ANALYSIS OF THE LAW OF FALLING RATE OF PROFIT: EUROPEAN CASE

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Abstract

This work aims to analyse the existence or non-existence of a decreasing rate of profit in Europe and determine the factors influencing it according to the Marxist theory of profitability. To do so, a panel data model was estimated for seven European countries over more than 60 years (from 1960 to 2021, inclusive). The results obtained allow us to verify the tendency for profitability to fall, which could lead the capitalist system to fail.

Keywords: Marxian economics, falling rate of profit, panel data analysis
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Introduction

The study of profitability in the capitalist mode of production is essential to understanding the dynamics of the process of capital accumulation since it is the engine that drives and encourages it. Without profit and sufficient profit, there is no growth or economic development; this statement is accepted by practically all schools of economic thought, from the Austrians and their entrepreneurial function generating "pure corporate profits" (Huerta de Soto, 2005, pp. 60–61) to the Marxists and their economic definition of capital (Nieto and Cockshott, 2017, p. 257), through to the Neoclassicists and their microeconomic theory in which the objective of companies is profit maximization.

Although it is a concept of great importance, it is surprising that there is not deep economic literature that studies the factors which make it evolve and in what way over time, neither by the economic orthodoxy represented by neoclassical synthesis (it looks at it in a very brief form and at a micro-level through the decreasing returns of fixed capital) nor by the rest of the schools of the so-called heterodox economy, except the Marxian

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economics school (the so-called tendency of the rate of profit to fall), which gives it a key role in explaining the functioning of capitalism and the recurrent economic crises it suffers, arguing that, unlike the rest of the schools of thought that attribute the crises to external shocks, these are produced as a consequence of the very dynamics of capitalist accumulation (Marx, 1976).

This study aims to verify, using a panel data econometric model and the methodology developed by Basu and Manolakos (2013) and Maniatis and Passas (2014), the existence of a falling rate of profit on the European continent from 1960 to the present. This is a novelty in this type of analysis since most of them focus on the case of the United States. Furthermore, no works use estimation of panel data, this being the main novelty introduced by this study. In this way, we analyse a representative sample of European countries with diverse and asymmetric economies (Hall, 2018) and, in addition, we study the effect of the counter-trends developed by Marx on profitability, *i.e.*, increasing intensity of exploitation, depression of wages below the value of labour power, cheapening of elements of constant capital. Relative to overpopulation, we also study the effect of demand on the profit rate.

The results obtained provide sufficient statistical evidence to confirm decreasing profitability in Europe during the period studied. It is also statistically proven that some of the counter-trends influence the rate of profit by temporarily slowing down this decrease.

This study is structured as follows: after this introduction, in Section 2, the literature on profitability and its Marxist analysis is revised, highlighting both the developments in favour and those that defend the existence of failures and inconsistencies. In Section 3, a panel data model is applied to seven European countries to determine a diminishing rate of profit and its determining factors. Finally, Section 4 shows the conclusions.

1. Theoretical Framework

Theories on the evolution of profitability start from the very beginning of economics as a scientific discipline. Thus, Adam Smith (1794) defends that capital profitability would decrease as capital accumulation intensified because new capital would progressively have more difficulty finding profitable business opportunities, competing with other capitals for the remaining business opportunities, thus lowering profitability. He also predicts the minimum return on capital in the long term, defining it as that which covers the cost of capital, as is the case with wages and their tendency to the subsistence level.

The development of the classical school does not end with Adam Smith, since one of the main economists of this school, David Ricardo (2014), also defends progressive

decrease of profits and profitability as a consequence of decreasing returns in agriculture, which make the price of food increase. This leads to a situation where, on the one hand, income (understood as the compensation that the landowner receives for the use of the land) increases to the detriment of profits and, on the other hand, the subsistence wage of the workers rises because the cost of feeding themselves increases, which, on the whole, leads to a drastic reduction in profits and slows down the process of capital accumulation. The solution he proposes to alleviate this situation is the elimination of restrictions on cereal imports, causing supply to increase and prices to fall.

