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'Business Cycles', Turnover and the Rate of Profit: An Empirical Test of Marxian Crisis Theory

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INTRODUCTION

The fragmentary nature of Marx's discussion on crises has led a number of authors to interpret Marx as saying that crises are due to: 1) a lack of effective demand, 2) the operation of the tendency of the rate of profit to fall or, 3) a profit squeeze. All of the participants in the debate over Marx's theory of the economic cycle agree that crises are associated with declines in the rate of profit. However, they disagree on the factors responsible for causing the decline.

Initially, the debate was carried out at a theoretical level. Recently, however, a number of authors have attempted to provide empirical evidence to substantiate these differing theoretical claims. Studies by Boddy and Crotty (1975), Weisskopf (1979), Hahnel and Sherman (1982) and Devine (1987) have examined the short run cyclical behavior of profit rates and tried to explain its behavior with different variants of Marxian theory. More recently, studies by Lipietz (1986) and Webber and Rigby (1986) have examined the behavior of profit rates with respect to the Marxian ratios in France and Canada.

In most of these studies the issue of turnover has been ignored or assumed to be constant. The one exception is the study by Webber and Rigby who correctly point out the significance of turnover in measuring the rate of profit. However, their study does not explicitly look at the cyclical role of turnover nor do they interpret changes in turnover in terms of changes in the process of realization. While probably of little consequence in the long run, the variability of turnover over the course of the economic cycle is of major importance.

The purpose of this paper is to empirically incorporate estimates of turnover into Marx's definition of the rate of profit, show that turnover plays an important role in explaining cyclical movements in the rate of profit, and offer some new empirical evidence on the debate over cyclical crises. Section 1 will define the rate of profit and demonstrate the importance of turnover. Section 2 will discuss the data used to estimate the rate of profit and present empirical estimates of the rate of profit. In section 3 the rate of profit will be decomposed into its component parts which will be used to explain cyclical variation in industrial production and capacity utilization. Moreover, the results presented in this section will shed new light on the debate over the causes of crises. Finally, the paper will conclude with a summary and discussion of the implications of our findings for Marxian crisis theory.

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Turnover and the Rate of Profit

In order to measure the rate of profit we must first begin by defining the rate of profit. Marx defines the annual rate of profit in its simplest form as follows:

$$r = s/(C + V) \tag{1}$$

where s is the surplus value produced in a year, C is the stock of constant capital, and V is a wage-fund (also measured as a stock) (Marx 1967 Vol. III pp. 70–76). Dividing all of the terms by V we obtain the following:

$$r = (s/V)/(C/V + 1) \tag{2}$$

where s/V is the annual rate of surplus value and C/V is the value composition of capital. Thus far it has been assumed that the annual rate of turnover is equal to one. However, Marx both in volumes II and III of *Capital* and in *Grundrisse* elaborated extensively on the impact of turnover both on the rate of surplus value and on the rate of profit.

Turnover contains two elements: production time and the time of circulation (Marx 1967 Vol. II p. 155 and 248). The process of turnover is reflected in the circuit of money capital which occurs in three stages. In the first stage the capitalist converts a sum of money capital into productive capital which takes the form of labor power and means of production (M – C).

In the second stage the commodities purchased by the capitalist are put to work and engage in the process of production. In the third stage the mass of commodities which have been produced must be returned to the market and sold so that the process can begin a new (C′ – M′). Marx describes this whole process in the following manner M – C . . . P . . . C′ – M′ where the dots indicate that the process of circulation has been interrupted (Marx 1967 Vol. II p. 23). The interruption before the completion of production is reflected in production time which is ultimately determined by technological factors (Marx 1967 Vol. III p. 70). The interruption after the process of production is reflected in circulation time which depends on improved transportation and 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 (Marx 1967 Vol. II p. 317).

A crisis is a period of disjunction between the direct process of production and the process of circulation when goods that have been produced cannot be sold in a 'normal' period of time (Marx 1968 Part II p. 507). This results in an increase in the time of circulation thereby reducing the turnover of capital. During an expansion period the time of circulation is reduced leading to an increase in the turnover of capital.

The annual rate of surplus value and the rate of profit both depend on the amount of capital advanced and they are both affected by the turnover of capital. The annual rate of surplus value can be written as follows:

$$s/V = (s'/V)\, n \tag{3}$$

where s is the annual amount of surplus value, V the variable capital advanced, n is the annual number of turnovers and s′ the surplus value produced in one period. Marx refers to s′/V as the 'real rate of surplus value' (Marx 1967 Vol. II p. 305). From equation 3 it follows that a decrease in turnover, other things constant, will decrease the annual rate of surplus value and therefore decrease the rate of profit.

