financial and/or long-run determiners of the circulation time are likewise important if one wishes to analyse the dynamics of a 'financially-sophisticated' capitalistic economy. The point is that the circulation time is affected not only by the efficiency of the commercial and communication systems (where the capital appears in its commodity form), but also by the developments in the banking & finance industry (where the capital assumes its monetary form). The higher the impact of this industry on the speed with which a given capital can be re-invested in the same production process (or moved to another, more profitable, business), the higher will be the related rate of turnover of capital.[20]

Turning to the rate of profit and using equation (7) in equation (5), we obtain:

$$(8) \qquad r_i' = \frac{1}{t_i^P(\tau_i + 1)} \cdot \frac{s_i}{q_i + 1} = \frac{s_i}{t_i^P(\tau_i + 1)(q_i + 1)}$$

If we conventionally take the time of production of a certain sector, call it '0', as the time numéraire of the whole system, then equation (8) becomes:

$$(8bis) \quad r_i' = \frac{\hat{s}_i}{\theta_i(\tau_i + 1)(q_i + 1)} \qquad \text{where: } \theta_i = \frac{t_i^P}{t_0^P}, \text{ and } \hat{s}_i = \frac{s_i}{t_0^P}$$

where $\hat{s}_i$ is the normalized rate of surplus-value, namely, the rate of surplus-value per unit of production time of industry 0. Plainly, the equation of the annual rate of profit of industry 0 reduces to:

$$(8tris) \quad r_0' = \frac{\hat{s}_0}{(\tau_0 + 1)(q_0 + 1)}$$

Equation (8bis) shows that, given the organic composition of capital (q_i), the relative time of production (θ_i), and the single-period (normalized) rate of surplus-value $(\hat{s}_i)$, it is the temporal composition of capital (τ_i) that determines the annual rate of profit of the i-th industry compared to other industries. Yet, as we mentioned in section (3), the competition between capitals will lead – according to Marx – to the long-run equalisation of the annual sectoral rates of profit. In this case, equation (8tris) can be re-read as the equation of the annual general rate of profit, where the total time of production of the economy is conventionally taken equal to one, q_0 is the organic composition of capital of the whole economy, τ_0 is the average temporal composition of capital (calculated as the weighted mean of the sectoral average temporal compositions), and $\hat{s}_0$ is the single-period average rate of surplus-value (as defined in Section 3).

The main results of the analysis above can now be shortly recalled and generalized.

Proposition 2 The higher (lower) the temporal composition of capital of the i-th industry compared to that of other industries, the lower (higher) will be the extracted annual mass of surplus-value compared to that of other industries.

PROOF. Using equation (7) in equation (2), we obtain: $S_i' = s_i V_i / [t_i^P(\tau_i + 1)]$. It follows that S_i' / S_j' decreases as τ_i / τ_j increases $\{\forall\, i, j = 1, 2, ..., k\}$.

Proposition 3 The annual rate of surplus-value extracted in the i-th industry increases (decreases) as the related temporal composition of capital decreases (increases). Similarly, the annual rate of surplus-value of the economy increases (decreases) as the average temporal composition of capital decreases (increases).

PROOF. Using equation (7) in equation (3), we obtain: $s_i' = s_i / [t_i^P(\tau_i + 1)]$. It

follows that s_i' increases as τ_i decreases, given $s_i, t_i^P > 0$ $\{\forall i = 1, 2, ..., k\}$. Similarly, by recalling equation (8tris), let us define the overall annual rate of surplus-value as follows: $\hat{s}_0' = \hat{s}_0 / (\tau_0 + 1)$. It follows that $\hat{s}_0'$ increases as τ_0 decreases, given $\hat{s}_0 > 0$.

Proposition 4 The general annual rate of profit increases (decreases) as the average temporal composition of capitals decreases (increases).

PROOF. From equation (8tris) it follows that r_0' grows as τ_0 decreases, given $\hat{s}_0, q_0 > 0$.

As we mentioned, the short-run trend in the (average) temporal composition of capital is mainly the result of the trend in the time-length of circulation. This latter, in turn, is affected not only by the demand level and the efficiency of the communication and commercial sectors, but also by the state of the banking & finance system. In the long run, by contrast, the reduction in both the time required by the production process and the time-length of circulation can be regarded as an additional 'countertendency' to the tendential fall of the (general) rate of profit.[21] Consequently, for a given rate of surplus-value, the prime purpose of the capitalist firm will be to adopt each and every measure which is necessary to cut the two components of the time-length of turnover. In this regard, «[t]he main means whereby the production time is reduced is an increase in the productivity of labour, which is commonly known as industrial progress» ([Engels in] Marx 1894, p. 163). However, once again it is the duration of the time of circulation that plays the crucial role. As Engels observed, the main means

> of cutting circulation time has been improved communications. And the last fifty years have brought a revolution in this respect that is comparable only with the industrial revolution of the second half of the last century. On land the Macadamized road has been replaced by the railway, while at sea the slow and irregular sailing ship has been driven into the background by the rapid and regular steamer line; the whole earth has been girded by telegraph cables. ([Engels in] Marx 1894, p. 164)

From the telegraph cables of the nineteenth century up to the undersea cables of modern stock exchange markets – which allow investors to shift capitals worldwide in real time through high-frequency trading – the leap has not been that big.