In the second half of the nineteenth century, Karl Marx (1976), taking the proposals of the classical thinkers as a basis, carried out an analysis of profitability (or gain) of great importance for the school he founded. In the capitalist mode of production, Marx argues that the engine that drives capital accumulation is profit. To increase it, the capitalist will have to compete on two fronts; on the one hand, in the sphere of production, he must try to increase the mass of surplus value which he can obtain from the workers and, on the other hand, in the sphere of realization, he must compete against other capitalists to get a more significant market share. In the first case, the introduction of machinery and technology is the way that seems most appropriate to obtain greater surplus value through increased productivity. On the other hand, in the sphere of surplus value realization, the reduction of unit costs is the best way to obtain a more significant market share and expel the rest of the competitors from the market. These more advanced production methods will lead to more extensive and more capital-intensive facilities, which will tend to reduce the costs per unit of product, thus becoming the ideal method for achieving economies of scale (with more extensive and more technological facilities, a given number of workers can process a larger amount of raw materials, and production can be raised). This will increase what Marx refers to as the organic composition of capital (C/V) since greater technology will mean that C (constant capital, *i.e.*, the sum of fixed capital and circulating capital) will increase and V (variable capital, *i.e.*, capital employed in the acquisition of labour force) will decrease or increase in a smaller proportion than constant capital since more significant investment in constant capital concerning variable capital reduces the weight of the only source of new value creation (the labour force) so that the creation of value will slow down. The rate of profit will tend to be reduced until a limit is reached in which there will be what Marx called a crisis of overproduction as a result of an overaccumulation of capital in which the capitalists will stop the process of reproduction of capital (M-C-M') because profit will be significantly reduced. Here, Marx finds the main contradiction of capitalism since it is the main mechanism that characterizes it that condemns it to recurrent crises. It will only be possible to escape by destruction of capitals, making the accumulation process begin again.

Although Marx's ideas strongly influenced contemporary history, it was not until the second half of the 20th century that different essays by Marxist economists and theorists began to appear, completing what Marx had said about the tendency of the rate of profit to fall. Among the most popular and influential we find Anwar Shaikh (1992), who conferred on the theory sophisticated mathematical support through infinitesimal calculation and also mentioned the temporal dimension, arguing that the theory is capable of explaining the long wave of the capitalist accumulation process, that is to say, he defends that the theory manifests itself in the long term. Likewise, he made an effort to connect the Keynesian (demand-based) approach with the Marxist one by establishing that demand positively influences the expectations of entrepreneurs by increasing the rate of profit, but only in the short term, with this relationship dissolving in the medium and long term.

Another aspect to be taken into account is the difficulty in calculating the variables described by Marx due to the lack of Marxist accounting that would allow accurate results. It is here that the Polish economist Michal Kalecki (1956) developed a rate of profit calculation based on national accounts to obtain the variables that make it up. More precisely, the Kaleckian rate of profit equation is $\pi/Y \times Y/K$, from which the inverse relationship between profit (π) and constant capital (K) is derived (Y being the national income), as advocated by the Marxian theory of profitability.

In spite of the relative scarcity of research on this subject, mathematical and theoretical developments have continued until recently thanks to the work of Paul Cockshott (2013), in which he asks whether the rate of profit, when decreasing in the long term, tends towards a determined value, or said in mathematical terms, whether the equation of the rate of profit presents a horizontal asymptote and what factors determine it, concluding that it is positively related to the increase in population and the cheapening of capital and negatively to the percentage of profits reinvested by the capitalists, which, according to him, is in line with reality if we observe that countries whose population increases very little or not at all also present significant economic stagnation (as is the case of Japan).

In the same way that many works and studies have been carried out to complete and validate the theory, there is also a considerable amount of economic literature that presents, according to its authors, the failures and inconsistencies of the theory. Among this group of authors, we find first Joan Robinson (1961), an economist who belongs to the Keynesian school, who criticizes one of the bases on which the Marxist theory of profitability is based, the labour theory of value, a necessary (although not sufficient) condition to be able to validate its theoretical assumptions. Robinson uses the term "metaphysical belief" in a derogatory tone to highlight the fact that Marxists suffer

from a blind faith not supported by empirical evidence when affirming that there are certain hypotheses of the labour theory of value that have been rejected by facts (such as the existence, according to Marx, of a constant real wage rate under the capitalist mode of production), but that have not prevented Marxists from continuing to defend it. Robinson (1980) not only focuses on the criticism of the labour value theory but also emphasizes the inconsistency of the terms used by Marx, mainly about the organic composition of capital, because while sometimes it seems to define constant capital as a stock variable, others suggest that it is a flow variable, which can make difficult the study of profitability and give different and even contradictory results depending on the notion of capital that is used.