The 'real rate of surplus value' is a function of technology and the class struggle. Therefore during the course of a production period it is assumed that it is fixed. The surplus value generated in one production period is thus a function of the stock of variable capital. Consequently it is initially independent of n, the rate of turnover, during a given production period.

In fact, the outlay of variable capital, during a given time period, is based on the expectation of a particular turnover time. If circulation time increases due to a lack of effective demand then turnover will decrease. Since the capitalist has already advanced a certain amount of V, and s′/V is constant, s/V must fall, leading to a decline in the rate of profit.

Subsequently, in response to a decline in turnover, capitalists might reduce V. However, even if the decline in V was proportional to the decline in n, the annual rate of surplus value, s/V would still decline because s′ is also proportional to V. In order to restore s/V to its previous level, s′/V, the 'real rate of exploitation' would have to be increased by raising the labor productivity of the remaining workers.

Even if the capitalist could increase the 'real rate of exploitation' and thereby hold the annual rate of surplus value constant, the decline in V would lead to an increase in C/V causing a decline in the rate of profit. Thus, during periods of expansion when circulation time is declining, turnover increases, raising the rate of profit. During periods of crisis and depression when circulation time lengthens, turnover time goes down lowering the rate of profit.

The 'real rate of surplus value' and the value composition of capital reflect, in a direct way, the conditions and process of production. Turnover, in the short run, reflects the conditions of realization or the process of circulation. Marx believed that these two processes were linked together but that during periods of crises these links were broken (Marx 1968 Part II p. 507). Thus in defining the rate of profit it is important to incorporate both elements of production and circulation. Taking into account changes in turnover Marx (1967 Vol. III p. 74) writes the annual rate of profit as follows:

$$r = ((s'/V)\, n)/(C/V + 1) \tag{4}$$

Measuring the Rate of Profit

In this section we will develop measures of each of the components listed in equation 4 in order to estimate the rate of profit for the manufacturing sector in the U.S. from 1949 to 1981. This paper confines itself to measuring the rate of profit in the manufacturing sector because data sources corresponding to the categories listed above are only available for this sector.

Ideally, one would like to have data expressed in labor values since Marx's theory is presented in these terms. Unfortunately, this data is not available and cannot be calculated on an annual basis. Fortunately, Shaikh (1981: 288–90) and Farjoun and Machover (1983: 125–37) have shown that the rate of profit measured from price data will closely approximate the rate of profit as measured with value data if highly aggregated data is being used. In addition, Morishima (1973: 142) and Shaikh (1981: 288–90) have shown that the rate of profit measured in value terms and the transformed rate of profit, measured in prices, are both monotonic increasing transformations of s/V. From this it follows that both the value rate of profit and the transformed rate of profit must also be monotonic decreasing functions of C/V. Therefore, most empirical studies of Marx's crisis theory rely on data expressed in prices (Weisskopf 1979, Hahnel and Sherman 1982, Lipietz 1986, Webber and Rigby 1986, Mosely 1986, and Devine 1987).

The first component we need to measure is the amount of surplus value produced during a year. To obtain a value for s = s′n, we take the value added in manufacturing and subtract from

it the wages of production workers and depreciation. Value added, as calculated by the *Annual Survey of Manufactures* is arrived at by taking the value of shipments and adding to them the change in inventory of finished products and subtracting the cost of materials.

The next component we need to measure is C constant capital. Constant capital has two components: 1) fixed capital, consisting of equipment and structures and 2) circulating capital, consisting of raw materials, supplies, fuel and work in process. For fixed capital we use the value of equipment and structures as published by the Department of Commerce in *Fixed Reproducible Tangible Wealth 1925–79.*

To measure the circulating portion of constant capital we take the value of inventories in manufacturing firms and subtract the inventories of finished products. This provides a stock measure of the outlay that the capitalist must make for raw materials, fuel etc. With each turnover of capital the capitalist receives the value of his original investment plus the surplus value which has been produced. Thus, the investment needed to carry out production is considerably smaller than the cost of materials, which is a flow, measuring the outlay multiplied by the number of turnovers in a year.

To measure variable capital we need to estimate the outlay necessary to complete production and realization during one turnover period. Unfortunately, this information is not readily available. However, the wage-fund multiplied by the number of turnovers in a year, V n is equal to the sum of wages paid out by the capitalist in a year. Thus in order to develope a measure of the wage fund we take v, the wages paid to production workers during the year and divide by n. Turnover, in general, is measured by taking the ratio of a flow to a stock which tells us the number of times the stock is contained in the flow. Turnover, (n), in the manufacturing sector is therefore calculated by taking sales (value added – the change in the inventory of finished products) which is a flow, and dividing it by the total inventory of the manufacturing sector which is a stock.

Using the data described above we have calculated the various Marxist ratio's for the years 1949 to 1981 which are shown in Table 1.