7. The rate of turnover in a simplified two-sector economy

In order to further clarify how the rate of turnover affects both value creation and profitability of capitalist firms, let us consider a simplified capitalistic economy split into two different industries or sectors: the productive sector, marked by the subscript 'p'; and the unproductive sector (whose output value equals the cost of production and hence does not contain any surplus-value), marked by the subscript 'u'.[22] As the total capital invested in the unproductive sector is a deduction from the total surplus-value, an interesting point here is how this affects the process of creation of surplus-value. As

we will show, such deduction assumes importance under the expanded reproduction regime. By contrast, since the amount of surplus-value 'lost' by the productive sector is exactly matched by the sum appropriated by the unproductive sector (though consumed in the form of unproductive capital), this 'deduction' does not reduce the rate of surplus-value for the capitalist class as a whole under a simple reproduction regime. In other words, in the absence of productive capital accumulation, the specific use of the surplus-value does not directly affect its current and future volumes.

This said, we may identify the productive sector with the manufacturing industry, and the unproductive sector with the banking & finance industry. For the sake of simplicity, let us assume that the two sectors are characterized by the same time of turnover. Against this background, we can easily determine the general rate of profit, r, of the economy at the end of each single turnover time, that is:

$$(9) \qquad r = \frac{S}{C+V} = \frac{S_p}{C_p + C_u + V_p + V_u}, \qquad \text{with: } \left(C_u + V_u\right) \leq S_{p(-1)}$$

where S_p is the single-period surplus-value (expressed in monetary units) extracted in the manufacturing sector, $V_{p,u}$ is the variable capital invested in each industry (that is, the sectoral monetary wage-bill), and $C_{p,u}$ is the constant capital invested in each industry (that is, the sectoral monetary value of the employed factors of production, except for labour-power). As usual, the absence of any subscript denotes those magnitudes which refer to the whole economy, whereas $S_{p(-1)}$ is the surplus-value realised in the previous period.

Turning to the annual general rate of profit, r', its value obviously depends on the specific regime of capital accumulation. We analyse the two cases separately in the next subsections.

7.1 The annual general rate of profit under a simple reproduction regime

In formal terms, the Marxian 'scheme of simple reproduction' corresponds to the simple capitalization regime addressed in financial mathematics. When the surplus-value obtained at the end of each turnover period is not re-invested in the subsequent cycle (but, say, it is turned into 'consumption' of the capitalist class and/or into unproductive capital), the annual rate of profit of the whole capitalist sector is simply equal to the single-period profit rate times the rate of turnover of capital (see Proposition 1),[23] that is:

$$(10) \qquad r' = n \cdot r = n \cdot \frac{S_p}{C_p + C_u + V_p + V_u} = \frac{nsV_p}{C_p + C_u + V_p + V_u}$$

where $s = S_p / V_p$ is the single-period rate of surplus-value of the economy. This latter is

given by the ratio of the single-period mass of surplus-value extracted in the productive sector to the variable capital invested in the same sector. Notice that we do not include in the denominator of s the mass of variable capital corresponding to the wage-bill paid to unproductive workers. If we did so, an increase in the variable capital anticipated in the unproductive sector would entail a reduction in the rate of exploitation of the working class. But this is clearly meaningless. The point is that V_u is not the monetary expression of a strictly-defined 'necessary labour time' (as opposed to a 'surplus-labour') and, therefore, it does not contribute to the definition of the rate of surplus-value of the economy. From a Marxian viewpoint, unproductive workers (such as bank employees and financial operators) are not 'exploited'.

This clarified, by dividing both the numerator and the denominator of equation (10) by V_p, we get:

$$\text{(10bis)} \qquad r' = \frac{ns}{q + \omega + 1}$$

where $q = (C_p + C_u)/V_p$ is the ratio between the total constant capital and the variable capital of the productive sector, and $\omega = V_u / V_p = v_u L_u / v_p L_p$ is the ratio of unproductive to productive variable capital in the two-sector economy considered. For the sake of simplicity, we do not break the rate of turnover, n, into its components.

Equation (10bis) shows that, ceteris paribus, the higher the capital paid to hire unproductive workers compared to the capital paid to hire productive workers, the lower will be the rate of profit. Such a conclusion recalls the old battle of Classical economists (except for Malthus) against unproductive uses of capital. Notice, however, that, insofar as it is recognised that the amount of resources employed in the banking & finance sector can positively affect the rate of turnover, the final effect of a change in ω on the annual profit rate becomes ambiguous, as it depends on the specific form of the function $n = n(\omega)$. More precisely, the annual general rate of profit turns out to depend on the impact of the relative number of employees of the banking & finance sector on the time of circulation of capital, given the time of production. In other words, it depends on the impact on the temporal composition of capital. In formal terms:

Proposition 5 Both sign and magnitude of the impact – on the annual general rate of profit – of a change in the employment share of unproductive industries depend on *'how'* the activity of those industries affects the rate of turnover of productive capital.