Another approach that seeks to question the veracity of Marx's conclusions is that outlined by French economist Philippe Adair (1985, p. 134). He states, based on data obtained from the French economy, that "the fall of the rate of profit appears then as a consequence and not as a cause of the economic crisis", also describing the theory as "purely axiomatic" and qualifying it as "infallible", arguing thus the impossibility of considering it as scientific in the absence of a necessary assumption to qualify it as such (Karl Popper's demarcation criterion).

It is important to mention the work undertaken by the Marxist economist Nobuo Okishio (1961), which is still being debated today among Marxist and non-Marxist economists. "Okishio's theorem", based on the theorem of Perron-Frobenius (which states that given a matrix with square and irreducible positive elements (a_{ij}), it has a simple and real eigenvalue, or own positive value, that is the supreme of all eigenvalues in absolute value of the matrix (or spectral radius) and that is limited by $min \sum_{i=1}^{n} |a_{ij}| \leq \lambda \leq max \sum_{i=1}^{n} |a_{ij}|$), showing that, given some conditions, the introduction of a cost saving innovation by a capitalist would entail an increase in the collective profit rate, a result that is opposed to the one derived by Marx (1976).

Finally, the work of Morishima (1973) generated an important debate because it breaks with one of the bases of Marxist theory (the labour theory of value) by defending that a positive exploitation rate, profit rate and growth are possible without the existence of the labour theory of value. For this, Morishima develops a model substituting the concept of Marxist value, called "actual values" in his work, by another one called "optimum values", which are shadow prices that minimize the amount of work necessary to produce the consumer goods needed for the reproduction of the workforce, obtaining the same results as Marx (1976) but without using the labour theory of value.

2. Model

The model used is a linear model with which it is intended to check whether the assumptions of the Marxist theory of the falling rate of profit are fulfilled and the incidence of factors that can make it vary. For this purpose, the classic variables of the Marxist model were employed, making some changes to adapt them to current conditions and, as a novelty, final private consumption was added to contrast the Marxist and Keynesian theses. The case of seven European countries with diverse and asymmetric economies was analysed, which, in our opinion, enriches and gives robustness to this analysis. Moreover, it is a novelty in this type of study since most of them have focused on the case of the United States.

The period we considered was limited by data availability. Even so, we were able to generate a panel data model for 62 years, from 1960 to 2021. In this sense, the use of panel data to study the determinants of the rate of profit is novel since most empirical works do not perform econometric analysis, and those that do employ data time series. Therefore, we analysed a maximum of 399 observations for each variable used. The use of panel data allows control over individual heterogeneity, providing data with a greater degree of variability and a higher level of co-linearity amongst the regressors. It also enables the study of dynamic adjustment processes, the identification and measurement of effects that are not detectable using pure cross-sectional data or time series, and the construction and comparison of behavioural models that are more complex than those possible with more detailed data.

2.1 Data

As mentioned above, the case of seven European countries (Portugal, France, Spain, the United Kingdom, Denmark, the Netherlands and Greece) was analysed for the period from 1960 to 2021 for Portugal, France, the United Kingdom and Greece, from 1966 to 2021 for Denmark, from 1969 to 2021 for the Netherlands and from 1980 to 2021 for Spain, so an unbalanced data panel with a total of 399 observations was analysed. All the data used were obtained from the European Commission's macroeconomic database (AMECO). It is necessary to mention that all the variables measured in monetary units (euros in our case) were deflated at 2015 prices to eliminate the effect of inflation that may distort the results. The variables we used are summarized in Table 1 below.