Explaining Cyclical Crises

Virtually all Marxists agree that cyclical crises are caused by declines in the rate of profit. Where Marxists disagree is with respect to the causes of the decline in the rate of profit. The debate has centered around three hypotheses.

The first hypothesis is that increases in the value composition of capital cause declines in the rate of profit. Recently, some have called into question the validity of this argument using Okishio's theorem. This theorem argues that since capitalists always select techniques which minimize their costs of production they will only choose a particular technique if it raises the uniform rate of profit (Steedman 1977). However, Shaikh (1978) has shown that this whole line of argumentation results from a confusion over the definition of the rate of profit. Okishio's theorem relies on a definition wherein the rate of profit is a mark-up on the cost of production. Marx, he argues, defines the rate of profits as a return on investment. Using this distinction, Shaikh has shown that it is possible for the rate of profit as defined by Okishio to increase while at the same time the rate of profit as defined by Marx declines when a new technique of production is selected. Furthermore, Shaikh (1981: 294–97) points out market prices and the rate of profit are never equal to prices of production and the uniform rate of profit and therefore it is entirely possible that an industry selects a technique which raises the rate of profit in an

TABLE 1
Marxist Ratio's 1949–1981

Year	VCC	s'/V	s/V	n	r
1949	7.20	1.39	4.01	2.88	0.49
1950	6.82	1.49	4.25	2.84	0.54
1951	5.95	1.42	3.59	2.53	0.52
1952	6.23	1.40	3.69	2.64	0.51
1953	6.40	1.39	3.85	2.77	0.52
1954	7.42	1.51	4.25	2.82	0.50
1955	7.70	1.63	4.86	2.98	0.56
1956	7.54	1.67	4.70	2.82	0.55
1957	8.10	1.69	4.80	2.84	0.53
1958	8.78	1.71	4.82	2.82	0.49
1959	9.00	1.82	5.52	3.04	0.55
1960	9.13	1.81	5.47	3.02	0.54
1961	9.55	1.85	5.53	2.99	0.52
1962	9.48	1.88	5.76	3.06	0.55
1963	9.86	1.95	6.21	3.19	0.57
1964	9.99	1.99	6.43	3.23	0.59
1965	10.18	2.04	6.75	3.31	0.60
1966	9.85	2.06	6.56	3.18	0.61
1967	9.95	2.07	6.35	3.07	0.58
1968	10.09	2.11	6.58	3.13	0.59
1969	9.98	2.11	6.47	3.07	0.59
1970	10.19	2.11	6.18	2.92	0.55
1971	10.89	2.20	6.71	3.05	0.56
1972	10.91	2.20	7.16	3.26	0.60
1973	10.54	2.28	7.36	3.24	0.64
1974	9.78	2.47	6.92	2.80	0.64
1975	10.52	2.47	6.80	2.75	0.59
1976	10.60	2.55	7.37	2.89	0.63
1977	10.79	2.56	7.85	3.07	0.67
1978	10.77	2.57	7.94	3.09	0.67
1979	11.09	2.71	8.32	3.07	0.69
1980	11.34	2.72	7.90	2.90	0.64
1981	11.74	2.75	8.07	2.93	0.63

Sources: U.S. Department of Commerce, Bureau of Census, *Annual Survey of Manufactures 1981,* (Washington, D.C.: U.S. Government Printing Office, 1982): Table 1a; U.S. Department of Commerce, Bureau of Economic Analysis, *Fixed Reproducible Tangible Wealth 1925–79* (Washington, D.C.: U.S. Government Printing Office, 1981): Table A3; and U.S. Council of Economic Advisors, *Economic Report of the President,* (Washington, D.C.: U.S. Government Printing Office, 1983): Table B-48.

industry but lowers the uniform rate of profit. Finally, Lipietz (1986) and Foley (1986) demonstrate that if one holds the value of labor power constant, an increase in the value composition of capital will reduce the cost of production i.e., meet the Okishio criterion and at the same time result in a decline in the rate of profit.

Clearly this is an area which will continue to be debated by Marxists. However, it is equally clear that a significant number of Marxists consider the rising value composition of

capital as being a theoretically sound proposition. Therefore, all of the empirical studies previously mentioned in this paper at least consider a rising value composition of capital as a potential cause for a decline in the rate of profit.

The second hypothesis is that a decline in the rate of surplus value results in a 'profit squeeze' causing the rate of profit to decline. This is brought about by rising wages during the latter part of the expansion phase of the cycle.

The third hypothesis states that declines in the rate of profit are the result of the failure to realize surplus value. This is usually attributed to a lack of effective demand on the part of workers.

