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Business Cycles, Investment, and Profits in Colombia: A Marxist Political Economy Approach

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ABSTRACT

Drawing on Marx's economic theory—where the profitability of capital determines investment and, consequently, the dynamics of output—this article identifies the business cycles of the Colombian economy and evaluates investment, the average rate of profit, and the mass of profits as their determinants. From the cyclical deviations of real gross domestic product (GDP), six cycles with an average duration of 8.3 years were identified between 1967 and 2019. Employing a vector autoregressive (VAR) econometric model, and Granger causality tests, evidence was found in favor of Marx's approach: both the rate of profit and the mass of profits determine investment while this, in turn, is co-determined by the business cycle. On the contrary, no evidence was found that investment determines either the rate of profit or the mass of profits. Thus, for the Colombian economy, the dynamics of the profitability of capital is the key to the business cycle.

KEYWORDS

Economic cycle; rate of profit; mass of profits; VAR model; Colombia

JEL CLASSIFICATIONS

B51; E32; C32; N16

Introduction

Capitalist business cycles are recurrent fluctuations in the level of economic activity that usually involve four phases: two trends (boom and contraction) and two inflection points (crisis and recovery) that mark the transition from one trend to another (Mariña 2020). Within each cycle, crisis and contraction phases imply a growth of unemployment, cuts on real wages, increasing poverty, bankruptcy of firms, and, in general, destruction of productive forces and material wealth. Therefore, economic cycles are an irrational and recurrent waste of human, material and ecological resources (Basu 2019; Cámara 2020; Sherman 1991).

In pre-capitalist societies economic crises did not have a cyclical nature, and they were explained by natural or social catastrophes (epidemics, floods, droughts, wars, earthquakes, etc.) that destroyed the means of production as well as the human labor power. Nevertheless, in capitalist economies, the destruction and waste of human/material resources are not the causes but instead the consequences of the economic crises (Mandel 1968). Business cycles—whose existence can be traced back to the beginning of the nineteenth century until nowadays—are a *structural and non-avoidable feature of the capitalist mode of production*. They have occurred in different contexts of world market, international monetary systems, economic policy, technological basis or socio-political struggles (Mariña and Mateo 2015).

The economic literature on business cycles has identified several time durations of them. On the one hand, the long-term fluctuations that would cover several decades. That is the case of Kondratiev long cycles (Barnett 2016; Sandoval 2015) or, in the Marxian tradition, the long waves (Mandel 1986; Mariña 2020). In contrast, there are short cycles, or Kitchin cycles, whose

approximate duration is three years (Rodríguez 2015). Finally, there is an intermediate kind of cycle: the medium-term cycle, business cycle, or Juglar cycle with an approximate duration between seven to ten years (Rodríguez 2015).¹ Since this last cycle is the research objective of this article, in the rest of the piece, the cycle is employed as synonym of medium-term cycle.

The bulk of studies on Colombian business cycles are based upon the neoclassical approach where economic fluctuations are modeled as successive displacements of equilibria states by exogenous “shocks.” Like “real shocks” by the supply-side (technology, preferences, labor supply, etc.) or shocks related to the demand-side (Escobar, 2005). Thus, the Colombian literature on cycles has been focused on the effect of demand-side external shocks (coffee or oil prices, flows of foreign investment, terms of trade, etc.) (Echavarría et al. 2012; Martínez 2008; Ocampo 2016; Posada and Misas 2000).

On the contrary, and following a heterodox approach, Moreno (2002) evaluates the Goodwin² (1967) predator-prey cycle model for the Colombian economy in 1951–1995, finding weak qualitative evidence on the Goodwin cycles for Colombia, but with no econometric evidence. Later, neither García and Herrera (2010) found empirical evidence of Goodwin cycles for the Colombian economy between 1951 and 2005.

This article offers a different approach, grounded in the Marxian economic tradition, to the study of the Colombian business cycles. Here, the investment, the average rate of profit, and the mass of profits are evaluated as determinants of the business cycle in the Colombian economy. To achieve that, and using national accounts data from 1967 to 2019, this article identifies the medium-term cycles employing the Hodrick-Prescott filter (Enders 2008) and then estimates a vector autoregression (VAR) econometric model. Following Marx’s theory, the central hypothesis is the key role of profitability of capital (measured by both, the *rate* of profit and the *mass* of profits) in the Colombian business cycles, determining both the investment and the output fluctuations. Furthermore, it is expected to compare and evaluate the empirical findings with Kalecki’s (1971) model where investment determines profits as with Keynes’s (2018) statement on the psychological determination of marginal efficiency of capital and its relation to both investment and cycles.

The rest of the article is organized in six sections, including this introduction. The second section presents the literature review focused on heterodox theories of business cycles and their empirical evidence. Section three explains the data sources as well as the statistical and econometrical methods employed. Section four identifies and describes the Colombian business cycles between 1967 and 2019. Then, the VAR econometric results (impulse-response functions, variance decomposition, Granger causality tests) are reported and discussed in the fifth section. Finally, the last section sets up the conclusions.

Literature Review

In contrast with the neoclassical approach, where business cycles are mainly explained by exogenous shocks (in the aggregate supply or demand), the majority of heterodox approaches in economics hold the endogenous nature of economic cycles. Namely, the internal dynamics of the central variables within the economic system determine the fluctuations in economic activity.

Thus, for Kalecki (1971) the cyclical dynamics of (private) investment is the main determinant of business cycles. Kalecki highlights the temporal lags between investment decisions and effective investment, on the one hand, as well as the unidirectional causal relationship from investment to

¹In the Marxist literature there are still debates regarding the timing and classification of economic cycles, especially for the long term. Recent controversies over long waves/cycles can be found in Roberts (2024), Tapia (2023, Chapter 8), Basu (2016), and Tsoulfidis and Papageorgiou (2019).

²The Goodwin (1967) model, in turn, is based upon the profit squeeze mechanism suggested by Marx (1990) in his general law of capitalist accumulation. For a detailed analysis of this topic, see Cámara (2022).

profits. According to Kalecki (1971, 78–79): “it is clear that capitalists may decide to consume and to invest more in a given period than in the preceding one, but they cannot decide to earn more. It is, therefore, their investment and consumption decisions which determine profits, and not vice versa.” Although in his analysis of the “determinants on investment” Kalecki (1971) acknowledges the “rate of change in aggregate profits” as one of the determinants of the investment,³ in his full explanation on business cycles Kalecki clarifies that, as the profits depend on previous investment, current investment is, in turn, determined by the dynamics of preceding investment (Kalecki 1971). A similar presentation can be found in other Post-Keynesian authors such as Kaldor (1957, 1987) or Lavoie (2009).

On the other hand, Keynes (2018, 279) explicitly holds that “the essential character of the trade cycle and, especially, the regularity of time-sequence and of duration which justifies us in calling it a cycle, is mainly due to the way in which the marginal efficiency of capital fluctuates.” Nevertheless, in Keynes, there is no unidirectional causal relationship from the marginal efficiency of capital (profits) to investment (Astarita 2008). First, because Keynes’ marginal efficiency of capital does not correspond to current or past profits but to the returns *subjectively* expected by capitalists.⁴ Those expected profits, in Keynes (2018, 282) words, are determined by “the uncontrollable and disobedient psychology of the business world.” Therefore, for Keynes the business cycle is determined, in last resort, by the fluctuations in the “psychology of investment markets,” with independence of the current or past behavior of the capital’s profitability.

Moreover, and as correctly holds Astarita (2008), the capitalists’ expectations on profits in Keynes’ theory depend overall on the expected dynamics of effective demand, where the investment is, in turn, one of its more important components. Therefore, and following circular reasoning, the conclusion is similar to Kalecki’s: the investment is determined by itself.

In contrast, for Marx (1990, 1991, 1992) the profitability of capital is the main driver of capital accumulation and, therefore, the key variable within the economic cycle (called by Marx the industrial cycle). Although Marx did not manage to write a specific chapter or section on business cycles and crises (Cámara 2020) his comments on the relationship between profitability of capital, accumulation, crises and cycles can be traced throughout *Capital* and other of his economic works (Marx 2005, 1969).

First, and following the circuit of capital, the continuous valorization of capital (the conversion of money into more money) constitutes the fundamental logic of capitalism; its *raison d’être* and the basic condition of economic reproduction. In the general law of capitalist accumulation, Marx (1990, Chapter 25) identifies profit as one of the main incentives of accumulation. In fact, he describes how eventual wage increases can squeeze profits and thus reduce the rate of accumulation—an idea later formalized by Goodwin (1967). Previously, in chapter 22 of volume I of *Capital*, Marx (1990) states that, independently of the percentage of surplus-value accumulated by capitalists, the volume of accumulation is determined by the factors that determine the mass of surplus-value (rate of exploitation and productivity of labor).

