Henryk Grossmann's Falling Rate of Profit theory of crisis: a presentation and a reply to old and new critics

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HENRYK GROSSMANN' FALLING RATE OF PROFIT THEORY OF CRISIS: A PRESENTATION AND A REPLY TO CRITICS

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Henryk Grossmann was the first Marxist economist that proposed a theory of crisis based on the Marxian law of the falling rate of profit due to the increasing organic composition of capital. This view, while initially disappointingly minoritarian, has become very popular nowadays within Marxist Political Economy. At the same time Grossmann's theory has been severely criticised by many economists (e.g., Sweezy, Howard and King etc.). In this essay, first, Grossmann's theory is presented. Then it is reformulated so as to be comparable to the Harrod-Domar tradition of growth models. Third, older and newer critiques are being reviewed critically. Finally, it concludes by arguing that Grossmann's theory – despite certain deficiencies to a large extent justified by its pioneering character - has a valid methodological and analytical basis. As such it is a true founder of modern theories of the falling rate of profit theory of crisis.

INTRODUCTION

Henryk Grossmann is renowned as the first Marxist economist who, during the mid-war era, formulated a theory of economic crisis based on the famous Marxian law of the Tendency of the Rate of Profit to Fall (TRPF) caused by the increase of the Organic Composition of Capital (OCC). This perspective, while very popular nowadays within Marxist Political Economy, had negligible support in the beginning of the 20th century when modern Marxist debates on crisis theory began. On the contrary, the other two historical theoretical perspectives (the theories of underconsumption and of disproportionality) dominated the scene.

Grossmann was born in 1881 in Cracow, coming from a rich Jewish family. He studied law and economics in Cracow and Wien with the economist Bohm-Bawerk (a leading proponent of the Austrian school) and the Marxist historian Karl Grunberg. He became active in the Left during his student years, was a founding member of the Jewish Socialdemocratic party of Galicia and, finally, in 1918, he joined the Polish Communist Party. At the same time he worked in the Central Statistical Agency and in the Free Polish University. Facing political persecutions he was forced, in 1925, to migrate to Germany. There he worked –

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after an invitation by his former teacher Grunberg – in the famous Frankfurt Institute for Social Research where he became a professor in 1930. He left Germany in 1933 after the Nazis' ascent to power and went first to Paris and then to London. He ended up in 1937 to New York where the whole Institute for Social Research had moved. After the 2nd World War he returned to East Germany and he was inaugurated professor of Political Economy in the University of Leipzig. He died in 1950.[1]

Grossmann's magnus opus, the 'Das Akkumulations-und Zusammenbruchsgesetz des Kapitalistischen Systems' was published in 1929 (it was published in an English [regretfully] abridged version in 1992 as 'The Law of Accumulation and Breakdown of the Capitalist System'). He also wrote 'Sismonde de Sismondi and his economic theories' in French in 1924 and the 'Evolutionary revolt against Classical Economics' in English in 1924 also. Another important work by Grossmann is the 'Die Anderung des ursprüngliche Aufbauplans des Marxschen Kapital und ihre Ursachen'('The change in the initial structure plans of Marx's Capital and their causes'), written in 1929, which studies the structure and the methodology of Marx's *Capital* a field in which followed the famous work of (the also Polish) Roman Rosdolsky (1977).

This essay studies Grossmann's theory of crisis and the macrodynamics analysis following from that. The second chapter presents Marx's analysis for the TRPF and the modern debates about it. The third chapter analyses Grossmann's contribution and focuses on two particular aspects: (a) its socio-political and theoretical background and its structure, crucial hypotheses and results and, (b) its relation to newer theories of growth stemming from Harrod's (1939, 1948) and Dommar's (1946) contributions. The fourth chapter reviews older and newer critiques and confronts certain of their arguments. The last chapter concludes by arguing that Grossmann's theory–despite certain deficiencies to a large extent justified by its pioneering character- has valid methodological and analytical basis. As such it is a true founder of modern theories of the falling rate of profit theory of crisis.

THE MARXIAN LAW OF THE TRPF AND THE MODERN CONTROVERSIES

Marx with his TRPF thesis aimed to prove that the capitalist system is inherently permeated by economic crises. In other words, economic crises in capitalism stem from organic causes. Moreover, he aimed to prove that, while the capital-labour antithesis (i.e. the wage relationship) is the fundamental one of the capitalist system, crisis tendencies are generated on its ground even when there is no active change of the class relations of power in favour of the working class. For this reason he consciously abstracted every crisis effect that can come from a change in the production process and income distribution that might favour labour. Consequently, he abstracted every factor that may lead to such effects and particularly the population constraint.[2]

The logic of the TRPF is the following. The fundamental motive in capitalism –the quest for profits–obliges every individual capital to strive (a) in the labour process against labour in order to exploit more the latter (i.e. to increase the

unpaid labour-time) and, (b) in the circulation process against other individual capitals in order to realise a greater portion of surplus-value in the form of profits. In the struggle against labour the mechanisation of production is the main weapon of capital because it enhances capital's control on the labour process and its ability to change in its favour the equilibrium between necessary and surplus labour-time (and, thus, between paid and unpaid labour-time). This enhances the extraction of surplus-value predominantly through the appropriation of relative surplus-value.[3]

In intra-capitalist competition every individual capital strive to reduce its unit production costs (its unit cost prices in Marx's terms). This dictates a rapid technical change which intensifies the use of capital and economises the use of labour (i.e. capital intensive and labour saving technical change).

At this point it is necessary to distinguish between technical change that is based on a new technology and leads to a new technological model (a thorough reconfiguration of the production process) and technical change within the existing technological model. In defining the TRPF we refer to the latter, i.e. it is being posited that the overall technological model remains the same. The reason for this is that only in this case we can define the OCC as an expression of the Technical Composition of Capital (TCC) and the Value Composition of Capital (VCC) (see Fine (1989)).[4] In plain words, a wholesale change of technology (a new technological model) changes completely the structure of constant and variable capital (and, of course, their interrelationship) and makes the new configuration incomparable to the previous one. Both the structures of the capital-labour relationship (the exploitation of labour) and of the capital-capital relationship (intra-capitalist competition) are altered radically. Such changes do not happen easily nor are continuous. They rather occur in special periods (sometimes after a serious crisis) and take place in distinct waves of change (even when their elements have already emerged).

Thus, with the assumption of technical change within the dominant technological model, innovating production methods lead to more capital intensive enterprises which can take advantage of economies of scale. By increasing the quantity of fixed capital processed, under normal capacity utilisation, they manage to lower their unit production costs. Because larger-scale production enables a given number of workers to process a greater amount of product, both raw materials and output per unit of labour tend to rise. At the same time, the greater amount of fixed capital per unit output implies higher depreciation charges and auxiliary materials' costs per unit output. Consequently, for innovative production methods, the higher capital advanced per unit of output implies higher unit non-labour costs (unit constant capital) while the higher productivity implies lower unit labour costs (unit variable capital). For the innovation to be profitable, the fall in the latter must be greater than the increase of the former so that the overall effect would be the decline of unit production cost (the sum of unit constant and unit variable capital). However, under given technical conditions, existing technology and knowledge and also the ability to increase the exploitation of labour have definite limits.