Table 1: Description of variables used

Variable	Description	Obs.	Mean	St. Dev.	Min	Max
r	Annual rate of profit for each country (obtained as ratio of surplus value to productive net capital stock). Source: *Prepared by the author using AMECO database.*	399	0.606	0.42	0.015	1.98
t	Trend variable. Source: *Own elaboration.*					
X_1	Annual level of unemployment in each country's economy (as a % of total working population). Source: *AMECO database.*	399	7.590	5.02	0.600	27.50
X_2	Annual operating rate of each country obtained as ratio of surplus value to wages. Source: *AMECO database.*	399	0.889	0.50	0.250	2.83
X_3	Wage deviation from value of workforce. Source: *AMECO database.*	399	-2.89×10^{-9}	5.20	-24.76	36.70
X_4	Deviation of relative price of capital from exchange value. Source: *AMECO database.*	399	-3.95×10^{-11}	0.02	-0.109	0.18
X_5	Annual final private consumption (in billions of euros) Source: *AMECO database.*	399	809.20	650.19	27.809	2 409.10

Source: Own calculations

2.2 Model

We estimated a linear model using the generalized least squares (GLS) estimator. When choosing this estimator, a series of tests were carried out to determine the most efficient one according to the variables used.

First, we carried out the Lagrange multiplier test for random effects. The value obtained for the chi-square (χ^2) leads to the rejection of the null hypothesis, so it is preferable to use ordinary least squares (OLS) with random effects to the pooled regression, *i.e.*, to the usual OLS estimator.

Afterwards, the Hausman test was performed to decide random and fixed effects. The value of "χ^2" obtained allows us to accept the null hypothesis, *i.e.*, the difference between the coefficients of random and fixed effects is not systemic, so it is convenient to estimate the panel data model considering the individual effects as random. The fact of considering the individual effects as random makes it unnecessary to check the existence

or non-existence of heteroscedasticity and autocorrelation in the model because the regressors estimated using random effects are obtained by means of generalized least squares (GLS), thus being the best linear unbiased estimator (BLUE) since it is the one with minimum variance, which makes the results obtained more accurate.

However, it is necessary to analyse the possible problems of multicollinearity (existence of a relationship between the explanatory variables) that the model may present. For this purpose, the variance inflation factors (VIF) are calculated, indicating the degree to which the estimator variance has increased due to collinearity between exogenous variables. Multicollinearity will not cause the estimators to cease to be BLUE. Still, it may cause the standard error to be high, leading to cases in which the estimators are not individually significant but jointly so, which is meaningless. As in our model, the VIF obtained do not exceed a value of three in any case; it can be stated that there is no evidence of multicollinearity that could affect the standard errors of the model (Hair *et al.*, 1995).

Therefore, the following model was estimated using GLS:

$$r_{it} = \alpha_i + \beta_1 t + \beta_2 X_{1it} + \beta_3 X_{2it} + \beta_4 X_{3it} + \beta_5 X_{4it} + \beta_6 X_{5it} + u_{it} \tag{1}$$

where r is the net rate of profit, which, as defined by Marx (1976), is the relationship between surplus value and the sum of constant productive capital and variable capital advanced by the capitalist, which was obtained based on the procedure described by Basu and Manolakos (2013). Thus, first, surplus value was defined as the difference between the net domestic product and the remuneration of employees (since it gives complete information on the capital advanced to workers by including the remuneration in kind and the capitalist's payments for workers' social security). On the other hand, while in previous research a distinction was made between productive and unproductive work when analysing profit, in this study, this distinction will not be made for two reasons:

● The lack of data related to the value generated by economic sectors, existing for some countries and not for the rest, made it impossible to distinguish between productive and unproductive sectors.
● This limitation does not alter the results obtained because a reduction in the rate of profit in the productive sectors[1] will reduce the overall rate of profit since the profit of the unproductive sectors comes from the surplus value generated in the productive sectors, so if it is reduced in the productive sector, it will also reduce the inefficient sector, making the overall rate (composed of the productive and unproductive sectors) fall accordingly.

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1   In this work, we will understand by productive capital that which is employed in sectors where work is productive, that is, which generates its salary and the surplus that is taken by the capitalist.