The centrality of profits in explaining investment and the business cycle has been highlighted by a whole series of contemporary Marxist authors (Bakir and Campbell 2017; Cámara 2020; Carchedi and Roberts 2013; Mariña 2020; Tapia 2017; Weisskopf 1979). Thus, according to Mariña (2020, 19): “it is the fluctuations, trends and disturbances of profitability that are the basic

³Kalecki (1971, Ch. 9) also considers, as determinants of investment, gross savings (depreciation, undistributed profits of firms, and the ‘personal savings’ of the firm’s owners) and, of secondary relevance, the interest rates and the share yields. In the long term, Kalecki (1971, Ch. 15) states that technical innovations inject a long-run upward tendency into investment, while the opposite effect is caused by rentiers’ savings. Here, Kalecki’s ideas differ broadly from Marx’s view that the profit rate tends to fall due to biased technical change. A further discussion of this topic, however, lies outside the scope of this article. The theoretical relation between Kalecki and Marx has been widely discussed. See, for example Brennan (2022), Hein (2019, 2024), Foster (2013), and Trigg (2002).

⁴Therefore, in Keynes, the interest rate as a determinant for investment is also based on capitalist expectations regarding future profitability.

determinants of the accumulation decisions made by capitalists and, consequently, of those of the dynamics of the economic process.” For Shaikh (2016) the profitability of capital regulates, through different channels, both aggregate supply and aggregate demand. In contrast to Keynes, Shaikh (2016) stresses that the profit expected by capitalists—which determines their investment decisions—is regulated by past and present profit behavior; not by psychological factors.

In volume II of *Capital*, Marx suggests that the recurrent duration of the cycle (decennial in Marx’s time) would be explained by the turnover time of fixed capital, that is, by the average lifespan of capital goods (machinery and equipment, buildings, means of transport, etc.). Moreover, for Marx (1992, 264): “a crisis is always the starting-point of a large volume of new investment.” On this point Mandel (1975, 110) comments: “In practice, machines are not renewed by 1/7 or 1/10 every year, which would mean that they would be completely reconstructed after 7 or 10 years. The actual process of the reproduction of fixed capital rather takes the form of mere repairs to these machines during the 7 or 10 years, after which they are replaced by new machines at a single stroke [...] it is the renewal of fixed capital that determines the feverish activity of the boom.”

Schematically, and following Marx’s insights, the rotation of fixed capital is related to cycles in the following manner. First, during the boom phase, high profitability triggers investment in fixed capital and, in turn, the economic boom. Second, the same boom eventually erodes the profitability through increases in wages and key input prices (profit squeeze) and a reduction in demand for fixed capital (due to the long lifespan of prior fixed capital installed at the beginning of the boom).⁵ Third, the fall in the profitability of capital reduces investment, triggering the crisis: overproduction, high unemployment, and bankruptcy of some firms, among others. Fourth, the contraction phase eventually recovers the profits through the reduction of real wages, devaluation of fixed capital and reduction of prices of key inputs. Fifth, finally, with a recovered profitability, the firms that survived the crisis/contraction can and must restore (expand) their fixed capital stock that has already reached its lifespan. Therefore, *grosso modo*, the average lifespan of fixed capital is one of the determinants of the duration of the cycle.⁶

In the same volume II, Marx also advances a critique of the idea that crises arise from the low consumption of the working class by pointing out that, empirically, all crises are preceded by an increase (and not a decrease) in the wage income of the working class (Marx 1992, 488). This dynamic behavior of wages has been empirically verified by Tapia (2012) for the U.S. economy in the period 1945–2010.

Finally, in volume III of *Capital*, Marx (1991) conceptually develops the two main measures of the profitability of capital: the rate of profit and the mass of profits. The mass of profits is determined by the mass of surplus-value (extracted from the working-class) and the profit rate, the rate at which the total capital is valorized, is determined positively by the rate of surplus-value and inversely by the organic composition of capital (Marx 1991). While the rate of profit would

⁵At a more concrete level of abstraction, the boom phase also erodes the profitability of industrial capital through increases in the interest rate and financial obligations (Cámara 2020; Marx 1991) and, particularly for peripheral economies that must import crucial fixed capital assets, through restrictions in the balance of payments (Duque 2025).

⁶In volume II of *Capital*, Marx (1992) also states that the lifespan of fixed capital is not only determined by physical factors but also by a “moral” element determined, in turn, by technical change. Therefore, if technical change accelerates the turnover of fixed capital, the average duration of the cycle will tend to contract. Conversely, the cyclical dynamics of capital accumulation induce the technical change: at the end of the boom period, the increases in wages induce the adoption of labor-saving innovations (Marx 1990) while, at the end of the contraction phase, the intensified competition among capitals induces them to adopt cost-saving (usually also labor-saving) innovations. The final outcome tends to be a labor-saving and capital-using pattern of technological change, called in the academic literature as Marx-biased technical change. A full treatment of technical change, accumulation, and cycles is outside of the scope of this article. Nevertheless, some estimations of the patterns of technical change in Latin America and Colombia can be found in Marquetti and Porsse (2017) and Duque and Ramírez (2026).

exhibit a long-term decreasing tendency (subject to certain counteracting causes),⁷ the mass of profits, in contrast, would exhibit a long-term increasing tendency. According to Marx (1991, 325):

“As the process of production and accumulation advances, therefore, the mass of surplus labor that can be and is appropriated *must* grow, and with it too the absolute mass of profit appropriated by the social capital. But the same laws of production and accumulation mean that the value of the constant capital increases along with its mass, and progressively more quickly than that of the variable portion of capital which is converted into living labor. The same laws, therefore, produce both a growing absolute mass of profit for the social capital, and a falling rate of profit.”

Our interpretation of the dynamic interaction between the mass and the rate of profit in Marx is depicted in Figure 1.⁸ On the one hand, in the long-term, the rate of profit tends to fall, due to increasing organic composition of capital, while the mass of profit tends to grow, due to the exponential growth in the capital accumulated. On the other hand, through the business cycle, the following schematic process occurs. Initially, during the boom phase, the mass of profits conceals the falling rate of profit. Then, during the crisis, the rate of profit drops so low that the mass of profit can no longer grow enough to sustain further investment. This is Marx’s absolute overaccumulation:⁹ investment falls, output is cut back, unemployment grows, realization problems emerge through firms that produce means of production and, later, through those that produce means of consumption, etc. During the contraction phase, as we have seen previously, the conditions are endogenously created for the recovery of profitability. Finally, in the recovery, the increasing profit rates allow the recovery of the mass of profits, triggering the next boom.

In the Marxist literature there is an important discussion on the relative importance of the rate of profit and the mass of profits in the explanation of crises and cycles. Thus, for Harvey (2021) the mass of profits plays a much more important role than the rate of profit. In fact, and following the underconsumptionist tradition of Rosa Luxemburg (2003), Harvey (2021) suggests that a growing mass of profits generates realization problems that may eventually lead to economic crises. In contrast, for Roberts (2021) both the rate of profit and the mass of profits play a decisive role in the business cycle. Furthermore, there would be a close relationship between the two: “the mass of profit can and will rise as the rate of profit falls, keeping capitalist investment and production going. But as the rate of profit falls, the increase in the mass of profit will eventually fall to the

⁷Theoretically, being C the constant capital advanced, V the variable capital advanced, and the P the mass of profits, the rate of profit (r) could be decomposed into the rate of surplus-value (e) and the organic composition of capital (σ):

$$r = \frac{P}{C + V} = \frac{P/V}{\frac{C}{V} + 1} = \frac{e}{\sigma + 1}$$

Assuming a constant (or decreasing) rate of surplus-value (Marx, 1991), an increasing organic composition of capital (due to biased labor-saving capital-using technical change and competition among capitals) will decrease the rate of profit. Marx’s tendency of the rate of profit to fall has been widely discussed in the Marxist literature. A recent, concise and rigorous presentation of this topic can be found in Basu (2013, 2019).

⁸The numerical example in Figure 1, for illustration purposes only, was built upon the following equations. The mass of profits: $P_t = r_t K_t$, where r_t is the profit rate and K_t the fixed capital stock. The rate of profit is exogenously generated with a sine trigonometric function with a declining trend: $r_t = a - bt + \beta \sin(\lambda t)$, where t is time, and a, b, β and λ are parameters. The stock of fixed capital: $K_t = (1 - \sigma)K_{t-1} + I_t$, where σ is the depreciation rate and I_t the gross investment. Finally, $I_t = (sr_{t-1})K_{t-1}$ where s is the investment effort (the share of profits invested by the capitalist). For simplification, all the parameters (a, b, β, λ, s) are held constant during the time. A rigorous mathematical model of endogenous cycles in the Marxist tradition is outside of the scope of this article. Recent advances in such models can be found in Cajas-Guijarro (2024, 2025) and Nikolaos et al. (2022).