When these limits are reached, subsequent increases in investment per unit output will lead to smaller reductions in unit production costs. Therefore, the more advanced individual capitals would tend to achieve a lower unit production cost at the expense of a lower rate of profit. The lower unit production cost enables them to capture a larger share of the market. At the same time, because the dominant market price is determined not by the more advanced individual capitals, but by the average conditions of production in each branch, innovating capitals supplement their profits by getting extra profits in the market. These are a net transfer of surplus-value generated under the auspices of other capitals who operate on average or below average conditions. These extra profits and the loss of market share compel other capitals to adopt the new production methods. However, this would sooner or later curtail the extra profits of advanced capitals, as their advantages would be eroded. When all production is stabilized at the new technical level, the result would be an increased rate of total constant over total variable capital and a lower general rate of profit.

The effects of the TRPF can be temporarily offset by an increase of the mass of profit, through the expansion of production. However, sooner or later, the TRPF weakens the incentive to invest leading to the stagnation of the mass of profit. This will lead to the inability to invest profitably the accumulated capital and thus *overaccumulation* takes place: the amassed capital is standing idle. For Marx, the only solution to the problem is the devalorisation (the destruction) of a significant amount of the accumulated capital. Because, in principle, the predominantly private character of the capitalist system does not facilitates a smooth (probably planned) devalorisation of capital (usually under state auspices) the devalorisation will take a wild, anarchical character; thus leading to a general crisis which affects even profitable and viable individual capitals. When devalorisation has proceeded enough then the surviving capitals will be adequately restructured and the field for profitable investment would be again expanded (with the closure of many enterprises). These will provide the necessary ground for a restart of the accumulation process.

Marx recognised that the TRPF co-exists with a number of counteracting tendencies such as (a) economies in the use of constant capital, (b) emergence of new spheres of production where the organic composition of capital (OCC–the ratio of constant to variable capital) is lower (for example, less developed countries or new branches), (c) intensification of exploitation, (d) imports of cheap inputs and depression of wages below the value of-labour-power (for example, due to increases of the reserve army of labour). In actual history, whether the TRPF or its counter-tendencies will prevail is a matter of contingency. However, in principle, the TRPF is the dominant side of this contradictory unity because the counter-tendencies operate within strict constraints. For example, intra-capitalist competition induces rapid technical change, which increases the OCC, since it absorbs machinery faster than it employs workers. This relative displacement of workers by machines is met with definite limits in the ability to intensify exploitation (i.e. increase the extraction of surplus-value). This is so because, under a given technological

model, capital is severely constrained by human physical limits in how much it can increase labour exploitation.

The TRPF has been at the centre of modern debates. Most of its critics refer to the Okishio (1961) theorem, which maintained that under certain assumptions (constancy of the real wage, perfect competition and so on) viable technical change raises the rate of profit. More specifically, if the real wage rate remains constant (i.e. if capitalists rip all the benefits from the improved conditions of production) then the profit rate would increase. It can only fall if workers are benefited at least partially by these new conditions of production. Hence, if capitalists choose technical change that maximizes the profit rate, then the latter is not going to fall. This thesis has been disputed from different perspectives. One route has been the questioning of Okishio's assumptions. Foley (1986) has shown that with a wage rate rising to maintain a constant wage share of output, capital-using technical change lowers the rate of profit. Fine (1989) also rejected Okishio's static equilibrium framework and argued that the TRPF law is a contradictory unity of the central tendency (translating a rising TCC to a rising OCC) and its counteracting tendencies (which affect the formation of the VCC). Another perspective accepts Okishio's assumptions but criticizes his definitions. Shaikh (1978a) distinguishes between the rate of profit estimated over total fixed and circulating capital (that is, covering the value of producer durable goods which transfer their value over a number of periods) and the margin of profits, estimated over current costs only. Capitalists introduce new techniques which-by lowering current costs-increase the profit margin but reduce the profit rate (through increased mechanization).

In a nutshell, Marx argued that it is the very success of the system (the rapid increase of accumulation) that leads to its failure (the inability to sustain the profit rate and, thus, to its fall and the subsequent crisis). This failure can, ultimately, only be surpassed through a destruction process (i.e. the devalorisation of significant portions of capital). Only this can, in the end, lead to a renewal of the accumulation process from leaner and more robust bases. This twin dialectical process of success - failure and destruction - creation is, for Marx, the crisis process.

GROSSMANN'S THEORY OF CRISIS

Grossmann's interest for the problem of economic crisis was fomented by the crisis debate within the Left in the beginning of the 20th century. To a large extent this debate was triggered by E.Bernstein's heretical thesis – representing the so-called 'neo-harmonists' - that capitalism is not destined to economically collapse and, thus, the labour movement should strive to reform it gradually. This thesis was challenged from many and different quarters. In the beginning it was confronted by K.Kautsky, the grand pope of German socialdemocracy, who in the end agreed with Bernstein's conclusions. From another perspective it was challenged by R.Luxemburg who argued that economic crisis would lead to capitalism's collapse. She attributed the cause of crisis to underconsumption (i.e. the lack of sufficient demand) and, at the same time, she explicitly rejected

facets of Marx's analysis (particularly his Volume's II schemes of reproduction). In her political conclusions she argued for capitalism's revolutionary overthrow. In the same vein, Sternberg advanced an economic theory, which adopted elements by both Luxemburg and the 'neo-harmonists', but concluded with the same revolutionary call. But for Sternberg the overthrow of the system does not stem from economic necessity but from ethical requirements of a voluntarist nature.

Grossmann rejected all these views. He vehemently disagreed with Bernstein's analysis and political reformism. But at the same time he disagreed with both Luxemburg's underconsumptionism and Sternberg's voluntarism. He argued that the class struggle for the overthrow of the capitalist system is not being developed in a void but has serious objective foundations and constraints. Thus, this struggle depends upon the inherent crisis tendencies of the system that tend to lead it to economic collapse. Although he has been accused by many for adopting and economistic and crudely determinist approach, Grossmann–because of his active political engagement–never disregarded the importance of class struggle and its possibilities neither he purported that the system is going to be overthrown solely by an economic collapse and independently of class struggle. He, however, maintained that all these processes are founded and operate within objective economic constraints.

For Grossmann the cause of economic crisis does not stem from secondary facets of the capitalist economy (monopolies, international trade etc.) but from the very *essence of capitalist accumulation*. He, therefore, consciously abstracted all these secondary crisis factors that stem from these secondary facets of capitalism (e.g. disequilibria of supply and demand, problems of monetary intermediation and of the financial structure). He also abstracted the effects of working class' struggle on both the change of labour relations and income distribution. This does not imply that it does not play a significant role. But Grossmann, by 'freezing' its operation, aimed to prove that capitalism is inherently prone to crises irrespectively of working class' intervention.