PROOF. For the sake of simplicity, let us assume that n is a continuous and differentiable function of ω. Using $n = n(\omega)$, with $dn(\omega)/d\omega > 0$, in equation (10bis) and calculating the derivative with respect to ω, we obtain:

$$\frac{dr'(\omega)}{d\omega} = \frac{n'(\omega)\cdot s\cdot(q+\omega+1)-n(\omega)\cdot s}{(q+\omega+1)^2}.$$

Thus, r' is an increasing function of ω $\forall\omega|\omega>0$ and $n'(\omega)\cdot(q+\omega+1)-n(\omega)>0$, whereas it is a decreasing function of ω $\forall\omega|\omega>0$ and $n'(\omega)\cdot(q+\omega+1)-n(\omega)<0$.

In order to provide a simple representation of this point, let us consider a pure-labour production process, where q = 0. The annual general rate of profit of the economy, corresponding to the annual rate of surplus-value, is therefore equal to $ns/(\omega + 1)$. Furthermore, since $r_u = r_p = r = s$, it follows that $v_u = v_p = v$ and $\omega = L_u/L_p$. In other words, ω is the ratio of unproductive to productive labour units.

[INSERT HERE DIAGRAM 2]

It seems to be reasonable to assume that the absolute impact on the rate of turnover of an increase in the (relative) number of unproductive labour units (employed in the banking & finance industry) is positive, whereas its marginal impact is negative. The rationale is that the higher the degree of development of the banking & finance sector (approximately measured by ω), the higher will be the speed at which manufacturing firms (or their owners/shareholders) could re-invest the initial capital. At the same time, beyond a given historically-determined threshold at least, 'diseconomies' are expected to arise as the (relative) dimension of the banking & finance sector increases. Given these hypotheses, we can portray the two 'multipliers' of the rate of surplus-value, n and $1/(\omega + 1)$, through a simple diagram. Diagram 2 shows that the share of unproductive labour units that maximizes the general rate of profit is positive (i.e. $\omega^* > 0$). More precisely, such share is given by the higher combination of the two multipliers of the single-period rate of surplus value (see the bold line in Diagram 2). The point is that the potential maximum annual rate of surplus-value depends (also) on the impact of ω on the rate of turnover. The development of the banking & financial industry produces, thereby, non-linear effects on the general profitability of capital.

7.2 The annual general rate of profit under an expanded reproduction regime

Before we conclude, we would like to add some short considerations on the Marxian expanded reproduction scheme. In mathematical terms, such a scheme corresponds to the compound capitalization financial regime. As a first approximation, we could suppose that capitalist firms of productive industries re-invest in each production cycle a constant share of the surplus-value realized in the previous period. Notice that, given the organic composition of capital, the net share of surplus-value which turns into

additional variable capital (call it β) is a sub-share of the gross ratio of retained surplus-value, as the latter covers also the investment in additional constant capital. It is the net share that directly affects the process of creation of surplus-value, therefore setting the rate of profit as well. However, both the accumulation of productive constant capital and the share of surplus-value which is turned into unproductive capital (or capitalists' consumption) indirectly affect the accumulation process. In fact, the range of values assumed by the net share of surplus-value invested in new productive variable capital stays between zero and the one's complement of the share of surplus-value invested in both additional productive constant capital and additional unproductive capital (or capitalists' consumption). The former is determined by the organic composition of capital, whereas the latter is determined by the ratio of unproductive to productive variable capital. If it is assumed that the rate of exploitation ($s > 0$) is steady over time and capitalists do not consume, then the general formula of the annual mass of surplus-value is:

$$\begin{aligned} S'' &= \underbrace{s \cdot V_p}_{t_1} + \underbrace{s \cdot \left[V_p \cdot (1+\beta \cdot s) \right]}_{t_2} + \underbrace{s \cdot \left[V_p \cdot (1+\beta \cdot s)(1+\beta \cdot s) \right]}_{t_3} + \ldots = \\ &= sV_p \sum_{t=1}^{n} (1+\beta s)^{t-1} \quad \text{with: } 0 \le \beta \le \frac{1}{1+q+\omega} \end{aligned} \tag{11}$$

Equation (11) shows that, insofar as a constant share of the surplus-value is re-invested in productive variable capital, the mass of surplus-value (i.e. the mass of profits) increases over time. Notice that if, by contrast, we assume that capitalist firms do not invest in productive variable capital any portion of the surplus-value realised at the end of each single cycle (namely, if we put $\beta = 0$), then equation (11) reduces to:

$$S'' = S' = S \cdot n = sV_p n \tag{11bis}$$

As for the annual general rate of profit, it becomes:

$$r'' = \frac{S''_p}{C_p + C_u + V_p + V_u} = \frac{sV_p}{C_p + C_u + V_p + V_u} \cdot \sum_{t=1}^{n} (1+\beta s)^{t-1} \tag{12}$$

This is obtained by dividing the overall annual mass of surplus-value by the initial amount of total capital advanced by capitalist firms. The higher the turnover rate, the higher is the annual mass of surplus-value accrued on the original capital. More precisely, equation (12) shows that under the expanded reproduction scheme (viz. in a growing economy) the annual rate of profit is more than n times the single-period rate of profit, owing to the accumulation process (see Foley 1987, p. 92). Plainly, if we assume that the rate of re-investment (in productive variable capital) of capitalist firms is nil (that is, $\beta = 0$), then equation (12) reduces to equation (10).