Weisskopf (1979) has argued that none of these hypotheses are mutually exclusive and therefore each must be tested. According to Marx's theory of crises, declines in production and capacity utilization are caused by declines in the rate of profit. The rate of profit consists of three components: 1) the 'real rate of surplus value' 2) the annual rate of turnover, and 3) the value composition of capital. Other things being equal, an increase in the 'real rate of surplus value' or the annual rate of turnover will increase the rate of profit and result in an increase in industrial production and capacity utilization. An increase in the value composition of capital, other things being equal, will cause the rate of profit to decline resulting in a decline in industrial production and capacity utilization.

These relationships can be expressed in equation form as follows:

$$\Delta IND = \alpha + \beta_1 \Delta s'/V + \beta_2 \Delta n + \beta_3 \Delta VCC \tag{5}$$

$$\Delta CU = \alpha + \beta_1 \Delta s'/V + \beta_2 \Delta n + \beta_3 \Delta VCC \tag{6}$$

where:

ΔIND = change in industrial production,
ΔCU = change in capacity utilization,
$\Delta s'/V$ = change in 'real rate of surplus value',
Δn = change in annual rate of turnover, and
ΔVCC = change in value composition of capital.

Equations 5 and 6 are both expressed in terms of first differences to eliminate trend effects which are long term and do not reflect cyclical variation. In addition, each independent variable represents a particular variant of Marxian crisis theory. If changes in the 'real rate of surplus value' play an important role in explaining movements in real production indicators this would lend support the 'profit squeeze' hypothesis. If changes in turnover or the value composition of capital explain movements in real production indicators this would lend support to the lack of realization and rising value composition hypotheses respectively. Equations 5 and 6 were estimated using ordinary least squares and the results are presented in Table 2.

The regression results shown in Table 2 are consistent with each of the three hypotheses put forward. All of the coefficients in equation 5 have the expected signs and the coefficients for Δn and ΔVCC are statistically significant at the .01 level while the coefficient for $\Delta s'/V$ is statistically significant at the .05 level. Similarly in equation 6 all of the coefficients have the expected signs and all are statistically significant at the .01 level.

In addition to the regular regression coefficients we also present estimates of the standardized beta coefficients for all variables. Standardized beta coefficients indicate the relative importance of each variable in explaining the variation in the dependent variable. The beta coefficients for ΔVCC and Δn are approximately six times the size of the beta coefficient

TABLE 2
Regression Results

	(5) ΔIND		(6) ΔCU	
	Coefficient	Beta	Coefficient	Beta
$\Delta s'/V$	18.46	0.18	16.26	0.18
	(2.08)		(2.97)	
Δn	35.07	0.90	32.18	0.95
	(8.85)		(13.13)	
ΔVCC	−12.77	−0.91	−11.91	−0.98
	(8.95)		(13.49)	
Intercept	4.47	0	1.12	0
	(7.04)		(2.84)	
R^2	0.77		0.88	
DW	1.92		1.32	

t statistics in parentheses.

for $\Delta s'/V$ indicating that the most important factors by far in explaining the cyclical movement in industrial production and capacity utilization are the value composition of capital and the annual rate of turnover. Moreover, examination of the data for the 'real rate of surplus value' (see Table 1) shows that it declined significantly in only one time period, from 1950 to 1953, during which time there was a period of crisis and recovery. In all other cycles the decline in the 'real rate of surplus value' was virtually non-existent. In light of this fact the positive coefficient on the variable $\Delta s'/V$ indicates that increases in s'/V help explain increases in industrial production and capacity utilization during periods of recovery but does not provide evidence that there is a 'profit squeeze'.

These results differ from those presented in previous studies by Boddy and Crotty (1975), Weisskopf (1979) and Hahnel and Sherman (1982). Specifically, Boddy and Crotty claim that the sole cause of economic crises is a profit squeeze while Weisskopf and Hahnel and Sherman see the profit squeeze as an important factor along with realization problems. In addition, the aforementioned studies all dismiss the role of the rising value composition of capital in causing cyclical declines in the rate of profit. These differences are due primarily to the fact that previous studies have failed to account for cyclical movements in turnover.

Summary and Conclusions

In this paper we have defined the rate of profit as Marx did in *Capital* taking into account not only the traditional Marxist ratios but also the rate of turnover. Following Marx we have argued that turnover is a critical aspect of the process of production and circulation over the course of the business cycle. In addition, we have provided empirical estimates of the traditional Marxist ratios as well as the rate of turnover for the manufacturing sector in the U.S. and used these estimates to explain cyclical movements in industrial production and capacity utilization.

The results of this study show the importance of including a measure of turnover in the rate of profit. Failure to properly account for turnover leads to a confusion between the 'real rate of

surplus value' and the annual rate of surplus value. In addition, this study has shown that cyclical crises, which express themselves in the form of a decline in the rate of profit and hence in industrial production and capacity utilization, can be explained primarily in terms of changes in turnover and changes in the value composition of capital.

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