From within this perspective, he proposed a general theory of economic crisis, i.e. one that analyses the general, abstract and essential causes of economic crisis irrespectively of their historical specific forms of appearance. The vehicle for his theory was the Bauer (1913) model. This model was created in order to refute Luxembourg's underconsumptionist theory of crisis and collapse. It was based on the assumptions of (a) an increasing OCC (and thus a TRPF), (b) equilibrium between supply and demand, (c) constant market prices (equal to labour values) and (d) constant value of money. Simulating this model for 4 years Bauer argued that the capitalist system is viable. Grossmann extended the simulation and proved that after several years the system is indeed going to collapse.

The Bauer–Grossmann Model

Grossmann's reformulation of the Bauer model is a two-sector model (departments of means of (a) production and (b) consumption) in the vein of Marx's reproduction schemes. He makes the following assumptions:

This is a closed economy model.

There are only capitalists and workers, i.e. there are no intermediate classes (e.g. there is no separate class of landowners and thus the complications of ground rent). Also, capitalists are pure industrial capitalists (i.e. the complications produced by the operation of merchant and money-dealing capital are being abstracted).

The rate of surplus-value is constant (at 100%).

Population's rate of increase is constant and geared to the rate of increase of variable capital.

The wage rate is constant.

Capital's turnover period is the same in all sectors (one year).

The rate of accumulation is equal in the two departments.

The rate of increase of constant capital is higher (10%) than the rate of increase of variable capital (5%), so as to exhibit the rising OCC.

The following is his own mathematical formulation of the model, slightly modified:

If c: constant capital and v: variable capital

k: capitalists' consumption share

α_c: rate of accumulation of constant capital

α_v: rate of accumulation of variable capital

s': rate of surplus-value

s: mass of surplus-value

Ω : OCC ($\Omega = c/v$)

R: rate of profit ($R = \dfrac{s}{c+v} = \dfrac{\dfrac{s}{v}}{\dfrac{c}{v}+\dfrac{v}{v}} = \dfrac{s'}{\Omega+1}$)

(1) $c_t = c_0 r^t$, where c_0: initial constant capital and c_t: constant capital after t periods

$$r = 1 + \left(\frac{\alpha_c}{100}\right)$$

(2) $v_t = v_0 w^t$, where v_0: initial variable capital and v_t: variable capital after t periods

$$w = 1 + \left(\frac{\alpha_v}{100}\right)$$

(3) $s = k + \alpha_c \dfrac{c}{100} + \alpha_v \dfrac{v}{100}$

(4) $R = \dfrac{k + \alpha_c \dfrac{c}{100} + \alpha_v \dfrac{v}{100}}{c + v}$

(5) Total value produced is: $AV = c + v + k + \alpha_c \dfrac{c}{100} + \alpha_v \dfrac{v}{100}$

(6) The rate of the capitalists' consumption share to the total surplus-value is k / s

(7) The rate of capitalists' investment (in constant and variable capital) to

the total surplus-value is $\dfrac{\alpha_c \dfrac{c}{100} + \alpha_v \dfrac{v}{100}}{s}$

(8) The mass of surplus-value is derived from:

(8a) $s = k + c_t \left(\dfrac{a_c}{100} \right) + v_t \left(\dfrac{a_{v_n}}{100} \right)$

and

(8b) $s = v_t \left(\dfrac{s'}{100} \right)$

By equating (8a) and (8b) we get:

(9) $k = v_t \dfrac{(s' - a_v)}{100} - c_t \left(\dfrac{a_c}{100} \right)$

By substituting (1) and (2) in (9) we get:

$$k = \dfrac{v_0 w' (s' - \alpha_v)}{100} - \dfrac{c_0 r' \alpha_c}{100}$$

In the Bauer-Grossmann model the initial levels and the rates of growth of constant and variable capital are given. The rate of surplus-value is, also, given. Hence, the mass of surplus-value is derived. As it can easily be discerned, all the crucial factors and rhythms of the model are given except from the distribution of surplus-value between capitalists' consumption and capitalists' investment. The latter is directly determined by the (given) rates of growth of constant and variable capital. Therefore, the only variable of the model is

capitalists' consumption share. However, the constant increase of accumulation –dictated by the rates of growth of constant and variable capital–require continuously increasing funds. On the other hand, the extraction of surplus-value fails to provide–to the required extent–these funds as its rate of growth (with a constant rate of surplus-value) is determined by the rate of growth of variable capital (which is by hypothesis smaller from that of constant capital). Therefore, in order for the rhythm of accumulation to be sustained, it is necessary funds to be transferred from the only available variable pool (i.e. capitalists' consumption share) to the capitalists' investment share. This gradual exsanguinations leads ultimately to the drainage of the first share and, consequently, to the collapse of the system.

In Grossmann's model when $k = 0$ then:

$$\frac{v_0 w'(s'-\alpha_v)}{100} = \frac{c_0 r' \alpha_c}{100} \Leftrightarrow (s'-\alpha_v)v_0 w' = \alpha_c c_0 r' \Leftrightarrow \left(\frac{r}{w}\right)' = \frac{(s'-\alpha_v)v_0}{\alpha_c c_0} \Leftrightarrow \left(\frac{r}{w}\right)' = \frac{(s'-\alpha_v)}{\alpha_c \Omega_0}$$

By taking the logarithmic form of the latter we can calculate the time of collapse of the system, which is a real number under the assumption that $s' > \alpha_v$:

$$t = \frac{\log \dfrac{s'-\alpha_v}{\alpha_c \Omega_0}}{\log \dfrac{100+\alpha_c}{100+\alpha_v}}$$

As it can be seen, the timing of collapse depends on (1) the initial OCC (Ω_0), (2) the rates of growth of constant (α_c) and variable capital (α_v) and, (3) the rate of surplus-value (s'). The higher the initial OCC and α_c the sooner comes the collapse. Conversely, the higher the initial α_v and s' the later comes the collapse. These relationships show the methods that can be employed in order to delay the collapse by activating appropriate countertendencies: to lower the rate of growth of or to devalorise constant capital, to lower wages or to export capitals. In these cases crises can be managed and instead of leading to collapse they will result in cyclical fluctuations (i.e. in the cyclical succession of phase of boom and down turn).