⁹According to Marx (1992, Ch. 5) “when the increased capital produced just as much, or even less, surplus-value than it did before its increase, there would be absolute over-production of capital; i.e., the increased capital $C + \Delta C$ would produce no more, or even less, profit than capital C before its expansion by ΔC .” In both cases there would be a steep and sudden fall in the general rate of profit, but this time due to a change in the composition of capital not caused by the development of the productive forces, but rather by a rise in the money-value of the variable capital (because of increased wages) and the corresponding reduction in the proportion of surplus-labor to necessary labor.

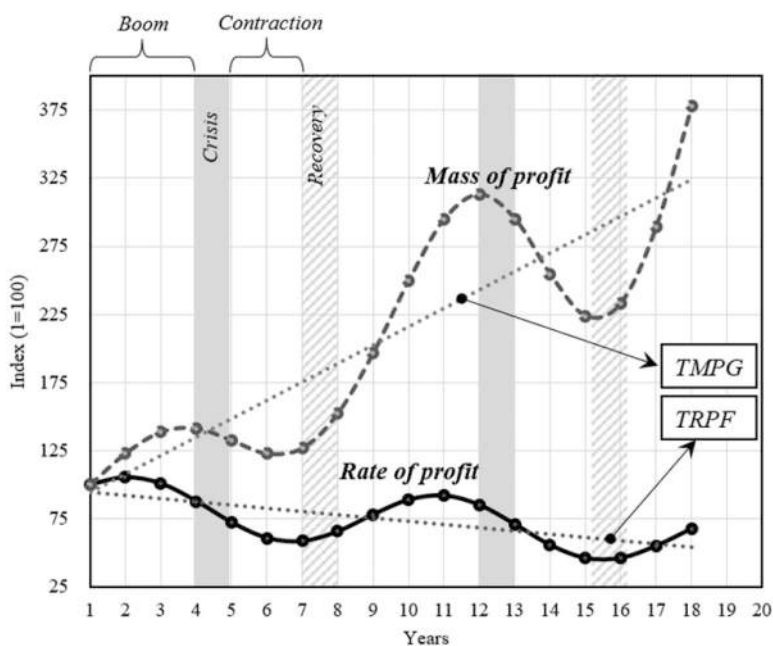


Figure 1. Theoretical dynamics of the rate of profit and the mass of profits through the business cycle. *Note:* TMPG, tendency of the mass of profit to grow; TRPF, tendency of the rate of profit to fall. *Source:* Author's own elaboration

point of ‘absolute over-accumulation,’ the tipping point for crises (Roberts 2021). A similar position can also be found in Mandel (1975), Mariña (2020), and other Marxist authors.

Several empirical studies have evaluated the dynamic interaction between business cycles, investment and the profitability of capital. Weisskopf (1979) and Cámara (2013) have found, for the U.S. economy after World War II and using descriptive statistics, that cyclical reductions in the average rate of profit tend to occur before the outbreak of economic recessions in many, but not all, cycles. For his part, Tapia (2012, 2013, 2017) has found—also for the U.S. economy—empirical evidence that cyclical reductions in the mass of profits constitute the core mechanism of the business cycle. Moreover, employing time series econometric techniques (VAR models and Granger causality tests), Tapia (2018) finds evidence of causality from the mass of profits to investment (and not the other way around). Similar results have also been found for Germany (Trofimov 2026) and Brazil (Grazziotin, Fornari, and Marquetti 2022).

Overall, that literature is part of a wider body of Marxist research dealing with the estimation of the average rate of profit and its determinants using available statistics from National Accounts (Basu et al. 2025; Brown and Mohun 2011; Cámara 2007; Moseley 1991; Shaikh and Tonak 1994). This procedure has involved several theoretical and methodological controversies. First, estimating fixed capital stocks and turnover time from national accounts data (Jefferies 2023; Roberts 2023). Second, the distinction between productive/unproductive labor and its role in the estimation of the profitability of capital (Cámara 2006; Mohun 1999; Moseley 1994, 2011; Paitaridis and Tsoulfidis 2012; Rotta 2018, 2022). Our specific methodological specifications for estimating fixed capital and productive/unproductive labor in Colombian data are explained in the following section.

Data and Methods

Data

Data employed in this research covers the period 1967–2019 (53 annual observations). The raw variables are Colombian gross domestic product (GDP) at constant national prices obtained from

Colombian official statistics (DANE 2021), *gross investment* (gross fixed capital formation) at constant national prices, excluding residential buildings investment,¹⁰ obtained also from Colombian official statistics (DANE 2021), the *average rate of profit* and the *mass of profits* obtained from the estimations of Duque (2022).¹¹

Considering the analytical emphasis on the cycles—instead of the long-run dynamics—the cyclical component of each time series is extracted using the Hodrick-Prescott (HP) filter (Enders 2008), widely employed in the economic literature, even in the Marxian one (Basu and Manolakos 2013; Shaikh 2016; Veneziani, Mohun, and Harvie 2006). The HP filter¹² decomposes each series, y_t , between a trend, τ_t , and a stationary cycle, c_t :

$$y_t = \tau_t + c_t \quad (1)$$

Figure 2 shows the decomposition of the four variables, expressed in natural logarithms (with the exception of the rate of profit, which is expressed in percentages), using the HP filter (due to the annual nature of the information, the lambda parameter used was equal to 100). It can be observed that both GDP and investment presented a long-term increasing trend. In contrast, the average rate of profit presented medium-term oscillations (long waves): increasing from 1967 to 1977, decreasing from 1978 to 2000, and increasing again from 2001 to 2019, although its linear trend for the whole period (1967–2019) was decreasing. For its part, the mass of profits exhibited a long-term increasing trend. As can be seen, these long-term trends of the variables are compatible with Marx's approach of a decreasing rate of profit and an increasing mass of profits. Moreover, and in correspondence with Roberts (2021) and Mandel (1975), the periods of sharp fall in the rate of profit (the early 80s, late 90s, years 2008–2009 and 2014–2015) corresponded with absolute contractions in the mass of profits and, as it will be seen in more detail in the descriptive analysis further in the following section, also with economic crises. *Grosso modo*, in those periods, the short-run contraction in the mass of profits (despite its long-run upward trend) is an expression of *absolute overaccumulation of capital*. Under those conditions, as shown in Figure 2, investment drops, unleashing overproduction of commodities and realization problems, which are reflected, in turn, for example, in an ulterior steep fall in manufacturing capacity utilization (ANDI 2026).

In what follows, the focus will be only on the cyclical components of each of the variables, that is, on their cyclical deviations from their long-term trends. Hence, when the references to “investment,” “mass of profit,” and so forth are in fact references to the cyclical component of investment, of the mass of profit, etc. A subsequent section, based on the cyclical behavior of GDP, identifies the average cycles of the Colombian economy between 1967 and 2019 and it carries out an exploratory analysis of the dynamic relationship of GDP with investment, the rate of

¹⁰From the Marxist perspective, residential housing is not a means of production and, therefore, the increase in housing stock is not considered part of capitalist investment.

¹¹Duque (2022) estimates the average rate of profit as the ratio between the mass of profits and the stock of fixed capital, both estimated from Colombian national accounts data. Regarding the fixed capital stock, Duque (2022, 302) explains: “Colombia has no official measurement of capital stock and depreciation. Therefore, the Colombian fixed capital stock, K_t , from 1967 to 2019 was estimated from Colombian National Accounts data (DANE 2020) following the perpetual inventory method broadly used in the economic literature (Harberger 1972; Mariña 2001; Mariña and Moseley 2000). This method requires the series of fixed capital formation, assumptions over the annual depreciation rate for each kind of fixed capital, and an estimate of the initial capital stock. We obtained the fixed capital formation series from official Colombian statistics (DANE 2020). Following other similar works in Mexico and Latin America (Mariña 2001), we assumed that non-residential buildings and other construction depreciate at 1/60 percent per year, while machinery and equipment depreciate at 1/15 per year [...] Within the fixed capital stock, we only included non-residential buildings and machinery and equipment. Residential buildings were excluded due to their non-capitalist nature, i.e., they are not fixed capital advanced to obtain surplus-value (Cámara 2007).” However, due to the lack of information, Duque's (2022) estimations of both rate of profit and mass of profits in Colombia do not consider the distinction between productive/unproductive labor or sectors. The profit mass is expressed at constant prices and it was calculated using the GDP deflator.

¹²For a critique of the HP filter, see Hamilton (2018); further discussion can be found in Hodrick (2020) and Moura (2024).