The productive constant capital has been obtained by subtracting the part corresponding to the unproductive sectors from the net capital stock. For that, we eliminated from the total value of constant capital all that was computed in housing (Maniatis, 2005); we should have added the changes in inventories and acquisition less disposals of valuable, but due to the lack of available data (there are only data for a few years, which would reduce the number of observations in a significant way) we only utilized the productive net capital stock as a proxy of constant capital as Basu and Manolakos (2013) and Maniatis and Passas (2014) did.

The variable t is a trend variable that measures the movement of the rate of profit over the years of analysis. Its objective is to determine whether the profit decreases or increases over time.

X_1 measures the level of unemployment, which is used as a proxy variable for overpopulation, just as Basu and Manolakos (2013) did, which acts by increasing the industrial reserve army, exerting downward pressure on the labour market wages.

X_2 is the rate of exploitation, whose formula is the relationship between the surplus value generated by the workers and the salary they obtain. The relationship between the previously obtained surplus value and the remuneration of employees was calculated. In this variable, we made changes concerning the work of Maniatis and Passas (2014), who used the cyclical component of the degree of exploitation by considering that this degree of exploitation varies depending on two factors: the technical-material conditions of the economy and the correlation of forces between the working class and the capitalist, factors that they consider independent, so by isolating the cyclical component they seek to analyse only changes resulting from the correlation of forces between the two classes. In our opinion, this is a mistake because technological development largely influences this correlation of forces. This can be seen if we observe phenomena such as the appearance of telework or applications and devices that control the number of hours performed by workers. In our case, we will use the degree of exploitation of work.

X_3 measures the deviation of wages from the value of the labour force. It was obtained (as Basu and Manolakos (2013) and Maniatis and Passas (2014) did) by applying the Hodrick-Prescott filter with a smoothing parameter of 6.2. In this case, we used the cyclical component of employee remuneration since we assumed that, in the long term, the wage is that corresponding to the exchange value of the labour force (established by the basket of goods necessary for its reproduction), so that, by breaking down the cyclical component of the trend, we can see the effect of wage deviations on the rate of profit.

X_4 represents the cheapening of constant capital relative to variable capital. To this end, we used the same methodology as Maniatis and Passas (2014), *i.e.*, the ratio between

the price of constant capital (represented by the gross capital formation deflator) and the price of variable capital represented by the consumer price index, because, according to Marx (1976), the cost of the labour force is determined by the price of the means necessary for its reproduction. In this way, if the relative price decreases, capital becomes cheaper than consumer goods (which in the long term determine wages as we mentioned above), which causes, according to Marx (1976), an increase in the rate of profit. Later, and unlike the works of Basu and Manolakos (2013) and Maniatis and Passas (2014), we obtained the cyclical component of the relative price because we understand that, as happens with the cost of the labour force, in the long term the relative price tends towards the exchange value of capital concerning consumer goods (which will be determined by the relation of the working time socially necessary to produce the two types of goods). Therefore, we intended to check how deviations from the relative price trend affect the rate of profit. We obtained the cyclical component in the same way as in the previous case, using the Hodrick-Prescott filter and using a smoothing parameter of 6.2 (as we are dealing with annual data).

In this model, as mentioned above, we included an additional variable, X_5, which measures private final consumption for a given year. This variable was included to contrast the Marxist and Keynesian theses, that is, if demand can influence the rate of profit as Keynes defends or if, on the contrary, it does not affect it and only varies as a result of the productive and competitive dynamics inherent in the capitalist mode of production.

2.3 Results

After estimating by GLS the model explained and checking the global significance of the model used, we obtain the results shown in Table 2.

The first conclusion to be drawn is that the quality of the adjustment is very good. The R^2, both the value *within* (which measures the temporal differences for each individual) and the R^2 *between* (which measures the differences between individuals) give us reasonably high values (84% and 76% respectively). At the same time, taking into account the R^2 *overall*, which provides a weighted average of both, its value is 76.16%.

As for the values obtained, in most cases, they are those expected a priori. Thus, in Table 2, we verify that the variable that measures the temporary tendency of the rate of profit (*t*) is significant and with a negative sign, its value being −0.0016064, which indicates that the rate of profit decreases annually by −0.16%, in agreement with the results obtained by Maniatis and Passas (2014) for the Greek economy during a similar period.