Moreover, Grossmann (1992, p.71-2) perceptively brought forward the Marxian relationship between the fall of the rate of profit and the mass of profits. He pointed out that in the initial periods the TRPF goes together with an increasing mass of profits and an increasing capitalists' consumption share. Only after the 21st year, in his simulation, the TRPF leads to a fall in the mass of profits. For Grossmann (1992, p.77), a Marxist theory of the economic cycle must be based on this changing interrelationship between the rate and the mass of profit. The increasing valorisation of capital leads to a boom even with a falling rate of profit. On the contrary, the imperfect valorisation of capital is the cause of the downturn and, ultimately, of crisis. It is very interesting how

Grossmann relates the imperfect valorisation of capital with its overaccumulation. In the boom phase, sooner or later, capital will start increasing faster than the surplus-value that can be extracted from the given population. This will cause overaccumulation and, thus, imperfect valorisation of capital. This will lead to downturn. In this phase the mass of profits would contract abruptly and, consequently, the added capital could not sustain the required rhythm of accumulation. This will result in (a) unemployment and, (b) a mass of capital that cannot be invested and remains idle; exactly as Marx has maintained. The appearance of (increasing) unemployment refutes directly Bauer's response to underconsumptionism. The latter argued that in so far as capital accumulation proceeds sufficiently fast so as to keep pace with the growth of population--with a given level of productivity--the system will create the markets it needs irrespectively of the increasing OCC. Grossmann proves that capitalism cannot sustain such a pace. Moreover, he argues that the *reserve army of labour* caused by the deficient accumulation of capital is a different process than the substitution of workers by machines. The latter is a normal tendency of capitalism, generated by intracapitalist competition and technical change and happens even in phases of boom. Contrarily, unemployment caused by deficient accumulation--which is, also, generated by the TRPF due to the increasing OCC--is a special process taking place solely in the phase of downturn.

Bauer--Grossmann and Harrod

Orzech and Groll (1983), Bronfenbrenner and Wolfson (1984) and Samuelson and Wolfson (1986) have brought forward the similarities between the Bauer-Grossmann and the Harrod model. In order to do so they have formulated single-sector models by aggregating the typical Marxian two departments of production. This is a path that Grossmann, after Bauer, had also followed in his mathematical model; although he kept in his numerical simulations the two sectors. What follows is an exposition of the Bauer--Grossmann model following Orzech and Groll.

The main assumptions are the same, of course, with those presented in the previous chapter with some notational changes.

I. Population's rate of growth is equal to the rate of growth of the workforce and, consequently, to the rate of growth of variable capital. The latter is posited as constant at a level β. Therefore, the increase of variable capital (i.e. the portion of surplus-value that goes to finance the increase of variable capital) is:

$$\Delta V_t = \beta V_t \Rightarrow V_t = (1 + \beta) V_{t-1} \tag{1}$$

II. The rate of surplus-value is posited as constant: $s' = \mu$.

Consequently, the mass of surplus-value (M) is: $M = \mu V$.

As a result, the growth rate of surplus-value is determined by the growth rate of variable capital:

$$M_t = \mu V_t = \mu(1 + \beta) V_{t-1} \tag{2}$$

The mass of surplus-value finances (a) the growth of constant capital (AC),

(b) the growth of variable capital (ΔV) and, (c) capitalists' personal consumption share (K):

$$M = AC + AV + K$$

III. The rate of growth of constant capital is posited as constant at a level α. Therefore, the increase of constant capital is:

$$AC_t = \alpha C_t \Rightarrow C_t = (1 + \alpha) C_{t-1} \tag{3}$$

IV. According to the Labour Theory of Value, total income equals new value added:

$$Y_t = V_t + M_t$$

which, via (1) and (2), is transformed to:

$$Y_t = (1 + \beta) V_{t-1} + \mu (1 + \beta) V_{t-1} \tag{4}$$

The time expressions of all these relations are the following:

$$V_t = V_i (1 + \beta)^{t-1} \tag{1a}$$

$$C_t = C_i (1 + \alpha)^{t-1} \tag{2a}$$

$$M_t = \mu V_t (1 + \beta)^{t-1} \tag{3a}$$

$$Y_t = (1 + \mu)(1 + \beta)^{t-1} V_i \tag{4a}$$

And accordingly:

$$AC_t = \alpha C_i (1 + \alpha)^{t-1} \tag{5}$$

$$AV_t = \beta V_i (1 + \beta)^{t-1} \tag{6}$$

V. Because the OCC is posited as increasing OCC, then $\alpha > \beta$.

VI. Because μ is constant and the OCC is increasing, an ever increasing rate of accumulation is required in order to secure the expanded reproduction of the system. That is, the ratio of total investment A_t (in constant and variable capital) to the total surplus-value M_t must increase more and more. This ratio is defined as:

$$\frac{A_t}{M_t} = \frac{AC_t + AV_t}{M_t} = \frac{\alpha C_i (1+\alpha)^{t-1} + \beta V_i (1+\beta)^{t-1}}{\mu V_i (1+\beta)^{t-1}} = \frac{\alpha}{\mu} \frac{C_i}{V_i} \left(\frac{1+\alpha}{1+\beta} \right)^{t-1} + \frac{\beta}{\mu} \tag{7}$$

From this it follows that the rate of accumulation must increase in a constant relationship to α and β:

$$\frac{1+\alpha}{1+\beta}$$

VII. The rate of profit falls because of the increasing OCC:

$$R_t = \frac{M_t}{C_t + V_t} = \frac{\mu V_t}{C_t + V_t} = \mu \left(\frac{C_t - C_t + V_t}{C_t + V_t} \right) = \mu \left(\frac{C_t + V_t}{C_t + V_t} - \frac{C_t}{C_t + V_t} \right) \Rightarrow R_t = \mu \left(1 - \frac{C_t}{C_t + V_t} \right)$$

which, via (1a) and (2a), is transformed to:

$$R_t = \mu \left(1 - \frac{C_1 (1+\alpha)^{t-1}}{C_1 (1+\alpha)^{t-1} + V_1 (1+\beta)^{t-1}} \right) \tag{8}$$

Since μ is constant, the rate of profit depends on the part of the equation within the parentheses. Because $\alpha > \beta$, the numerator increases faster than the denominator and, consequently, R_t is decreasing and tends to 0. This is proved as follows:

The limit of (8) depends on the limit of the ratio within the parenthesis which, divided by the faster increasing term, is transformed to:

$$\lim \frac{C_1(1+\alpha)^{t-1}}{C_1(1+\alpha)^{t-1} + V_1(1+\beta)^{t-1}} \frac{\lim \dfrac{C_1(1+\alpha)^{t-1}}{C_1(1+\alpha)^{t-1}}}{\lim \dfrac{C_1(1+\alpha)^{t-1}}{C_1(1+\alpha)^{t-1}} + \lim \dfrac{V_1(1+\beta)^{t-1}}{C_1(1+\alpha)^{t-1}}} =$$

$$= \frac{1}{1 + \lim \dfrac{V_1(1+\beta)^{t-1}}{C_1(1+\alpha)^{t-1}}} = \frac{1}{1 + \dfrac{V_1}{C_1} \lim \dfrac{(1+\beta)^{t-1}}{(1+\alpha)^{t-1}}} \tag{8a}$$

Because $\alpha > \beta$, then $\dfrac{1+\beta}{1+\alpha} < 1$ and therefore it tends to 0. Thus, (8a) becomes

$\dfrac{1}{1+0} = 1$ and (8) tends to 0 as the parenthesis is nilled.