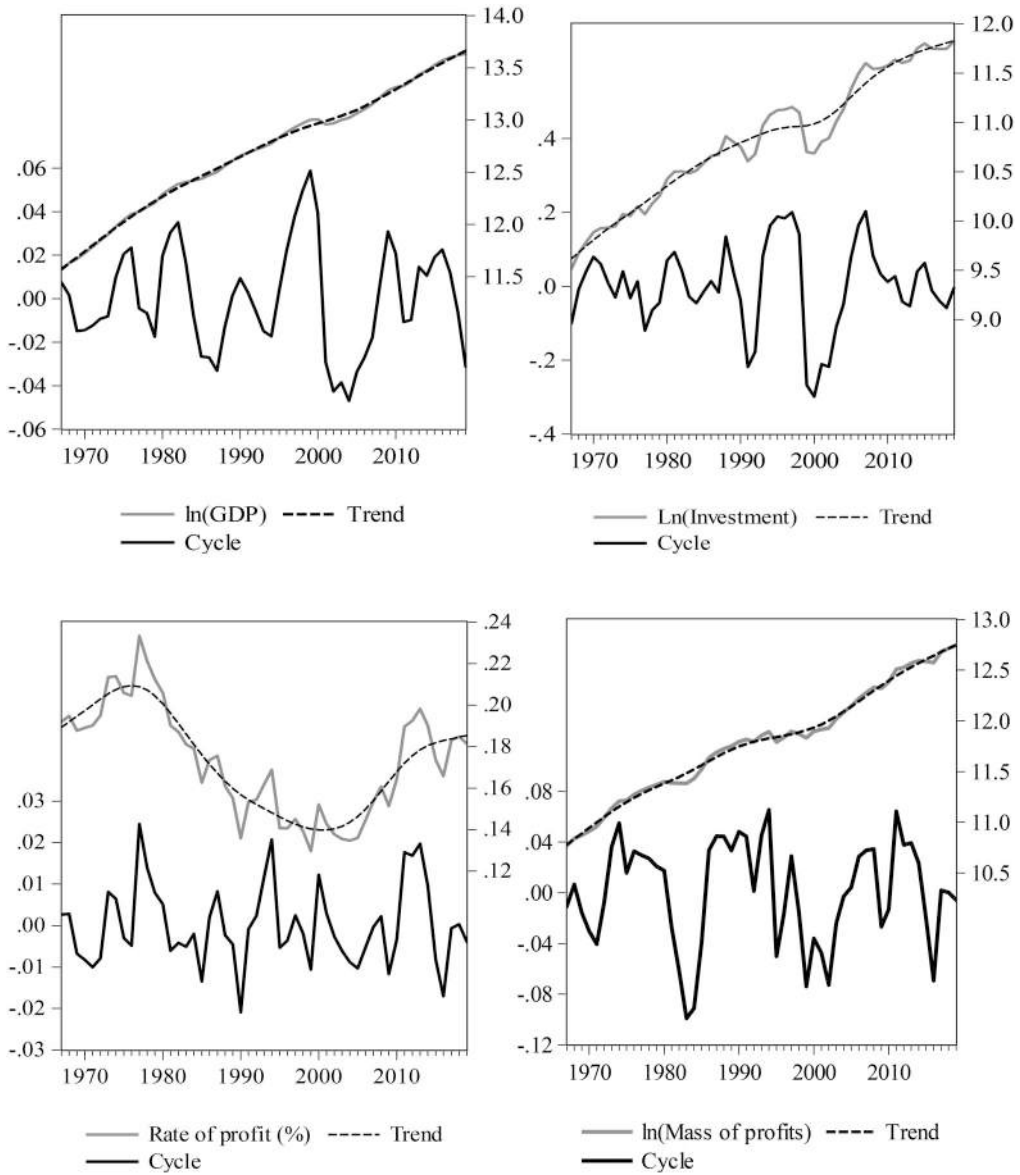


Figure 2. Decomposition of GDP, investment, rate and mass of profits from the Hodrick-Prescott filter, Colombia 1967–2019. *Note:* GDP, gross domestic product. *Source.* Author's estimations on the basis of annual data obtained from DANE (2021) and Duque (2022).

profit, and the mass of profits, respectively. Subsequently, in the penultimate section, it is developed the econometric analysis of time series, whose methodological characteristics are presented in the following section.

Econometric Specification

The econometric analysis makes use of a VAR model, which is a system of n equations and variables that allows us to explain each variable in terms of its own lagged values, as well as the present and past values of the remaining $n-1$ variables (Enders 2008; Stock and Watson 2001).

Unlike other econometric methodologies, in VAR models all variables are treated as endogenous and, as can be seen below, the direction of dynamic causality between them can be tested, being a particularly useful methodology for our research objective. The general specification of our VAR model is as follows:

$$Y_t = B_0 + B_1 Y_{t-1} + \dots + B_p Y_{t-p} + \varepsilon_t \quad (2)$$

where,

$$Y_t = \begin{bmatrix} GDP_t^c \\ I_t^c \\ r_t^c \\ \Pi_t^c \end{bmatrix}$$

where Y_t the 4×1 vector of the variables of our VAR model: GDP_t^c is the cyclical deviation of GDP at constant prices with respect to its long-run trend; I_t^c is the cyclical component of investment; r_t^c is the cyclical component of the average rate of profit; and Π_t^c is the cyclical component of the mass of profits (see Figure 2). As it is reported in the Appendix (Table A1), all variables within the vector are stationary, that is, $I(0)$, which is predictable due to the use of the HP filter to obtain them (Enders 2008). In turn, B_0 it is a 4×1 vector with the intercepts while $\{B_i, i = 1, 2, \dots, p\}$ are the 4×4 coefficient matrices of the VAR model up to lag p . Finally, ε_t is the 4×1 vector of stochastic shocks.

Descriptive Statistics: Cycles and Crisis in Colombia (1967–2019)

This section identifies the average cycles of the Colombian economy between 1967 and 2019 and presents an exploratory analysis of the relationship between these cycles and the cyclical behavior of investment, the rate of profit, and the mass of profits. Figure 3 reports the cyclical fluctuations of real GDP, around its long-term trend, as well as economic shocks (identified as periods of negative real GDP per capita growth) for the period 1967–2019. Following the methodology of Rodríguez (2015), Graph 2 indicates the extreme relative values linked to each fluctuation, i.e. the relative peaks of expansion and contraction, which allows us to identify the respective average cycles in the Colombian economy (see Table 1).

Thus, in 1969, real GDP was 1.5% below its long-term trend, marking the relative minimum of that cycle, while in 1976 it reached a maximum of 2.3% above its long-term trend. Subsequently, in 1979 a new relative minimum was reached (1.7% below the long-term trend). Thus, between minimum and minimum, the first cycle was identified for the years 1969–1979, with a peak of maximum expansion in 1976. On the other hand, the second cycle starts in 1979 and goes until 1987, with a maximum in 1982, and so on, as reported in Table 1. Thus, for the period considered, the Colombian economy presented 6 average cycles whose average duration was 8.3 years. The shortest cycles lasted 7 years while the longest lasted 10 years, thus being related to the “decennial cycle” described by Marx (1992). The length of the average cycles in Colombia is similar to that found by Rodríguez (2015) for the Mexican economy (7.8 years) in the period 1980–2009.

Leaving aside the year 1967, the Colombian economy was above trend during the periods 1974–1976, 1980–1983, 1989–1991, 1995–2000, 2008–2010, and 2013–2017. The average duration of these expansionary phases was 4 years. In contrast, the periods in which the economy was below its trend were 1968–1973, 1977–1979, 1984–1988, 1992–1994, 2001–2007, 2011–2012, and 2018–2019. Thus, the average duration of these contractionary phases was 4.3 years, slightly longer than that of the expansionary phases. The data in Figure 3 and Table 1 show that, although all the cycles presented relative minimums, not all were associated with crises per se (periods

Table 1. Medium-term cycles in the Colombian economy, 1967–2019.

Cycles	Timeline		Minimum	Length (years)	Associated crisis
	Minimum	Maximum			
I	1969	1976	1979	10	None
II	1979	1982	1987	8	Debt crisis
III	1987	1990	1994	7	None
IV	1994	1999	2004	10	End-of-the-century crisis
V	2004	2009	2011	7	Great recession
VI	2011	2015	2019	8	(Crisis COVID-19)
Average				8.3	

Source. Own elaboration based on data from DANE (2020) and Duque (2022).