Table 2: Model 1 estimation by GLS

	Rate of profit		
		P-value	*t*-statistic
Trend	−0.0016 (0.0003376)***	0	−4.76
Unemployment	−0.004 (0.0009421)***	0	−4.33
Rate of exploitation	0.524 (0.0015004)***	0	34.94
Deviation of wages	−0.000746 (0.0005506)	0.179	−1.34
Deviation of relative price of capital	0.403 (0.1314159)***	0.002	3.07
Demand	−0.000010 (0.0000142)	0.451	−0.75
Number of observations	399		
R² overall	0.7616		

*Significant at 10%   ** Significant at 5%   *** Significant at 1%
Source: Own calculations

The parameter estimated for the variable measuring unemployment (X_1) is significant and has a negative sign, indicating that an increase in unemployment causes a decrease in the rate of profit. It seems to clash with the developments made by Marx (1976) since it is supposed that an increase of unemployment causes a decrease in wages, which makes the rate of profit increase. However, the mistake here of many Marxist academics and other economic schools is to define the industrial reserve army as the unemployment rate (a description that even Marx himself uses) and not as a social relation constituted by the capitalist, the worker and the workers who look for a buyer of their labour force. This means that there can be a certain portion of workers who, even if they are employed, look for jobs for various reasons (they look for a better job, the salary obtained is lower than that necessary for the reproduction of the labour force, etc.). This phenomenon is particularly present in our economies today (especially in Europe) where, although unemployment rates are generally low (except in Spain and Greece), precariousness has spread to a large part of the population as a result of the proliferation of low-paid jobs and part-time contracts (Gutiérrez-Barbarrusa, 2016). This is why,

in this case, a more appropriate indicator for estimating the industrial reserve army would be the sum of the unemployed, people working involuntarily part-time, long-term unemployed and people who, even if they have a job, are looking for another, all divided by the active population. An approximate figure for this can be found in the statistical institutes of countries such as the United States. Still, as the data are not available for a sufficient sample of countries to allow working with panel data, they had to be dispensed with.

Regarding the variable that measures the rate of exploitation (X_2) in the economy, this is shown as significant and with a positive sign, that is, an increase in the proportion between surplus value and wages generates growth in the rate of profit in the economy, coinciding with what was explained in the theory (Marx, 1976).

On the other hand, the estimated regressor for the variable that analyses the deviation of wages from the exchange value of labour force (X_3) presents a negative sign, by the assumption developed in Marx's theory (1976). However, we observe that the variable is not significant, so we cannot rule out that the result obtained in that variable was chance, as in Basu and Manolakos (2013).

The result obtained for the variable that measures the deviations of the relative price of capital from its relative value (X_4) is surprising, since it is significant and with a positive sign, that is, if the relative price moves from the value determined by the relation of socially necessary working time (making the relative price increase), the rate of profit will increase. This is opposed to what Marx (1976) exposed, while he argues that the increase in the price of capital increases the organic composition of capital, making the rate of profit decrease. This may be because both Marx and the other economists who have studied the rate of profit have not established a difference between short, medium and long term and the differences this entails. Specifically in the phenomenon under discussion, although in the short term a rise in the price of constant capital causes a reduction in the rate of profit, this increase in costs will also have an impact in the medium and long term on the organic composition of capital by altering the existing relationship between constant capital and variable capital (labour force) because if capital becomes more expensive, the capitalists will opt for more intensive methods of production in variable capital (which produces surplus value), thus causing the organic composition to be reduced and the rate of profit to increase. These changes in the distribution of labour and capital are explained in the model developed by Ohlin and Heckscher (Jones, 1956). These authors hold that a reduction in the wage/income ratio, motivated by a rise in the price of capital, leads to an increase in the labour-capital ratio since capitalists select more labour-intensive production methods.

Finally, the variable that measures final private consumption, X_5 (the variable that represents demand), is insignificant in the model. It cannot be refused that chance is involved in the relationship between demand and the rate of profit. This seems to indicate that demand, in the medium and long term, does not influence the rate of profit. This agrees with Shaikh (1992), who argues that aggregate demand only affects the cycle of capitalist accumulation in the short term, this relationship dissolving in the medium and long term.