In this model the Harrodian rate of growth of net income (g_n) follows population's rate of growth:

$$g_n = \frac{Y_{t+1} - Y_t}{Y_t} = \frac{(1+\mu)(1+\beta)^t V_1 - (1+\mu)(1+\beta)^{t-1}V_1}{(1+\mu)(1+\beta)^{t-1}V_1} = \frac{(1+\mu)(1+\beta)^{t-1}\beta V_1}{(1+\mu)(1+\beta)^{t-1}V_1} = \beta$$

Respectively, the rate of growth of gross income (g_g) is:

$$g_g = \frac{(C_{t+1} + V_{t+1} + M_{t+1}) - (C_t + V_t + M_t)}{C_t + V_t + M_t} = \frac{(C_{t+1} + Y_{t+1}) - (C_t + Y_t)}{C_t + Y_t} =$$

$$= \frac{C_1(1+\alpha)^t + (1+\mu)(1+\beta)^t V_1 - C_1(1+\alpha)^{t-1} - (1+\mu)(1+\beta)^{t-1}V_1}{C_1(1+\alpha)^{t-1} + (1+\mu)(1+\beta)^{t-1}V_1}$$

$$= \frac{\alpha(1+\alpha)^{t-1}C_1 + (1+\mu)(1+\beta)^{t-1}\beta V_1}{C_1(1+\alpha)^{t-1} + (1+\mu)(1+\beta)^{t-1}V_1}$$

Because $\alpha > \beta$ and income $(V + M)$ increases at the rate β (as both V and M follow this rhythm) while constant capital increases at the rate of α, then in the process of time g_g approximates asymptotically α. Consequently, there is a deviation from the balanced growth path.

The mechanism of this deviation–and, ultimately, of collapse–can be seen clearly also in the Harrodian reformulation. As it is well known, for the Harrodian knife-edge equilibrium to hold it is required that the warranted accumulation rate is equal to the actual accumulation rate and both of them equal to the population growth rate.

The warranted growth rate is:

$$G_w = \Delta Y/Y = s\sigma$$

where Y: income, S: savings, s: average (and marginal) propensity to save, σ: output–capital ratio, Γ: capital stock, and it holds that: $S = sY$, $\sigma = \Delta Y/\Delta\Gamma$.

The Harrodian savings (income minus consumption) is the investment in Bauer–Grossmann:

$$S_t = Y_t - (V_t + AV_t + K_t) = (V_t + M_t) - (V_t + AV_t + K_t) = (V_t + AC_t + AV_t + K_t) - (V_t + AV_t + K_t) = AC_t$$

As it can be seen from this relationship, for Harrod investment is only the increase of constant capital.

The Harrodian average propensity to save is the ratio of total savings to total income. In Bauer–Grossmann terms this is translated as follows:

$$s_t = S_t/Y_t = I_t/Y_t = AC_t/(V_t + M_t) = \frac{\alpha C_1 (1 + \alpha)^{t-1}}{(1 + \mu)(1 + \beta)^{t-1} V_1} \tag{9}$$

The output – capital ratio is:

$$\sigma = \Delta Y/\Delta\Gamma = \Delta Y/AC = \frac{\beta(1 + \mu) V_1 (1 + \beta)^{t-1}}{\alpha C_1 (1 + \alpha)^{t-1}} \tag{10}$$

From (9) and (10) it is derived that:

$$s_t\sigma = \beta$$

That is, the Bauer–Grossmann model fulfills Harrod's balanced growth condition. However, Orzech and Groll has shown this similarity to be superficial. In the Harrod model σ and s_t are constant. Contrariwise, in the Bauer–Grossmann model s_t is increasing (as accumulation must increase continuously) whereas σ is decreasing. Simply, the changes of the one parameter are invalidated by the opposite changes of the other. From (9) it can be seen that:

$$s_t = \frac{\alpha}{(1 + \mu)} \frac{C_1}{V_1} \left(\frac{1 + \alpha}{1 + \beta}\right)^{t-1} \tag{11}$$

Because $[(1 + \alpha)/(1 + \beta)] > 1$ by definition, s_t increases without constraints.

Similarly, from (6) we get:

$$\sigma = \frac{\beta(1 + \mu)}{\alpha} \frac{V_1}{C_1} \left(\frac{1 + \beta}{1 + \alpha}\right)^{t-1} \tag{12}$$

Because $[(1 + \beta)/(1 + \alpha)] < 1$, σ decreases without constraints.

Till now there would not be any problem of reproduction despite the fact that the system is becoming more and more capital intensive and the output–capital ratio is continuously decreasing. But the Bauer–Grossmann model additionally assumes a constant rhythm of growth which requires a continuously increasing propensity to save (i.e. investment's rate of growth) so as to counterbalance the decreasing product–capital ratio. Investment (that is savings) comes from surplus-value but increase faster than the latter as its rate of growth increase while the rate of surplus-value remains constant. In order to sustain the rhythm of accumulation funds are being transferred from capitalists' consumption share. This is possible till this share is completely drained. Then the system collapses.

This process of collapse has been proved by Bronfenbrenner and Wolfson (1984). In the Bauer–Grossmann model workers do not save and capitalists save a portion from the total surplus-value. Bronfenbrenner and Wolfson (1984) argue that the Marxian equivalent of Harrod's rate of savings (s_r) is equal to the product of the propensity to save out of surplus-value (s_r^*) and the surplus-value (μV_t) divided by total income (Y_t). This distinction between the savings rate and the propensity to save out of surplus-value is necessary because surplus-value is divided between investment and capitalists' consumption share. The portion that goes for investment is further sub-divided between the part that is expended for variable capital and the part that is expended for constant capital. The former part is indirectly channelled to aggregate consumption and only the latter part constitutes—in Harrod's terms—investment. Consequently:

$$s_r = \frac{s_r^*(\mu V_t)}{Y_t} = \frac{s_r^* \mu (1+\beta)^{t-1} V_1}{(1+\mu)(1+\beta)^{t-1} V_1} = \frac{s_r^* \mu}{1+\mu} \qquad (13)$$

Moreover, the propensity to save out of surplus-value has to be greater than zero (i.e. greater than some $\varepsilon > 0$). But, because capitalists expend a part of total surplus-value for their personal consumption, their exogenously determined tendency to save is smaller than unity: $0 < \varepsilon < s_r^* < 1$

From (9) and (13) it is derived that:

$$\frac{s_r^* \mu}{1+\mu} = \frac{\alpha}{1+\mu} \frac{C_1}{V_1}\left(\frac{1+\alpha}{1+\beta}\right)^{t-1} \Rightarrow s_r^* = \frac{\alpha}{\mu} \frac{C_1}{V_1}\left(\frac{1+\alpha}{1+\beta}\right)^{t-1}. \qquad (14)$$

Equation (14) shows that the propensity to save out of surplus-value depends upon a number of factors (α, β, μ and C_1/V_1, i.e the initial OCC) which are all exogenously predetermined. For the rate of accumulation to be sustained—as the increasing OCC causes the fall of the profit rate—it is required the propensity to save out of surplus-value to increase rapidly. This whittles down capitalists' consumption share till the system collapses.