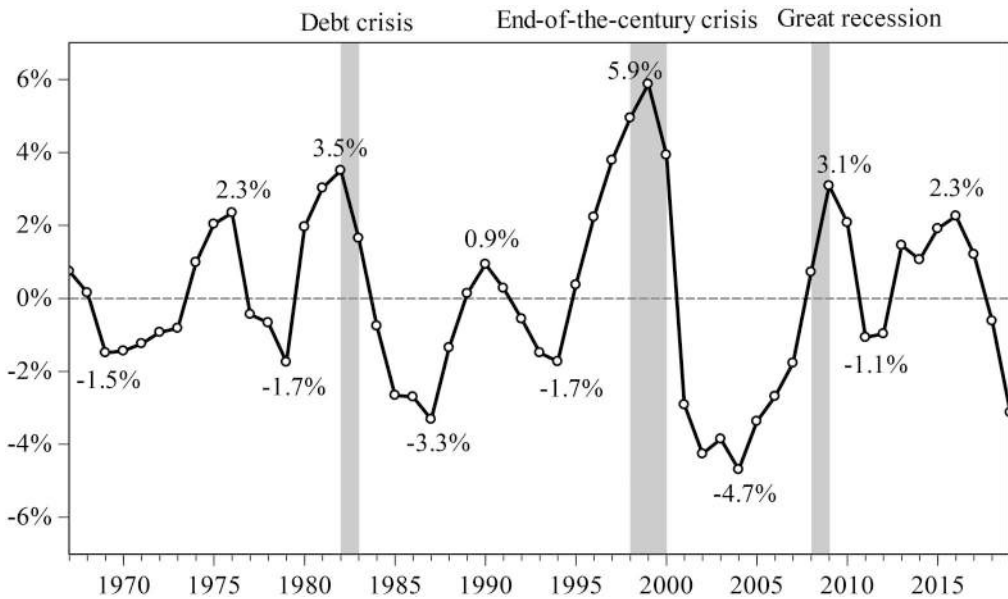


Figure 3. Medium-term cycles and crisis in the Colombian economy, 1967–2020. Notes: GDP, gross domestic product. Cyclical deviations (%) of real GDP from the long-term trend obtained with the Hodrick-Prescott Filter (lambda parameter = 100). Source. Own elaboration based on data from DANE (2020) and Duque (2022).

with negative annual growth in GDP per capita). Such was the case of the first and third cycles in 1969–1979 and 1987–1994, respectively.

The context of cycle I (1969–1979) was marked by the final stage of the state-led developmentalist import-substitution industrialization (ISI). Cycle II (1979–1987) saw the ISI process reach its limits: the severe crisis of 1982–1983, as well as the tendential fall in the profitability of capital, stagnation of investment and output, a process also common to Mexico (Cámara 2008), Brazil (Marquetti, Maldonado Filho, and Lautert 2010), and Argentina (Malvicino and Terranova 2024). Cycles III (1987–1994) and IV (1994–2004) were accompanied by the neoliberal transition in the Colombian economic policy: privatization of state-owned enterprises (in health, finance, transportation, utilities, and manufacturing sectors); international free trade policies; labor reforms to increase exploitation of labor; liberalization of the exchange rate as well as the international movement of capital, and so forth (Ahumada 1996). During those two cycles, the agriculture and manufacturing sectors lost relative importance in comparison with mining (including oil) and finance. Harsh new monetary policy (high interest rates to reduce inflation) during the 1990s decade seems to have squeezed industrial profits and, therefore, triggered the crisis of 1999–2000 (the worst crisis in the Colombian twentieth century).

Finally, cycles V and VI marked the consolidation of neoliberal policies in the Colombian economy. This era was characterized by a biased pattern of capital accumulation, primarily oriented toward finance, real estate, and mining (Duque and Ramírez 2026; Martínez Casas 2014). Discontent grew among the lower classes, particularly toward the end of this period, which ultimately led to the social unrest of 2021 and the election of a new left-wing reformist government from 2022 to 2026.

Figure 4 plots, together with the GDP cycles, the cyclical dynamics of investment, the rate of profit, and the mass of profits. In all three cases, we observe a close relationship of the variables with the average cycles. In fact, the three crises that occurred in the period 1967–2019 were preceded and/or accompanied by contractions in investment as well as in the rate of profit and the mass of profits. Moreover, a close relationship between the dynamics of the rate of profit and the mass of profits can be identified. However, the simple visual inspection of the variables does not allow us to rigorously establish the relationship between them, whether this relationship is statistically significant, let alone the possible causal direction between them. Hence, it is necessary to move to the econometric analysis of the VAR model.

VAR Model: Results and Discussion

From the general specification presented in Equation (1), and following the Akaike information criterion, a VAR model with two time lags ($p=2$) was estimated (using the software Eviews). Next, the results of the generalized impulse-response functions are discussed, and, later, the results of variance decomposition and Granger causality tests (the results of the econometric diagnosis of the VAR are presented in the Appendix A).

Generalized Impulse-Response Functions

One of the limitations of standard (recursive) VAR models is that the estimated coefficients, as well as the impulse-response functions, depend on the *a priori* ordering of the variables. Thus, different variable orderings would lead to different results (Stock and Watson 2001). To avoid these potential problems, generalized impulse-response functions were used (Pesaran and Shin 1998), where the impulse-response analysis does not depend on the ordering of the variables in the VAR model. Figures 5 to 8 show the results of the impulse-response functions for a 10-year horizon with 95% confidence intervals (to establish statistical significance) estimated using the bootstrap replication method.

Figure 6 illustrates the *ceteris paribus* effects of shocks or disturbances of the variables under study on the average GDP cycles (here a disturbance in a variable should be understood as an unexpected increase equivalent to one standard deviation and whose duration corresponds to one year). It can be seen that a shock to investment increases the cyclical component of GDP in years three, four and five, since in the other years the effects are not statistically significant. However, a positive shock in the rate of profit or in the mass of profits also increases the cyclical component of GDP between years 3 and 5. Thus, the relevance of both investment and the profitability of capital in the dynamics of economic cycles in Colombia is evident.

The *ceteris paribus* effects on investment are reported in Figure 6. There it can be observed that, in line with Kalecki (1971) and Keynes (2018), a shock to investment has a temporary impact on itself, for years 1 to 3. However, in line with Marx (1991), the mass of profits has positive effects on investment in year one. Conversely, although GDP and the rate of profit have positive impacts during the first years, they are not statistically significant.

The dynamic responses of the average rate of profit to different shocks are illustrated in Figure 7. An important result was found: contrary to Kalecki (1971) and Keynes (2018), shocks to investment have no significant impact on the rate of profit (a finding that will be reinforced