2.4 Robustness analysis

A second model was carried out to analyse the robustness of the model. We eliminated the non-significant variables of the first model. Fixed effects were considered instead of random effects (thus using the OLS estimator). The results obtained are shown in Table 3.

Table 3: Robustness analysis. Model 2 estimation by OLS

Rate of profit			
		P-value	*t*-statistic
Trend	−0.0018387 (0.0001942)***	0	−9.47
Unemployment	−0.0036502 (0.0008909)***	0	−4.10
Rate of exploitation	0.5241684 (0.0147459)***	0	35.55
Deviation of relative price of capital	0.3757756 (0.130339)***	0.004	−1.34
Number of observations	399		
R² *overall*	0.7583		

*Significant at 10%   ** Significant at 5%   *** Significant at 1%

Source: Own calculation

The results obtained indicate robustness in the model studied since the conclusions derived from this model do not differ from those obtained in the first model. Therefore, we can affirm that there is, on the one hand, sufficient statistical evidence to confirm the presence of a tendency of the rate of profit to fall, at least during the period analysed (1960–2021) and, on the other hand, that the counter-trends analysed by Marx (1976) affect the rate of profit.

Conclusions

The study undertaken presents robust empirical evidence that allows us to assert that the postulates developed by Marx (1976) are not so far removed from reality, which is equivalent to affirming that the mechanism of accumulation that characterizes the capitalist mode of production inevitably tends to a stagnation from which it can only emerge through a social or economic crisis that destroys capital and allows the cycle to resume again.

It is necessary to mention that the results should not be considered definitive, thus closing the debate on the trend of profitability in capitalism, but should serve as a guide and source for further work on the subject, mainly because the model (like all) is not perfect and is susceptible to improvement. Firstly, in more extensive works, variables such as the one that measures overpopulation could be modified to reach even more precise estimates. Secondly, the inclusion of variables that, due to the lack of data for all countries, could not be used would improve the explanatory power of the model (for example, the percentage of financial firms in the total as an indicator of the financialization of the economy).

In addition, this work confirms the capacity of the theory to be completed with postulates and theoretical developments coming from other non-Marxist schools such as the Keynesian or even marginalist schools (as has been done when describing the effects of the temporal dimension on some variables). This is a significant problem that concerns the whole academia. This dangerous dogmatism makes it impossible to move away from certain ideological moulds, with the evident limitations that this entails when analysing reality.

In the light of the results obtained, first of all, these are not at all flattering. Does this mean that we are condemned to suffer recurrent economic crises that sentence a large part of the population to deprivation of the most basic needs? We must add that the only mechanism the State has to act against this tendency is public spending that increases aggregate demand. However, in the short term, it can improve economic conditions; later on, it cannot solve the problem that concerns us in this work.

On the other hand, one of the most important implications of this theory is that, under the capitalist mode of production, the development of productive forces (mainly the technical and technological development of society) is seriously limited because of the existence of a negative relationship between the organic composition of capital and profitability (Cockshott and Cottrell, 2003) and as a consequence of capitalists' scarce incentives to invest in times of low profitability. In other words, the capacities of our society to improve welfare through technology are not fully exploited under capitalism (Nieto and Cockshott, 2017).

It does not seem plausible, as we have seen, that the solutions to this problem can be given in the framework of a mode of production characterized by private ownership of the means of production, by the existence of independent, productive units interconnected through mercantile relations and by the control of other people's work, it not being in consequence crazy to consider alternative social relations of production to the existing ones now because, if in the same way that neither slavery nor feudalism have been eternal modes of production, what can make us think that capitalism is? To state that it could be so would make us fall into a serious ahistoricism that would reduce our possibilities of reaching increasingly higher levels of development or even following impossible scenarios to see capitalism as the non-obligatory (material) nature of human labour thanks to the reach of technological uniqueness (Lafargue, 1999).

The answers to this dilemma are very varied and constitute one of the most exciting debates today among economists, from those who advocate more intense capitalism to those who defend economic planning using computing power that current computing offers us (Nieto and Cockshott, 2017), but always bearing in mind that there is a solution to this problem.