Concluding remarks

To sum up, the aim of this article was threefold: first, to bridge the gap in the literature dealing with the V2 of Capital; second, to provide a re-definition of several Marxian concepts on the basis of the role played by the rate of turnover of capital; third, to analyse the effect of developments in the banking & financial industry on the turnover time and, thereby, on the rate of profit. In this regard, we found that by a combination of a re-reading of the standard version of Marx's Capital with the new evidence from the MEGA^2 edition it is possible to obtain the following results:

i. The work of Friedrich Engels on the original manuscripts of V2 of Capital must be regarded as more than a simple editing of Marx's manuscripts, because Engel's work directly affected the analytical core of Marx's theory, such as the analysis of the role of the turnover of capital.
ii. Neither the formula provided by Marx in V3 of Capital nor the one provided by Engels in Chapter 4 of the same volume can be regarded as the general equation of the annual rate of profit.[24]
iii. Rather, the usual Marxian formulation should be modified, in the spirit of Marx, not only to explicitly include the impact of the rate of turnover of capital (as Engels does in Chapter 4 of V3), but also to consider both the long-run equalization of the rate of profit and the re-investment of capitalist firms (that is, the expanded reproduction of capital).
iv. The rate of turnover and, therefore, the profitability of capital are crucially affected by the conditions of the banking & finance sector, due to its effect on production and investment decisions.
v. Insofar as the development of the banking & finance sector (which is usually regarded as an unproductive sector) enables 'industrial' capitalist firms to increase the speed of turnover of capital, the final effect of an increase in the share of (unproductive) labour units employed in the banking & finance sector on the general rate of profit could be positive (below a given threshold of unproductive capital at least).
vi. This very effect should be regarded as a further (temporary) 'countertendency' to the Marxian law of the tendential fall of the rate of profit.[25]

This is the reason we think that Marx would perhaps have regarded the process of 'financialisation' of advanced economies in the last three decades as the 'humpback bridge' that the capitalist class has eventually gone through to sustain the profitability of capital.

Bibliography

Arthur C. J. and Reuten G. (eds.) 1998. The Circulation of Capital: Essays on Volume *Two of Marx's Capital*, London, Macmillan and New York, St. Martin's Press

Bellofiore R. 2005. The Monetary Aspects of the Capitalist Process in the Marxian System: An Investigation from the Point of View of the Theory of the Monetary Circuit, pp. 124-39 in Moseley F. (ed.), *Marx's Theory of Money*, Basingstoke, Palgrave Macmillan

Bellofiore R. and Fineschi R. 2009. Introduction, pp. 1-16 in Bellofiore R. and Fineschi R. (eds.), Re-reading Marx. New Perspectives after the Critical Edition, Basigstoke, Palgrave.

Bellofiore R., Starosta G. and Thomas P. (eds.) 2013. *In Marx's Laboratory.* Critical Interpretations of the Grundrisse, Leiden and Boston, Brill

Campbell M. 1998. Money in Circulation of Capital, pp. 129-57 in Arthur C. J. and Reuten G. (eds.), op. cit.

Desai M. 1979. Marxian Economics, Oxford, Basil Blackwell Publisher

Dos Santos P. L. 2011. 'Production and Consumption Credit in a Continuous-Time Model of the Circuit of Capital', Research on Money and Finance Discussion Paper no 28, SOAS, Department of Economics

Duménil G. 1975. L'expression du taux de profit dans 'Le Capital', Revue Économique, vol. 26, no. 2, 198-219

Duménil G. and Foley D. 2008. The Marxian transformation problem, in Durlauf S. N. and Blume L. E. (eds.), The New Palgrave Dictionary of Economics (Second Edition), Basingstoke: Palgrave Macmillan. Online since 07 January 2014, DOI:10.1057/9780230226203.1052

Foley D. 1986. *Understanding Capital: Marx's Economic Theory*, Harvard, Harvard University Press

Fichtenbaum R. 1988. 'Business cycles', turnover and the rate of profit: an empirical test of Marxian crisis theory, Eastern Economics Journal, vol. 13, no. 3, 221-28

Garbero P. 1985. Teoria del valore, lavoro produttivo e costi di circolazione in Marx [Value theory, productive labour and circulation costs in Marx], Quaderni di storia *dell'economia politica*, vol. III, no. 2, 81-101

Haass, J. M. 1992. Technical and organizational progress and the turnover of capital, Review of Radical Political Economics, vol. 24, no. 1, 114–35

Hecker R. 2002. La seconda Sezione della MEGA^2 verso il completamento [Towards the Completion of the MEGA^2 Second Section], pp. 49-67 in Mazzone A. (ed.), MEGA^2: Marx Ritrovato grazie alla nuova edizione critica, Roma, Mediaprint

Hecker R. 2009. New Pespectives Opened by the Pubblication of Marx's Manuscripts of Capital Vol. II, pp. 17-27 in Bellofiore R. and Fineschi R. (eds.), op. cit.

Heinrich M. 1996/7. Engels' Edition on the Third Volume of Capital, and Marx's Original Manuscript, Science & Society, vol. 60, no. 4, 452-66

Hourwich I. A. 1894. The rate of Profits Under the Law of Labour-Value, Journal of Political Economy, vol. 2, no. 2, 235-50

Laibman D. 1992. Value, Technical Change, and Crisis: Explorations in Marxist Economic Theory, New York, M. E. Sharpe Inc.