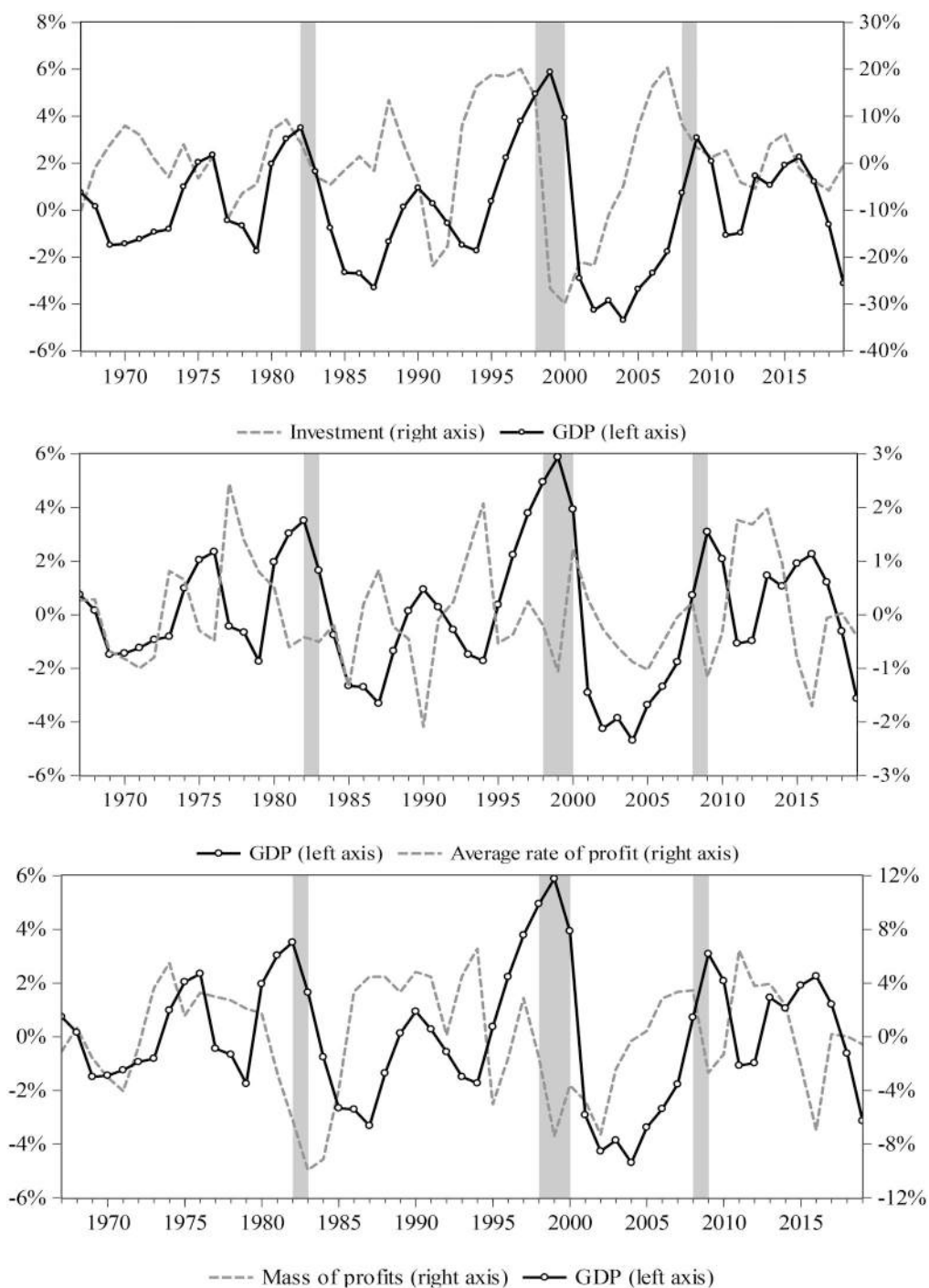


Figure 4. Cycles of GDP and cyclical dynamics of investment, profit rate and mass of profits, Colombia, 1967–2019. *Note:* GDP, gross domestic product. *Source:* Own elaboration based on data from DANE (2022) and Duque (2022). Economic crises marked in gray.

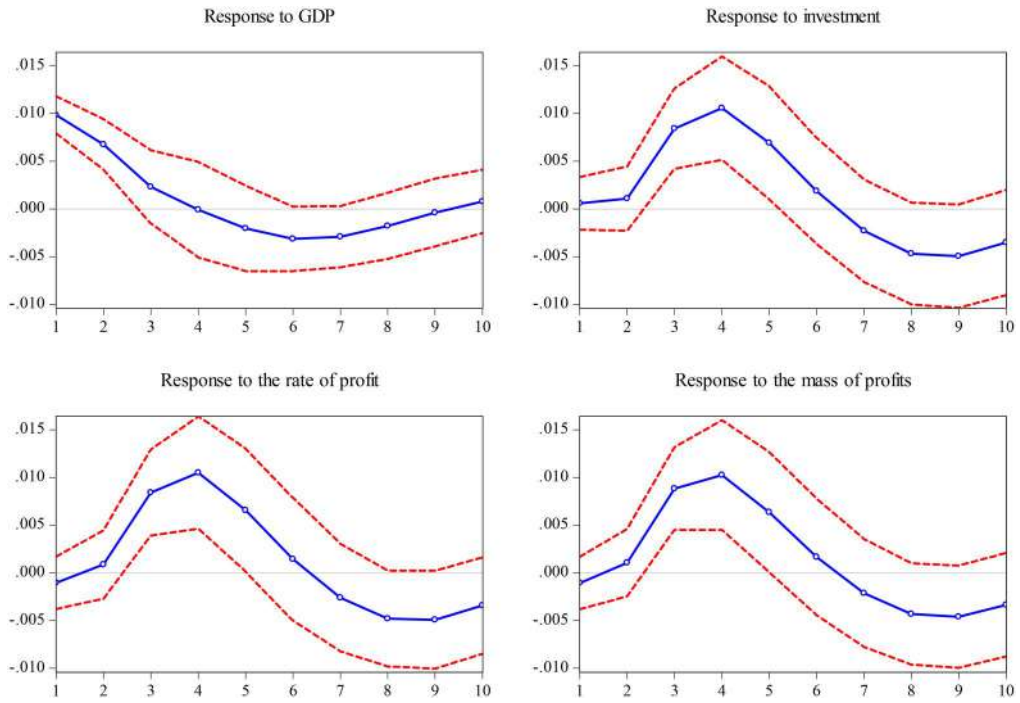


Figure 5. Responses of average GDP cycles to shocks in variables, 1967–2019 Colombia. *Note:* GDP, gross domestic product. *Source:* Own elaboration based on data from DANE (2021) and Duque (2022).

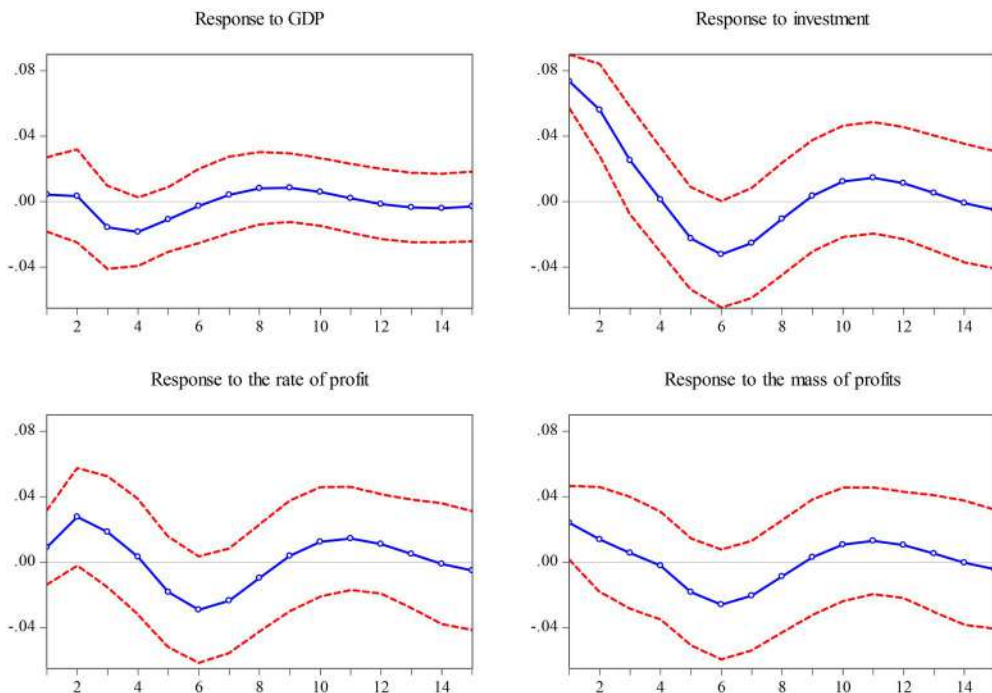


Figure 6. Responses of investment to shocks in variables, 1967–2019. *Source:* Own elaboration based on data from DANE (2021) and Duque (2022).

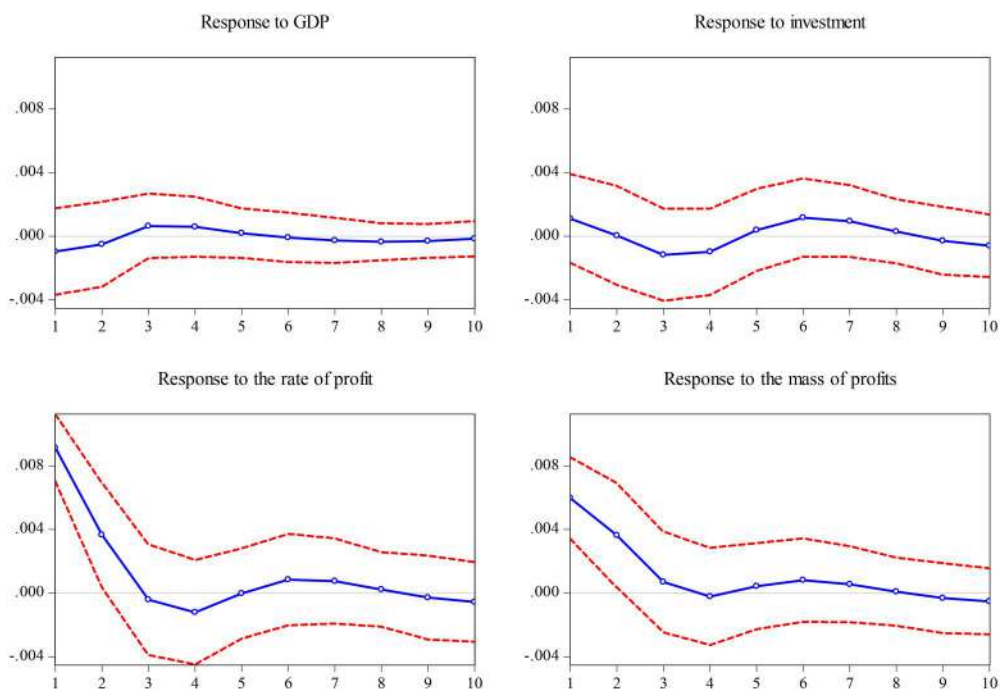


Figure 7. Responses of average rate of profit to shocks in variables, 1967–2019. *Source.* Own elaboration based on data from DANE (2021) and Duque (2022).