GROSSMANN AND HIS CRITICS

Grossmann's theory has been severely criticised both during his days and later. Most of the critiques during his time were either disagreements in

principle (usually from other crisis theoretical standpoints) or insubstantial (see Kuhn (1995, 2004)). However, a number of issues raised require particular attention.

One line of critique focused on the political aspects of his thesis and accused him of economic fatalism and having created a mechanistic theory of collapse (essentially a catastrophe theory). Grossmann has convincingly refuted this criticism (see Kuhn (1995, 2004)). This criticism has been reiterated, in a slightly different form, by Howard and King (1988) who argued that because of these Grossmann cannot see how capitalism can recover from an economic collapse. This is an unjust criticism because Grossmann was one of the first that combined a theory of crisis with a theory of cyclical fluctuations. He had very clearly clarified that crises function as a healing mechanism for the system through the devalorisation of capital that can restore viable conditions of reproduction. Cyclical fluctuations are the expression of the cyclical succession of phases of crisis and recovery and depend upon the level of the OCC, the rate of surplus-value and the growth rates of constant and variable capital.

Sweezy's (1949) critique has a special position. For quite a long time his presentation of Grossmann's theory has been its sole available exposition to the English-speaking readership. It was a presentation that did not do much justice to Grossmann. Sweezy criticized him from his own underconsumptionist perspective. His first accusation was that Grossmann neglects the realization problem (i.e. the heart of the underconsumptionist argument). This is an unjust criticism since Grossmann has, from the very beginning of his analysis, clarified that while the problem of realization exists he does not consider it as the cause of crisis but rather as a concomitant event. Thus he relegates it to a lower level of abstraction. Sweezy's second criticism is that he neglects the role of the rate of increase of population that can suspend the increase of the OCC. This is obvious but is is also well known that Marx when studying crisis abstracted from that for valid reasons (presented in the beginning of this paper). Grossmann simply followed Marx's path on this aspect. Thirdly, Sweezy attributed the increase of the OCC to the tendencies to increase the wage rate (particularly in a tight labour market). This is a completely erroneous analysis for the reasons presented in chapter 2. Finally, Sweezy argued that the rate of accumulation is the independent variable (unlike the Bauer-Grossmann hypothesis). This is true in practice but in formal modelling–as in the schemes of reproduction–it makes no sense at all. In these models the rate of accumulation depends upon the growth rates of constant and variable capital, as it has been shown in the previous section. These rates are given; therefore the rate of accumulation cannot be an independent variable.

But of all the critiques advanced two–both aired by Howard and King (1988) –are more important. First, that Grossmann implicitly adopted Say's law because supply is equated to demand (as savings are equated to investment). Second, that the rate of surplus value cannot be posited as constant because then there can be no extraction of relative surplus-value.

Grossmann and Say

Accusing Grossmann for being a crypto-Sayist is totally inaccurate and it hinges upon a misunderstanding of the Marxist dialectical method and the very purpose of the Marxian schemes of reproduction and the reproduction models in general. Shoul (1957), in a pioneering article, has shown how Marx treats Say's law. While he unambiguously rejects it as a real process and as the basis for modelling the operation of a capitalist economy he nonetheless employs not the logic of Say's law but the equation of supply and demand at certain levels of abstraction. This is not analytical inconsistency but a principled and meticulous application of his dialectical methodology of layered levels of abstraction. For Marx disequilibria of supply and demand are a normal phenomenon of the capitalist economy. Therefore its analysis cannot be based on the equation of supply and demand through some fictitious auctioneering process. Instead, its operation is based on the sophisticated process of determination of prices by labour values. In this process the sphere of production has the primary role and the sphere of circulation–to which these equilibria belong–has a subordinate role. Therefore, at the more abstract level of analysis these disequilibria are being abstracted and the equation of supply and demand is provisionally posited in order to analyse the fundamental relations of determination. Subsequently, at a lower level of abstraction, in the determination of market values these disequilibria are reintroduced as a sine qua non element of the capitalist economy and as one of the causes of deviation of actual prices from their labour value determinants.

From within this perspective Marx, in his schemes of reproduction, he posits the equation of supply and demand. Since he wanted to study the process of equilibrium and smooth reproduction of the capitalist economy he legitimately abstracted every disequilibrating process. In this vein it is equally legitimate at the higher levels of abstraction of crisis theory to leave aside mid and short-term disequilibria stemming from market fluctuations or/and changes in income distribution in order to focus on the fundamental, long-term causes of crisis. These stem from the primarily determinant sphere of production and its interaction with the most fundamental elements of intra-capitalist competition. This analysis does not consider yet actual competition which is conducted on the basis of market prices and, therefore, encompasses the interplay of supply and demand. Instead, it focuses on the long-run determinants of intra-capitalist competition, i.e. the production structure of each individual capital and its advantages and disadvantages over other individual capitals. This analysis refers to labour values and prices of production and not yet to market prices. When the fundamental crisis tendencies have been discovered then it is possible to lower the level of abstraction and encompass more concrete (i.e. more specific and at the same time of secondary importance) elements such as disequilibria of supply and demand and the formation of market prices but also the formation and the character of the general equivalent (the money), the structure of the financial system, the international economic relations and class struggle over income distribution. This, for Marxist Political Economy is not a one-way but an interactive process of determination: the more fundamental and essential processes determine the less ones but in their turn they are being influenced by

them as well in the time process. Hence, a fully developed Marxist model of crisis and reproduction in the end encompasses, in a dialectical hierarchy, the most abstract fundamental and the more concrete features.

Grossmann follows exactly this analytical course and, therefore, he certainly does not lapse to Say's law.

Making the Rate of Surplus-Value Variable

The second criticism is more acute. It is logical that technical change will be accompanied by a rising rate of exploitation particularly through the extraction of relative surplus-value. Of course, in theory technical change can, under certain conditions, lead to an improvement of labour productivity without affecting the intensity of labour and the rate of exploitation. But in practice these two processes go together. Is this then a fatal error of Grossmann's model?

Marx (1981, p.318)-in the 13th chapter of *Capital* vol. III, when defining the TRPF-makes explicitly the assumption of a fixed rate of surplus-value:

> '...*then this gradual growth in the constant capital, in relation to the variable, must necessarily result in a* gradual fall in the general rate of profit, *given that the rate of surplus-value, or the level of exploitation of labour by capital, remains the same'.*

His aim was to prove that crisis is generated in capitalism because of its own inherent characteristics (and particularly the nature of technical change dictated by intra-capitalist competition) and in abstraction from workers' class struggle in production. That is the falling profit rate is not caused by a *profit squeeze* caused by increasing wages. In this way he wanted to confront Ricardo, who ascribed the falling profitability of capital in the increase of corn's relative price and, hence, to the increasing nominal wage and wage share.