Lapavitsas C. 2000. On Marx's Analysis of Money Hoarding in the Turnover of Capital, Review of Political Economy, vol. 12, no. 2, 219-35

Lexis W. 1895. The concluding volume of Marx's Capital, The Quarterly Journal of Economics, vol. 10, no. 1, 1-33

Marx K. 1857-58. Grundrisse Foundations of the Critique of Political Economy (Rough Draft), UK, Penguin Books Ltd/New Left Review, 1993

Marx K. 1867. Capital. A critique of Political Economy, Volume One, UK, Penguin Books Ltd/New Left Review, 1976

Marx K. 1885. Capital. A critique of Political Economy, Volume Two, UK, Penguin Books Ltd/New Left Review, 1978

Marx K. 1894. Capital. A critique of Political Economy, Volume Three, UK, Penguin Books Ltd/New Left Review, 1981

Marx K. 1992. Ökonomische Manuskripte 1863-67, MEGA^2, Teil II, Band 4.2, Berlin, Dietz Verlag

Morishima M. 1973. *Marx's Economics: A Dual Theory of Value and Growth*, New York and London, Cambridge University Press

Murray P. 1998. Beyond the 'Commerce and Industry' Picture of Capital, pp. 33-66 in Arthur C. J. and Reuten G. (eds.), op. cit.

Roth R. 2009. Karl Marx's Original Manuscripts in the Marx-Engels-Gesamtausgabe (MEGA): Another View on Capital, pp. 27-49 in Bellofiore R. and Fineschi R. (eds.), op. cit.

Rubin I. I. 1928. *Essays on Marx's Theory of Value*, New Delhi, Aakar Books, 2008

Saros D. E. 2008. The Turnover Continuum: A Marxist Analysis of Capital Fluctuations, Review of Radical Political Economics, vol. 14, no. 2, 189-211

Saros D. E. 2013. Interlocking Turnover Continua and the Structure of Capital, Review of Radical Political Economics, published online on 12 December 2013, DOI: 10.1177/0486613413506081

Savran S. and Tonak E. A. 1999. Productive and Unproductive Labour: An Attempt at

Clarification and Classification, Capital & Class, vol. 23, 113-52

Schmidt C. 1889. *Die Durchschnittsprofitrate auf Grundlage des Marx'schen* Werthgesetzes [The Average Rate of Profit, Based on *Marx's Theory of Value*], Stuttgart: Dietz. Italian edition: Il saggio medio del profitto e la legge marxiana del valore, Milano, Casa Editrice Summa Uno, 1971

Smith A. 1776. An Inquiry into the Nature and Causes of the Wealth of Nations, Chicago, University of Chicago Press, 1977

Thomas P. D. and Reuten G. 2013. Crisis and the rate of Profit in Marx's Laboratory, pp. 311-28 in Bellofiore R., Starosta G. and Thomas P. (eds.), op. cit.

Webber M. J. and Rigby D. L. 1986. The rate of profit in Canadian Manufacturing, 1950-1981, Review of Radical Political Economics, vol. 18, no. 1&2, 33-55

Philological Appendix

Engels' editorial work on Marx's manuscripts composing V3 of Capital was thorough, but, to some extent at least, ambiguous (notice that the manuscripts later included in V3 are: one rough draft of V3, dated 1864/65; some treatises on surplus value and profits, dated 1867/68; some draft of the beginning of V3 dated 1867/68; and two comments on differential rent, dated 1876). On the one hand, Engels explicitly claims that he only made some minor revisions in the spirit of Marx. On the other hand, there is evidence that he made several changes which have not been clearly pointed out, though aiming to make the text more understandable. The point is that the two aims – philological accuracy and readability – were mutually inconsistent. As the MEGA^2 clearly shows, no paragraph of V3 has remained as Marx wrote it. Like Engels' editing of V2, the changes made by Engels in V3 concerned titles, headings and the structure of the manuscripts. In addition, Engels made a meticulous sub-division of the Marxian text: while the original manuscript (1864-65) comprised seven chapters, each with a few paragraphs, Engels split it into seven parts, further divided into fifty-two chapters and several paragraphs. As a result, Engel's arrangement of the text and the new headings have deeply influenced the understanding of V3 over time. More precisely, the 'first draft' nature of the Marxian work has been widely misunderstood. The vast majority of Marx's original manuscripts are open-ended and undecided. Engels only provided some of the possible answers to the questions raised by Marx. Sometimes he ended up neglecting the existence of the original Marxian questions. This is particularly remarkable with regard to the credit theory developed by Marx in V3. Notice also that Marx was not happy with his presentation of 1864/65, in which he started from the relationship between the surplus-value and the profit. Consequently, he wrote at least four additional drafts of that presentation in 1867/68, where he started from 'cost, price and profit'. As previously mentioned, one of the subjects which remained open-ended was 'credit and

interest', tackled in the fifth chapter. Notice that this chapter includes several excerpts representing a sort of collection of ideas and insights which needed further elaboration. Notice also that not only did Marx add such excerpts (to the original manuscript) at a later date, but also that he never returned to these subjects ever again. Against this background, the analysis of 'credit' was the last topic in the analysis of interest-bearing capital within Marx's original manuscript. By contrast, under Engels's final arrangement of V3, the analysis of interest-bearing capital turned into an introduction to the analysis of credit. Therefore, a fundamental question arises: was the analysis of the credit system part of Marx's original plan of V3 of Capital? On this point, the interpretations provided, so far, by Marxists diverge. Some of them are prone to answer negatively (see, for instance, Heinrich 1996-7, pp. 460-463). These scholars stress that in the 1864/65 manuscripts Marx repeatedly states his intention to disregard the analysis of the credit system. They point out also that Engels often provides his personal interpretation of Marx's statements. For instance, Marx introduces what later become the paragraph entitled 'Credit. Fictitious Capital' as follows:

> Die Analyse des Creditwesens und der Instrumente, die es sich schafft, wie des Creditgeldes u.s.w., liegt ausserhalb unsres Plans [An analysis of the credit system and of the instruments which it creates for its own use, like credit-money etc., lies beyond our plan]. (MEGA^2, II/4.2, p. 469)

By contrast, Engels' translation is:

> It lies outside the scope of our plan to give a detailed analysis of the credit system and the instruments [that] this creates (credit money, etc.). (Marx, 1894, p. 525)

Therefore, it was Engels who added the adjective 'detailed' (eingehende). As a result, the qualitative distinction between the different levels of abstraction of Marx's analysis disappears. This, in turn, would have allowed Engels to include in V3 any issues mentioned, by Marx, however sporadically, with no regard for its specific level of abstraction.

Yet, according to other scholars, there would be a second possible interpretation of Marx's theory of credit, mostly found in Marx's correspondence. For instance, at the end of April 1868, Marx states that both credit and interest-bearing capital should be included in the fifth chapter of V3. In November 1868 he talks about the fifth chapter as «the chapter of credit». Later, in the summer of 1880, Marx confirms this emphasis in an interview that was released to The New York Sun (see Roth 2009, p. 37). The same scholars also point out the relevance of the articles written by Marx (mainly for the New York Tribune) in the 1850s and 1860s. These articles should be regarded as a further elaboration of Marx's theory of credit (we refer again to Roth 2009, p. 39). However, the question of the role of credit and its impact on the valorisation process (within Marx's manuscripts of V3) is still open.

Tables and figures

Diagram 1. The impact of a change in the temporal composition of capital on the rate of turnover.

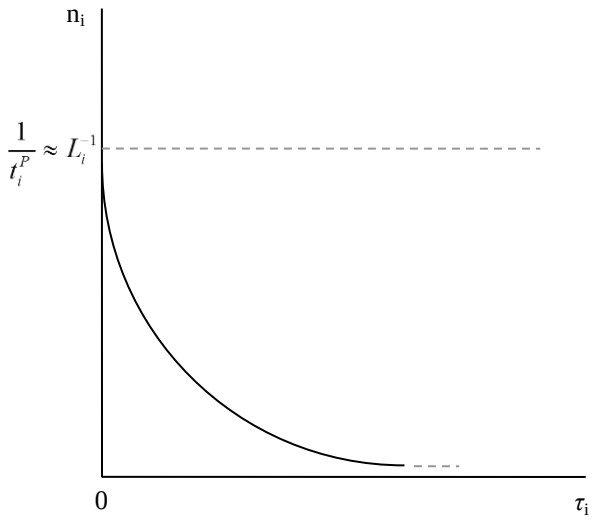
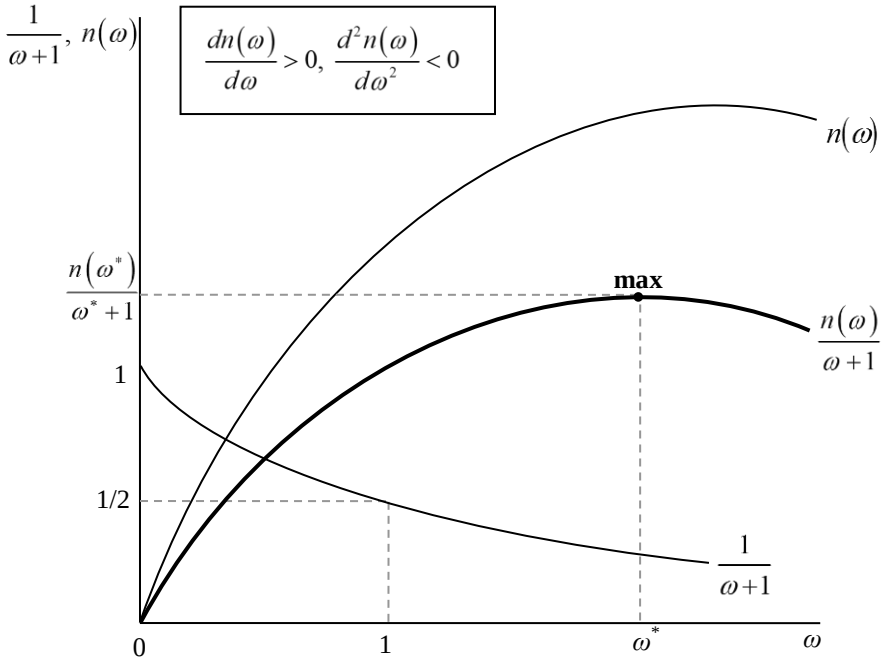


Diagram 2. The share of unproductive labour units maximizing the general rate of profit. Notes: n(ω) is portrayed as a parabola where the coefficient of the square term is negative, the intercept is nil and the elasticity is > 1.