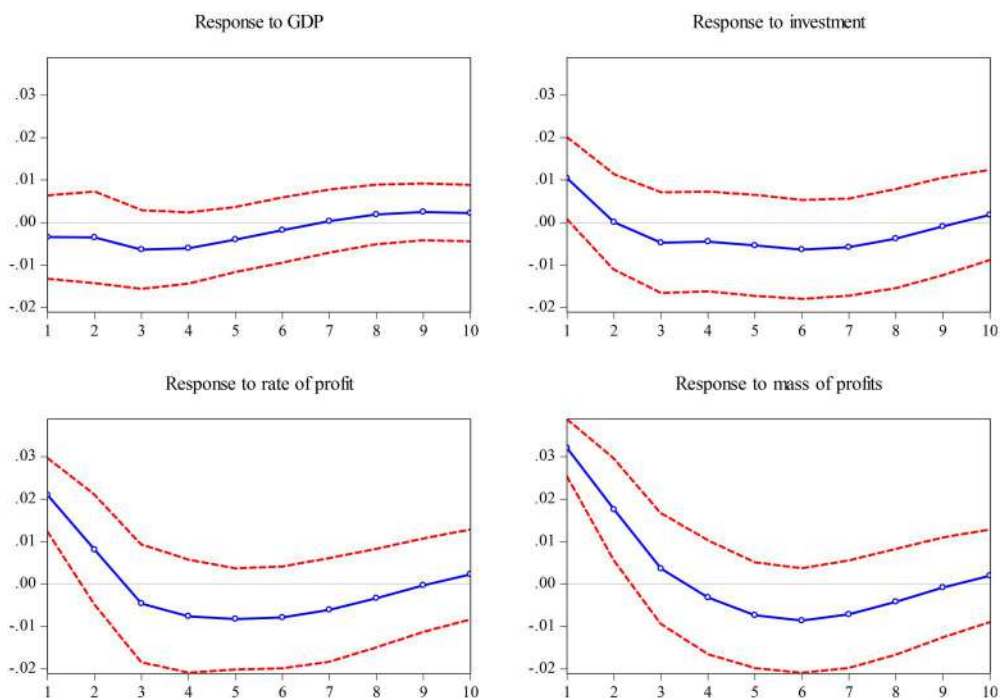


Figure 8. Mass of profits responses to shocks in variables, Colombia 1967–2019. *Source.* Own elaboration based on data from DANE (2021) and Duque (2022).

Table 2. Variance decomposition, Colombia 1967–2019.

Year	GDP_t^c				I_t^c			
	GDP_t^c	I_t^c	r_t^c	Π_t^c	GDP_t^c	I_t^c	r_t^c	Π_t^c
1	100.0	0.0	0.0	0.00	0.3	99.6	0.0	0.0
2	97.5	0.3	1.5	0.50	0.3	88.9	4.6	6.1
5	26.6	40.4	31.2	1.50	5.9	78.5	7.4	8.0
10	24.3	41.6	32.6	1.30	5.9	73.8	13.9	6.3
15	24.0	41.8	32.9	1.26	5.9	72.9	15.1	6.0
20	23.9	41.8	32.9	1.26	5.9	72.6	15.3	5.9

Year	r_t^c				Π_t^c			
	GDP_t^c	I_t^c	r_t^c	Π_t^c	GDP_t^c	I_t^c	r_t^c	Π_t^c
1	1.1	1.6	97.2	0.00	1.1	11.0	37.1	50.7
2	1.1	1.3	94.0	3.40	1.7	8.0	31.5	58.6
5	1.8	3.6	86.9	7.50	6.4	9.6	32.4	51.4
10	2.0	5.9	84.6	7.30	6.6	13.1	33.5	46.7
15	2.0	6.4	84.1	7.20	6.6	14.2	33.8	45.2
20	2.0	6.5	84.0	7.20	6.6	14.5	33.8	44.9

Note. GDP_t^c , cyclical deviation of the gross domestic product; I_t^c , cyclical component of investment; r_t^c , cyclical component of the average rate of profit; Π_t^c , cyclical component of the mass of profits. Source. Own elaboration based on data from DANE (2021) and Duque (2022).

by the results of the Granger causality tests, presented below). Neither does the cyclical variation of GDP. In contrast, and as expected, positive shocks to the mass of profits do raise the average rate of profit; in a statistically significant way during the first two years.

Finally, the responses of the mass of profits to the different shocks are reported in Figure 7. It is observed that, in line with Roberts (2021), Mandel (1975), and Marx himself (1991), the rate of profit has a positive and broadly significant effect on the mass of profits (during the first year). In contrast, shocks to the cyclical component of GDP have no statistically significant impacts, while shocks to investment have barely statistically significant impacts during the first year on the mass of profits.

Variance Decomposition

The variance decomposition reports the relative proportion of the movement in a variable due to its lags compared to the shocks to the other variables. Unlike the *ceteris paribus* approach to impulse-response functions, which we have just presented, the variance decomposition measures the relative weight of each structural shock in explaining the total variance of each variable. Table 2 indicates the variance decomposition of our four variables for the short run (years 1, 2, and 5), medium run (years 10 and 15), and long run (20 years).

It is evident that the variation of the economic cycle, GDP_t^c , depends mainly on the shocks in investment (40–41%) and in the rate of profit (31–32%) in the short, medium, and long term. In turn, and accordance with Marx's economic theory, the variance of investment depends fundamentally on shocks to the profitability of capital: in the short term, mainly, on the mass of profit; in the medium and long term, on the rate of profit (which explains 15% of the variance of investment).

The main factor in the variance of the profit rate is the mass of profits, which explains approximately 7.5% of the variance in the short, medium, and long term. Shocks to GDP and investment have, in comparison, a much smaller effect at any of the time horizons. Finally, the mass of profits is mainly affected by the profit rate, which explains between 31% and 37% of its variance in the short, medium, and long term. In contrast, investment shocks have a more important effect in the medium and long term, which is congruent with the role of gross capital

Table 3. Probability values of Granger causality tests, Colombia 1967–2019.

Independent variables	Dependent variables			
	GDP	Investment	Rate of profit	Mass of profits
GDP	–	0.0012***	0.3523	0.0956*
Investment	0.0000***	–	0.5105	0.2952
Rate of profit	0.0059***	0.0155**	–	0.3039
Mass of profits	0.3212	0.0679*	0.2672	–
All	0.0000***	0.0079***	0.5560	0.1026

Note: GDP, gross domestic product. Source: Own elaboration based on data from DANE (2021) and Duque (2022).

formation in the expansion of productive capacity and, therefore, of the production of value, surplus value, and the mass of profits. The same can be said of the effects of GDP.

Granger Causality Test

In the context of VAR models, Granger causality tests allow us to corroborate hypotheses of causal direction between variables. Causality here is understood as the ability of lagged values of one variable (or group of variables) to predict the values of another variable (Enders 2008; Stock and Watson 2001). The results of the Granger causality tests are shown in Table 3. The table presents the probability values associated with the null hypothesis, which states that the values of the independent variables do not predict the behavior of the dependent variable. If this hypothesis is rejected (at the traditional confidence levels of 1%, 5%, and 10%), then it indicates evidence of causality in the Granger sense.

In the first column, it can be seen that both investment and the profit rate predict the cyclical component of GDP, with a significance level of 1% in both variables, which is consistent with the results of the previous analyses and with our general theoretical framework: economic cycles are determined by fluctuations in investment and the profitability of capital. Whereas, the mass of profits does not present statistically significant causality over the GDP. However, in the second column, it can be observed that GDP, the rate of profit, and the mass of profits allow us to predict the cyclical behavior of investment. Consequently, there is a bidirectional relationship between the cyclical components of GDP and investment. In other words, both variables determine each other (a two-way relationship where investment boosts GDP and GDP accelerates investment):

$$GDP_t^c \leftrightarrow I_t^c \quad (3)$$

In contrast (see the third column of Table 3) no variable causes, in Granger's sense, the cyclical component of the rate of profit.¹³ Conversely, for the mass of profits, only the cyclical component of GDP seems to have a certain predictive capacity, but with a relatively weak statistical significance (10%). Thus, an important result emerges: while there is no evidence of the causal direction of investment on the profitability of capital (both in the rate and the mass of profits), there is strong evidence that both the rate of profit and the mass of profits unidirectionally determine investment:

$$\Pi_t^c, r_t^c \rightarrow I_t^c \quad (4)$$

The set of causal relationships (in Granger's sense) between the variables is synthesized in Figure 9. There we see that the cyclical behavior of the profitability of capital in Colombia during the years 1967–2019 unidirectionally determined the investment cycles while the latter, in turn,

¹³The average rate of profit can be decomposed into the average rate of surplus-value and the average organic composition of capital. Alternatively, and following Weisskopf (1979), it can be decomposed into the profit share and the output-capital ratio. Duque (2022) estimates and discusses in detail this last decomposition for the average rate of profit in Colombia.