References

Adair, P. (1985). La baisse tendancielle du taux de profit chez Marx (pertinence et limites d'un pronostic). *Cahiers d'économie politique/Papers in Political Economy,* (10–11), 305–322. Available at: https://www.persee.fr/doc/cep_0154-8344_1985_num_10_1_1015

Basu, D., Manolakos, P. T. (2013). Is there a tendency for the rate of profit to fall? Econometric evidence for the U.S. economy, 1948–2007. *Review of Radical Political Economics*, 45(1), 76–95, https://doi.org/10.1177/0486613412447059

Cockshott, P., Cottrell, A. (2003). A note on the organic composition of capital and profit rates. *Cambridge Journal of Economics*, 27(5), 749–754, https://doi.org/10.1093/cje/27.5.749

Cockshott, P. (2013). Is the theory of a falling profit rate valid? *World Review of Political Economy*, 4(3), 323–340, https://doi.org/10.13169/worlrevipoliecon.4.3.0323

European Commission (2020). *Macro-economic database AMECO.* Available at https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/macro-economic-database-ameco_en. Accessed March 1, 2020.

Gutiérrez-Barbarrusa, T. (2016). The growth of precarious employment in Europe: Concepts, indicators and the effects of the global economic crisis. *International Labour Review*, 155(4), 477–508, https://doi.org/10.1111/ilr.12049

Hair, J. F., Jr., Anderson, R. E., Tatham, R. L., et al. (1995). Multivariate Data Analysis, 3rd edn. New York: Macmillan Publishing Company. ISBN 978-0-02-946564-6

Hall, P. A. (2018). Varieties of capitalism in light of the euro crisis. *Journal of European Public Policy*, 25(1), 7–30, https://doi.org/10.1080/13501763.2017.1310278

Huerta de Soto, J. (2005). *Socialismo, cálculo económico y función empresarial,* Madrid: Unión Editorial. ISBN 978-8472095311.

Jones, R. W. (1956). Factor proportions and the Heckscher-Ohlin theorem. *The Review of Economic Studies*, 24(1), 1–10, https://doi.org/10.2307/2296232

Kalecki, M. (1956). *Teoría de la dinámica económica*. Ciudad de México: Fondo de Cultura Económica

Lafargue, P. (1999). *Le droit à la paresse.* Paris: Éditions Allia. ISBN 978-2-84485-406-3.

Maniatis, T. (2005). Marxian macroeconomic categories in the Greek economy. *Review of Radical Political Economics*, 37(4), 494–516, https://doi.org/10.1177/0486613405280802

Maniatis, T., Passas, C. (2014). The Law of the Falling Rate of Profit in the Post-War Greek Economy. In: Mavroudeas, S., ed. *Greek Capitalism in Crisis: Marxist Analyses* (pp. 105–129). London: Routledge Frontiers of Political Economy. ISBN 978-0-415-74492-8.

Marx, K., Engels, F. (1976). *El capital, Tomo III, El proceso global de la producción capitalista*. Ciudad de México: Siglo XXI.

Morishima, M. (1974). Marx in the Light of Modern Economic Theory. *Econometrica*, 42(4), 611–632, https://doi.org/10.2307/1913933

Nieto, M., Cockshott, P. (2017). *Ciber-comunismo.* Madrid: Trotta. ISBN 978-84-9879-721-3.

Okishio, N. (1961). Technical changes and the rate of profit. *Kobe University Economic Review*, 7(1), 85–90.

Ricardo, D. (2014). *Principios de economía política y tributación*. Ciudad de México: Fondo de Cultura económica. ISBN 978-9681618902.

Robinson, J. (1961). Prelude to a critique of economic theory. *Oxford Economic Papers*, 13(1), 53–58, https://doi.org/10.1093/oxfordjournals.oep.a040858

Robinson, J. (1980). Time in economic theory. *Kyklos*, 33(2), 219-229.

Shaikh, A. (1992). The Falling Rate of profit as the Cause of Long Waves. In: Kleinknecht, A., et al., eds. *New findings in long wave research* (pp. 174–202). London: Palgrave Macmillan. ISBN 978-1-349-22450-0.

Smith, A. (1794). *La riqueza de las naciones*. Valladolid: Oficina de Viuda e Hijos de Santander.