Notes

[1] This led some authors to label it as the 'forgotten volume' of Marx's Capital (see the introduction of Mandel to Marx 1885; see also Saros 2008, p. 189).

[2] In our opinion, this disagreement depends on the different levels of abstraction of the analyses proposed by Marx and Lapavitsas, respectively. However, a thorough discussion of Lapavitsas' criticism is beyond the scope of this paper.

[3] Incidentally, we found these two works just after the writing of the first draft of our paper. Recently, the model presented in Saros (2008) has been further extended (see Saros 2013).

[4] The MEGA^2 project has generally been neglected (see Bellofiore and Fineschi 2009), in spite of the fact that it affects the historiographical ground underpinning the current debate on Marx's works. In this regard, notice that the collection of essays edited by Arthur and Reuten (1998) is not an exception, as it has been published before the integral publication of Marx's original manuscripts of V2.

[5] On this point, see mainly Hecker (2009, p. 18). It also deserves to be noticed that the new material made available by the MEGA^2 philological edition confirms Marx's assertion that he wrote all of the preliminary drafts of the three books of Capital before the publication of V1 (see Hecker 2002, p. 57). More precisely, the so-called Manuscript I of V2 was written in the first half of 1865, whereas, starting from March 1867, Marx had been writing some fragments of V2 and V3 of Capital, and some collected excerpts as well. This material is now called the Manuscript III, due to the numeration used by Marx for labelling his drafts. Still, in October 1867 Marx wrote the so-called 'fragment used for Manuscript IV'. Thereafter, Marx re-started writing V2, but he stopped at the section labelled 'The concept of turnover'. This document is now known as the Manuscript IV. After a break, he re-started working in December 1868. The Manuscript II was ready in the second half of 1870. The subsequent manuscripts – namely, the Manuscript V (April 1877) and the Manuscript VI (after October 1877 and before July 1878) – are rather short (as the former has only 17 pages). The same goes for the Manuscript VII (dating back to July 2nd 1878 and amounting to 7 pages only). Finally, the so-called Manuscript VIII was labelled 'the 1878 Manuscript' by Engels. However, according to a number of scholars, this manuscript should be dated back to a period between the last quarter of 1880 and the first half of 1881 (see, for instance, Hecker 2002, p. 59). As for the manuscripts comprising V3, we refer the reader to the Philological Appendix at the end of the paper.

[6] The 'circulation capital' (Zirkulationskapital) must not be confused either with the 'circulating capital' (as opposed to the 'fixed capital') or with the 'variable capital' (as opposed to the 'constant capital'). On this point, see also note 8.

[7] We prefer to use the label 'capitalist firm' instead of 'capitalist' in order to stress that Marx's analysis always refers to impersonal forces and 'functions' (i.e. relationships between social classes), and not to single individuals. In the Preface of V1, Marx made it clear that he «[does] not by any means depict the capitalist and the landowner in rosy colours. But [that] individuals are dealt with here only in so far as they are the personifications of economic categories, the bearers [Träger] of particular class-relations and interests» (Marx 1867, p. 92).

[8] Following the standard Marxian nomenclature, we name 'variable capital' that part of total capital corresponding to the wage-bill paid to workers employed in the i-th sector. By contrast, the label 'constant capital' refers to the sum of 'fixed capital' (that is, capital invested in fixed assets such as land, buildings, vehicles, plant and equipment, etc.) and 'circulating capital' (raw materials, intermediate goods, etc.) net of the wage-bill. For the sake of simplicity, we assume that all of constant capital is made by circulating capital hereafter. Capital components are expressed in units of money.

[9] Notice that the whole amount of living labour time units expended in the i-th industry (L_i) can be regarded as the product between the number of workers hired in the i-th industry (call it N_i) and their working day (call it g_i), that is: $L_i = g_i N_i$. However, for the sake of simplicity, we will assume hereafter that $g_i = g \{\forall\ i, = 1, 2, 3, \ldots, k\}$.

[10] According to Marx, the difference in capitals' times of turnover assumes an even higher importance if one considers the whole social capital, instead of examining each single capital alone. We will come back to this point over the next sections.

[11] From here onwards, by reversing the algebraic symbolism employed by Marx (and Engels), we will use a prime in the superscript to indicate those magnitudes which refer to one year, as opposed to magnitudes which refer to a single turnover of capital.

[12] The measuring of capital within equation (4) gave rise to the 'transformation' controversy which followed the publication of V3 and which still enlivens the debate among Marxian scholars. As mentioned, we adopt here a 'simultaneous' and 'single-system' interpretation of Marx's theory, according to which each magnitude in denominator of equation (4) is expressed in monetary units. These monetary units express, in turn, a certain quantity

of direct social labour. However, a thorough analysis of the transformation problem is beyond of the scope of our paper.