Marx was fully aware that labour productivity increases are related to the rate of surplus-value. However, he argued that the law of the TRPF stands even with an increasing rate of surplus-value:

> 'The law of the falling rate of profit, as expressing the same or even a rising rate of surplus-value, means in other words: taking any particular quantity of average social capital, e.g. a capital of 100, an ever greater portion of this is represented by means of labour and an ever lesser portion by living labour. Since the total mass of living labour added to the means of production falls in relation to the value of these means of production, so too does the unpaid labour, and the portion of value in which it is represented, in relation to the value of the total capital advanced. Alternatively, an ever smaller aliquot part of the total capital laid out is converted into living labour, and hence the total capital absorbs ever less surplus labour in relation to its size, even though the ratio between the unpaid and the paid parts of the labour applied may at the same time be growing. The relative decline in the variable capital and increase in the constant capital, even while both portions grow in absolute terms, is, as we have said, simply another expression for the increased productivity of labour.'(Marx (1981, p.322)).

Marx argued so because he maintained that the processes that increase the rate of exploitation are the same with those that displace living labour by dead

labour, i.e. the processes that lead to an increasing OCC. Thus, the tendency to increase the OCC goes together with that of increasing the rate of surplus-value:

> 'However, as the same factors that increase the rate of surplus-value ... tend to reduce the amount of labour-power employed by a given capital, the same factors tend both to reduce the rate of profit and to slow down the movement in this direction.'(Marx (1981, p.342)).

But, he argued that the tendency of the OCC to increase is stronger than that of the increase of the rate of surplus-value because the latter is possible only 'within certain definite limits' (Marx (1981), p.333). Therefore, the former is stronger and constitutes a 'law' whereas the latter is weaker and more erratic and, thus, constitutes a counter-tendency:

> 'The rise in the rate of surplus-value–particularly since it takes place under circumstances in which, as mentioned above, there is no increase in the constant capital as against the variable, or no relative increase - is a factor which contributes to the determination of the mass of surplus-value and hence also the rate of profit. This does not annul the general law. But it has the effect that this law operates more as a tendency, i.e., as a law whose absolute realization is held up, delayed and weakened, by counteracting factors.'(Marx (1981), p.341-2).

Marx (1981, p.340) had also argued–contrary to Grossmann's critics–that these hold particularly in the case of relative surplus-value:

> 'It has already been shown, moreover, and this forms the real secret of the tendencial fall in the rate of profit, that the procedures for producing relative surplus-value are based, by and large, either on transforming as much as possible of a given quantity of labour into surplus-value or on spending as little as possible labour in general in relation to the capital advanced; so that the same reasons that permit the level of exploitation of labour to increase make it impossible to exploit as much labour as before with the same total capital. These are the counteracting tendencies which, while they act to bring about a rise in the rate of surplus-value, simultaneously lead to a fall in the mass of surplus-value produced by a given capital, hence a fall in the rate of profit.'

Conversely, absolute surplus-value is much more effective in counteracting the TRPF: '...the tendency for the rate of profit to be reduced, in particular, is attenuated by the increase in the rate of absolute surplus-value that stems from the prolongation of the working-day' (Marx (1981, p.341). In this case the tendency to replace living labour with machines is weaker and capitals would prefer labour-intensive technologies in so far as they can increase the work-time without any (or an analogous) increase of the wage.

Grossmann follows faithfully Marx's logic on this issue. For this reason, immediately after the presentation of his TRPF theory, he studies four cases of counter-tendencies; the change in the rate of surplus-value being one of them. As Kuhn (1995) has accurately point out, for Grossmann the equilibrium between the TRPF and its counter-tendencies is a short-run empirical question. In the long-run the 'law' (the main tendency) will prevail over its opponents. For these

reasons, although he assumed a constant rate of surplus-value, Grossmann argued that this can be rectified without compromising his approach. Bronfenbrenner and Wolfson (1984, p.179) and Samuelson and Wolfson (1986, Part ÉÉÉ)) have incorporated satisfactorily a variable rate of surplus-value in the Grossmann model. The result is not the cancellation of the breakdown tendency but simply its delay.

A variable rate of surplus-value has to follow a rule. Let us suppose that – similarly to constant and variable capital - it increases at a constant rate; for example $\tilde{a}$. This is logical since the rate of exploitation is a long-run factor depending upon certain structural features (technological paradigm, balance of power between capital and labour in the production process etc.). Thus, it does not change easily and moreover its movement cannot be very erratic. Then:

$$s_t' = s_1'(1 + \gamma)^{t-1} \tag{15}$$

Accordingly, the mass of surplus-value is:

$$M_t = s_t'V_t = s_1'(1 + \gamma)^{t-1}V_1(1 + \beta)^{t-1} \tag{16}$$

Substituting in (9):

$$s_t = S_t/Y_t = I/Y_t = AC_t/(V_t + M_t) =$$

$$= \frac{\alpha C_1(1+\alpha)^{t-1}}{(1+\beta)^{t-1}V_1 + (1+\gamma)^{t-1}s_1'(1+\beta)^{t-1}V_1} = \alpha\frac{C_1}{V_1}(\frac{(1+\alpha)^{t-1}}{(1+\beta)^{t-1}[1+s_1'(1+\gamma)^{t-1}]} \tag{17}$$

The limit to which tends the (17), dividing by the faster increasing term, is:

$$\lim s_t = \lim \frac{\alpha C_1(1+\alpha)^{t-1}}{(1+\beta)^{t-1}V_1 + (1+\gamma)^{t-1}s_1'(1+\beta)^{t-1}V_1} =$$

$$= \frac{\lim\dfrac{\alpha C_1(1+\alpha)^{t-1}}{(1+\alpha)^{t-1}}}{\lim\dfrac{(1+\beta)^{t-1}V_1}{(1+\alpha)^{t-1}} + \lim\dfrac{(1+\gamma)^{t-1}s_1'(1+\beta)^{t-1}V_1}{(1+\alpha)^{t-1}}} =$$

$$\frac{\alpha C_1}{0V_1 + \lim\dfrac{(1+\gamma)^{t-1}s_1'(1+\beta)^{t-1}V_1}{(1+\alpha)^{t-1}}} =$$

$$= \frac{\alpha C_1}{s_1'V_1\lim[\dfrac{(1+\gamma)(1+\beta)}{(1+\alpha)}]^{t-1}} = \frac{\alpha C_1}{s_1'V_1\lim[\dfrac{1+\beta+\gamma+\beta\gamma}{1+\alpha}]^{t-1}}$$

The limit of the last equation depends upon the relation between $1 + \alpha$ and $1 + \beta + \gamma + \beta\gamma$ or, simplifying, between α and $\beta + \gamma + \beta\gamma$. That is s_t depends upon a complex relationship between α, β and γ. More specifically, if:

$\beta + \gamma + \beta\gamma > \alpha$ then s_t tends to nil, i.e. capitalists do not save anything.