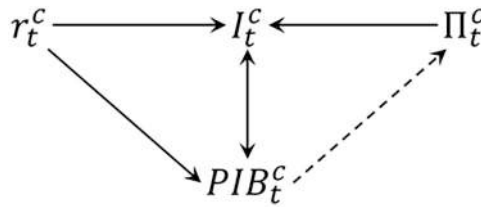


Figure 9. Causal relationships between variables based on Granger causality tests, Colombia 1967–2019. *Source.* Own elaboration.

were co-determined with the economic cycles. In this way—in accordance with Marx, and contrast with the position of Kalecki (1971) and various post-Keynesian authors—it is the profitability of capital (and not investment) the fundamental engine of the economic cycle.

Those empirical findings are similar to Granger causality results reported in other countries. Thus, for the U.S. economy from 1947 to 2009, Tapia (2013, 254) states: “Overall, causality from profits to investment is strongly supported by Granger tests at all lags, while that is not the case for causality from investment to profits.” Meanwhile, for the Brazilian economy from 1953 to 2017, Grazziotin, Fornari, and Marquetti (2022, 202) also claim that: “The tests suggest that the rate of profit temporally precedes the rate of accumulation, anticipating its variations, which empirically corroborates the Marxist theoretical interpretation that profitability is the engine of capital accumulation [...] Thus, the study of profitability makes it possible to understand and anticipate moments in the economic cycle, and also to understand the economic conjuncture.” Moreover, the results of the impulse-response functions, variance decomposition, and Granger causality tests show that contrary to Keynes (2018), investment is determined by present and past profitability, not by psychological factors.

Regarding the controversy over the preeminence of the rate of profit over the mass of profits, the general results suggest the following for the case of Colombia. First, both variables exert a clear causal direction on investment, with a positive sign. This finding corroborates Mandel (1975) and Roberts (2021) claim but not Harvey’s (2021) one. In fact, and contrary to the latter’s approach, the rate of profit does have a positive and highly significant effect on the cycle and investment. However, no evidence was found that the expansion of the mass of profits was associated with realization crises. On the contrary, it is the fall in the mass of profits that leads to a reduction in both the rate of profit and investment (see Figures 6 and 7).

Second, there is a close relationship between the rate of profit and the mass of profits: *ceteris paribus*, shocks in one of the variables positively and significantly affect the other (Figures 7 and 8). However, when simultaneous shocks are considered, the profit rate seems to have a greater relative effect on the mass of profits (in the short, medium and long term). Finally, and in accordance with Granger tests, no causal relationship was found between the two measures of return on capital. That is, in spite of their close relationship, both have a certain autonomy between them.

Conclusions

This article estimated the average cycles in the Colombian economy between 1967 and 2019 and, using a VAR model, evaluated investment, the rate of profit, and the mass of profits as determinants of the cycle. In the period studied, six cycles were identified with an average duration of 8.3 years, of which, on average, 4 years were expansionary phases and 4.3 years were contractionary. In three cycles, the end of the expansionary phase was marked by the outbreak of a crisis. During those cycles, the Colombian economy successively went through the boom and decline of

import-substitution industrialization; the neoliberal transition; and, finally, its consolidation and decline.

The econometric results of the VAR model—using the cyclical component of the variables—yielded evidence in favor of the Marxist approach to crises and business cycles. The profitability of capital (expressed both in the rate of profit and the mass of profits) determines investment and, consequently, the cyclical fluctuations of GDP. In contrast to the position of Kalecki and several post-Keynesian authors, no evidence was found that investment determines profits. Likewise, the findings suggest that, contrary to Keynes' contention, it is not the “psychology of the business world” that determines investment but the prior dynamics of capital returns. Broadly speaking, these findings add to research that has also found similar results for the United States, German, and Brazilian economies.

Regarding the existing controversy on the leading role of the rate of profit or the mass of profits, our findings suggest that both variables are closely related and, moreover, decisively determine both investment and the business cycle (although the profit rate occupies a bigger place in the causality chain). We found no evidence in favor of the hypothesis put forward by Harvey (2021) regarding the rising mass of profit as a trigger for realization crises. On the contrary, increases in the rate of profit and/or the mass of profits stimulated investment and the expansionary phases of the economic cycle in Colombia.

Finally, the overall results presented in this article have some relevant implications for economic policy. First, they indicate that the traditional Keynesian emphasis on stimulating aggregate demand (through fiscal and monetary policies) may be insufficient if they do not reach, at the same time, stimulate the profitability of capital. Second, they suggest the relevance of investment not determined by profits, like public investment and State-Owned-Enterprises, to stabilize and boost output and employment growth (Macheda and Liu 2025; Qi and Kotz 2020). Third, they support Roberts and Carchedi's (2013) critique regarding the inherent limits of certain countercyclical measures—such as wage increases—within the capitalist logic of valorization and accumulation. Furthermore, the empirical results, in light of the critical Marxist tradition, show the necessity of replacing the criterion of private profit in the determination of investment with alternative social criteria.

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Author contributions

CRedit: **Carlos Alberto Duque Garcia**: Conceptualization, Investigation, Methodology, Software, Writing – original draft, Writing – review & editing.

Disclosure statement

No potential conflict of interest was reported by the author.

Notes on contributor

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Latest published papers

- Duque, C. A., & Ramírez Reinoso, D. F. (2026). Patterns of Technical Change for Colombia in the Twenty-First Century: A Sectoral Approach. *Review of Radical Political Economics*. DOI: <https://doi.org/10.1177/048661342614440>
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Appendix A

Table A1. Unit root tests, Colombia 1967–2019.

Variable	Specification of the test equation	ADF statistic	Order of integration
Y	None	−4.76758***	I(0)
	Only intercept	−4.71407***	
	Trend and intercept	−4.64504***	
I	None	−4.58294***	I(0)
	Only intercept	−4.53659***	
	Trend and intercept	−4.48895***	
r	None	−4.77209***	I(0)
	Only intercept	−4.72461***	
	Trend and intercept	−4.677145***	
II	None	−3.62088***	I(0)
	Only intercept	−3.58531***	
	Trend and intercept	−3.54913**	

Notes. ADF, Augmented Dickey-Fuller. *, **, and *** denotes rejection of the null hypothesis of unit root at 10%, 5%, and 1%, respectively. The Schwarz information criterion was used in the ADF test. *Source.* Own elaboration based on data from DANE (2021) and Duque (2022).

Table A2. Stability test of VAR(2) model, Colombia 1967–2019.

Root	Modulus
0.798748 − 0.369077i	0.879895
0.798748 + 0.369077i	0.879895
0.616552 − 0.523361i	0.808729
0.616552 + 0.523361i	0.808729
0.502635 − 0.609976i	0.790388
0.502635 + 0.609976i	0.790388
−0.142379 − 0.760188i	0.773406
−0.142379 + 0.760188i	0.773406
−0.613920	0.613920
−0.110882 − 0.443696i	0.457341
−0.110882 + 0.443696i	0.457341
−0.339637	0.339637

Source. Own elaboration based on data from DANE (2021) and Duque (2022).

Table A3. White test for heteroscedasticity of the VAR(2) model, Colombia 1967–2019.

Joint test	VAR(2)
Degrees of freedom	240
Chi-squared statistic	247.5
Probability	0.3557

Source. Own elaboration based on data from DANE (2021) and Duque (2022).

Table A4. LM Serial correlation test, VAR(2), Colombia 1967–2019.

Lag	LM Statistic	Degrees of freedom	p-Value
1	18.77148	16	0.2807
2	18.99981	16	0.2687
3	22.81042	16	0.1189
4	9.044788	16	0.9116

Note: LM, Lagrange Multiplier. *Source.* Own elaboration based on data from DANE (2021) and Duque (2022).

Table A5. Normality tests for the residuals of VAR(2), Colombia 1967–2019.

Component	Jarque-Bera	Probability
1	0.044103	0.9782
2	10.974690	0.0041
3	0.271663	0.8730
4	4.843457	0.0888
Joint	16.133910	0.0405

Source. Own elaboration based on data from DANE (2021) and Duque (2022).