[13] Some authors, such as Fichtenbaum (1988, p. 223), attributes equation (5) to Marx. As we argued, we think that it should be rather regarded as an Engels' contribution. Other authors derive the rate of turnover from the annual profit rate equation. For instance, Desai (1979, p. 65) defines it as the ratio of the fixed capital to the constant capital. Foley (1986, p. 92) defines it as 'the ratio of the flow of capital advanced to the stock of capital tied up in the production circuit', that is: $\check{n} = (C + V)/K$. Interestingly enough, Foley (1986)'s definition is consistent with our equation (5bis), as: $r' = \check{n}s/(q + 1) = [(C + V)/K]s/(q + 1) = s/K$. For the derivation of the formula of the annual rate of profit under an enlarged reproduction regime (within a simplified two-sector economy), we refer the reader to Section 7.

[14] On this point, we refer the reader to Bellofiore (2005, p. 133).

[15] In Marx's own words: «their actual object is not the formal transformation of value, but the conservation of the value which exists in the commodity as a product, a use-value, and hence can be conserved only by conserving the product, the use-value itself. The use-value is not increased or raised; on the contrary, it declines. But its decline is restricted, and is it itself conserved. The value that is advanced and exists in the commodity is also not increased here. But new labour, both objectified and living, is added to it» (Marx 1885, p. 217).

[16] Notice that Marx (1894) talks extensively about 'confidence' in what later became the fifth part of V3. See in particular: ch. 22, pp. 480-492; ch. 25, pp. 525-442; ch. 26, pp. 543-565; ch. 31, pp. 626-636; ch. 34, pp. 680-698; and ch. 35, pp. 699-727.

[17] It is Marx himself who stresses the relevance of this ratio, as he makes clear that the amount of the additional capital which is necessary to assure the continuity of the production process (over the period of circulation) is determined by the ratio of the time of circulation to the time of turnover (see Marx 1885, p. 342), that is: $\tau' = t^C/t^R = \tau/(1 + \tau)$.

[18] This assumption is adopted by Marx himself (1894, p. 70). See also Ficthenbaum (1988, p. 222).

[19] See, for instance, Laibman (1992). A noteworthy exception is Murray (1998: 50-1) who shows that «the durations of the several components of turnover time have a profound effect on the realisation, distribution, rate and accumulation of surplus value […] and that the durations of those periods depend upon a host of use value factors including […] the sorts of financial 'instruments' in use». Notice that, in the wake of the Marshallian tradition, we use the term 'short run' to define a logical time dimension, as opposed both to the 'long run' (as the other logical time dimension) and the 'short period' (as a historical-time period). However, in the wake of Marx, we identify the long run with the theoretical condition of reproduction of the economy.

[20] In today's economies, the impact of the developments in the banking & finance industry on corporate profits is further strengthened by the improvement in the realisation phase, for instance, by means of 'consumer credit'. On this point, see Dos Santos (2011).

[21] The standard formulation of the law of the fall of the rate of profit in the long run is provided in Marx (1894, pp. 317-338). Actually, as the original manuscript edited by MEGA^2 shows, Marx never expresses the explicit purpose to formulate a general law (see Roth, 2009, p. 34, note 24). In fact, in the original manuscripts of V3, Marx provides several examples of economic settings under which the rate of profit would be increasing. The very open-ended nature of Marx's analysis (due also to the unfinished nature of manuscripts of V3) is likely to be the reason he does not explicitly refers to the reduction in the time turnover of capital as one of the counter-tendencies to the fall of profit rate. However, a thorough examination of this issue is certainly worth to be made in future works. We refer the reader to Bellofiore, Staraosta and Thomas (2013), particularly the third chapter of part 5 (Thomas and Reuten, 2013, pp. 311-28).

[22] The literature on the Marxian concept of 'productive' (and 'unproductive') labour is too vast to be quoted. In our opinion, one of the most interesting positions is the one expressed by Rubin (1928), and partially recalled and improved by Savran and Tonak (1999). According to these authors, labour can produce either use-values or commodities (namely, 'values'). Commodity-producing labour, in turn, can be applied either to the 'petty commodity production' (i.e. the 'simple mercantile production') or to the 'wage-labour production'. Within the latter, wages can be paid either by income or by capital. When paid by capital, workers can be employed within either the circulation sphere or the production sphere. As mentioned, this latter includes transportation, maintenance and storage of commodities, namely, all of those functions which are conceived «as the continuation of a production process within the circulation process and for the circulation process» (Marx 1885, p. 229). It is only when labour is exchanged against capital within the production sphere that we are in presence of productive labour (for capital), that is, labour producing surplus-value. Notice that both Rubin (1928) and Savran and Tonak (1999) adopt Engels' most-disputed concept of the 'simple mercantile production', though, in our opinion, this does not affect their main conclusions. For a criticism of the above position, see Garbero (1985).

[23] If the two sectors are marked by different rates of turnover, then n can be regarded as the average rate of turnover. On this point, we refer the reader to equation (5bis).

[24] This happens because «[w]hen the social surplus-value is distributed between the capitals invested in different branches of industry, differences in the various times for which the capital is advanced (for example, varying lifespans in the case of fixed capital) and different organic compositions of capital (thus also the different circulations of constant and variable capital) have similar effects in the equalisation of the general rate of profit and the transformation of values into prices of production» (Marx, 1885, p. 294).

[25] This implication has been stressed in the pioneering contribution of Hourwich, according to whom '[i]ncreased rapidity of rotation [...] may reduce commissions and selling expenses sufficiently to make up for the fall of the gross profits, or surplus-value' (Hourwich 1894, p. 247).