$\beta + \gamma + \beta\gamma < \alpha$ then s_t tends to infinity, i.e. capitalists save all their income.

$\beta + \gamma + \beta\gamma = \alpha$ then s_t tends to a specific number that ensures the smooth reproduction of the system.

The first two cases are economically irrational. In the first case capitalists end up with saving nothing. In the second case they end up to save all their income. Only the third case is viable. However, there is no economic reason what so ever that can justify this specific relationship between these three rates. Thus, since the third is a very special and rare case, it is more probable that one of the other two cases will actual happen. In these cases the system breaks down again.[5]

There is another important point regarding a variable rate of surplus-value. As Yaffe (1972) argued, in order for the rate of surplus-value (s') to offset the increasing OCC its rate of increase should be unrealistically big and, thus, difficult to sustain. A simple numerical simulation can easily show that abnormally high and, thus, unsustainable rates of surplus-value are required.

Concluding, technical change based on an increasing OCC must probably lead to an increased rate of surplus-value. There is, however, a limit to the increase of the latter, imposed by humans' physical limits within a specific technological model. This limit can only be surpassed with a new technological model. If this limit is violated within the existing technological model–particularly regarding the intensification of labour then the productivity of the latter will fall instead of increasing. On the contrary, there are no such limits in the increase of constant capital. For all these reasons the increase of the rate of growth of surplus-value may counteract but it cannot cancel the TRPF.

CONCLUSIONS

Henryk Grossmann work can be justifiably characterised as a pioneering contribution in Marxist Political Economy and in macroeconomic dynamics in general.

As Bronfenbrenner and Wolfson (1984, p.180-1) argued, the 1920s generation of Marxist economists (Luxemburg, Bauer, Grossmann etc.) was the first to study–even in a primitive way–macroeconomic dynamics long before any other orthodox economist. They constructed models which, under certain rules (given rates of growth of the main variables), study if a steady growth path can be achieved. And if so whether it is stable, i.e. in the case of deviations from that whether there exist forces that can restore it. Keynesian and neo-classical economics discovered this field quite later and explored it with a rather inferior analytical toolbox. Whereas the Marxist economists followed the great tradition of both Classical Political Economy and Marx by recognising social classes and their role in the economic analysis, Neo-clasical and–to a certain extent–Keynesian theory preferred the a-social framework of marginal analysis. Furthermore, they posited economic crisis at the centre of their investigations whereas for Neo-classical economics this is completely alien since crisis is considered as something non-inherent in capitalism: if market forces operate

unhindered there want be any of it. On the other hand, Keynesianism analyses crisis solely through its underconsumptionist lenses.

Grossmann's contribution distinguishes from the others of his era for a number of reasons.

First, he constructs a value-theoretic model and this continues to be an inspiration today in contrast to other radical and post-Keynesian non-value-theoretic perspectives.

Second, he places particular emphasis in Marxist dialectical methodology as a tool for his economic analysis. Although most of his generation of Marxist theorists was well acquainted with dialectics, they did not actually use it in their economic analyses. A characteristic example is its marked absence from Hilferding's influential work and its serious misunderstanding by Luxembourg in her study of Marx's schemes of reproduction. It was only after Rosdolsky's work that the importance of dialectical methodology was truly appreciated. Grossmann implements it masterfully and constructs a model through clearly defined and analytically 'legitimate' level of abstraction. He was clearly aware that their model-building was at a higher level of abstraction and not an immediate representation of the everyday working of a capitalist economy, as both Luxembourg and Bauer believed.

Third, his contribution in the Marxist theory of crisis remains seminal and provides a useful basis for contemporary theories (see Shaikh (1978b)). It is true that his model is overdetermined in the sense that his exogenous variables are more than his endogenous and because of its very assumptions it will collapse. But this is not a problem for a Marxist model of crisis since the latter is its very purpose. Furthermore, for Marxist Political Economy–contrary to orthodox economics–contradictions are not an analytical deficiency but a characteristic of real life. The capitalist system is permeated by contradictions which can only temporary be assuaged.

Fourth, his choice of capitalists' consumption share as the variable that can be manipulated is logical–contrary to later Kaleckian views (see Trigg (2004)). At the more abstract level, a capitalist is solely a 'functioning capitalist' (i.e. one geared towards accumulation of capital) and not a 'hedonist' (i.e. one geared towards a standard of living)–as in many cases it can actually be.

For all these reasons, Grossmann's work continues to be relevant today.

NOTES

1. For a more detailed biographical account see Kuhn (2004).

2. The latter is a very popular explanation of crises: a shortage in the labour market leads to higher wages and thus lower profit rates. However, Marx wanted to argue that crises erupt in capitalism even when there is no such constraint.

3. For Marx, because the extraction of relative surplus-value is more subtle and less conflictual, it pertains more to capitalism. This, however, does not mean that the extraction of absolute surplus-value becomes irrelevant. On the contrary, it is always present and, during specific periods, it can assume a very crucial role.

4. Fine (1989) points out that the concept of the OCC engulfs processes that do not necessarily move to the same direction or with the same rhythm. Marx defined the TCC as the ratio of the physical amount of the mass of means of production processed in a period to the physical amount of the mass of means of consumption consumed in the same period. As such it is an expression of the ratio of constant to variable capital but in terms of physical quantities, which do not have the same measure. The VCC expresses the same ratio but both the numerator and the denominator are in value terms, i.e. they are commensurable. Now a technical change that increases labour productivity increases also the TCC, since the same number of workers (consuming the same amount of means of production) process a greater mass means of production. The VCC would also increase since the value of the means of production would increase while the value of the means of consumption would remain constant. If the technical change is within the same technological model then these increases would be proportional. However, if this technical change leads to a different technological model, then the increase of the TCC would not necessarily correspond to an increase (or a similar increase) of the VCC. Thus, Marx (1982, p.762) argues that there is a close correlation between the VCC and the TCC and he declares that 'to express this, I call the value-composition of capital, in so far as it is determined by its technical composition and mirrors the changes in the latter, the organic composition of capital'.

5. Bronfenbrenner and Wolfson (1984, p.179) and Samuelson and Wolfson (1986, Part III) reached similar conclusions. Using exponential equations they argued that if: (1) $\alpha > \beta + \gamma$, then s_t increases without bounds. (2) $\alpha < \beta + \gamma$, then s_t tends to nil. (3) $\alpha = \beta + \gamma$, then s_t decreases till a limit that secures a constant rate of growth. But, as Samuelson and Wolfson (1986, p.76) recognize, there is nothing that can justify this particular correlation.

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