



# Economic activity and profitability: Lessons of the COVID-19 crisis for Mexican consumer goods companies

## *Actividad económica y rentabilidad: aprendizaje de la crisis COVID-19 para empresas de consumo frecuente mexicanas*

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### Abstract

The response of the frequent consumer sector of the Mexican Stock Exchange company's financial performance is analyzed in light of the dynamics of their level of participation in economic activity in the period between 1993Q2 and 2020Q4 is analyzed contrasting the influence of the COVID-19 pandemic. The model estimates for panel data show that the dynamics of economic activity produced changes in the evolution of the profitability of companies and that the pandemic did significantly affect this relationship. The COVID-19 period caused decreases in the variations of the returns on equity capital (ROE) and assets (ROA) and increases in the net profit margin (MgN); the analysis shows that the sensitivity of the equity capital indicator was double that of the ROA. The results of our analysis could have important implications for business decisions.

*JEL Code:* G19, G39, M29, M41

*Keywords:* profitability; mexican stock Exchange; GDP; COVID-19

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## Resumen

Se analiza la respuesta de la rentabilidad de empresas del sector de consumo frecuente de la Bolsa Mexicana de Valores ante la dinámica de su nivel de participación en la actividad económica en el periodo comprendido entre 1993T2 y 2020T4, contrastando la influencia de la pandemia COVID-19. Las estimaciones de modelos para datos en panel muestran que la dinámica de la actividad económica produjo cambios en la evolución de la rentabilidad de las empresas y que la pandemia si afectó significativamente esta relación. El periodo COVID-19 ocasionó disminuciones en las variaciones de las rentabilidades del capital accionario (ROE) y de los activos (ROA) y aumentos en las del margen de ganancia neta (MgN), el análisis demuestra que la sensibilidad del indicador del capital accionario fue el doble que la del ROA. Los resultados de nuestro análisis pudieran tener implicaciones importantes en las decisiones empresariales.

*Código JEL:* G19, G39, M29, M41

*Palabras clave:* rentabilidad; Bolsa Mexicana de Valores; PIB; COVID-19

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## Introduction

One of the most widely used indicators to evaluate corporate financial performance is profitability, in other words, the capacity to generate profits from available resources. To the extent that such profitability is persistent over time, companies' chances of survival and growth are improved, especially when faced with unexpected shocks. In this way, these companies can offer benefits to the different stakeholders, for example, by maintaining the level of employment, contributing to the public treasury by paying taxes, complying in due time and form with the financial commitments agreed with suppliers and creditors and, of course, offering goods and services that satisfy the needs of society in general (González, 2005), among other aspects.

The environment and decisions of the different economic agents that participate in a domestic market are constantly affected, to a greater or lesser extent, by systematic risk; various studies agree in suggesting that non-diversifiable risk is manifested through changes in macroeconomic conditions that are seen in the financial markets (López, Venegas & Gurrola, 2013), highlighting the importance of national production through Gross Domestic Product (GDP), which is considered the indicator that best captures the economic cycle in the domestic economy (Heath, 2012).

At the beginning of 2020, the SARS-COV-2 virus was detected in Wuhan and based on its harmful effects and high transmission capacity, the health authorities of the United Nations (UN) declared a pandemic in March. COVID-19 has caused havoc in the health aspect (millions of deaths worldwide, overwhelmed health systems, shortage of medicines, among others) and, of course, in the economic-financial field with notable drops in production and, consequently, in capital markets around the world.

The crisis caused governments to implement social lockdown measures and a reduction in economic activity so that companies could expect lowered activity, revenues and, consequently, returns for their stakeholders.

The objective of this paper is to study the response of profitability indices proposed as representatives of financial performance -Return on Assets (ROA), Return on Equity (ROE), and Net Profit Margin (NPM)- of a group of issuers listed in the consumer goods sector in the BMV (Mexican Stock Exchange) to the dynamics of the level of corporate participation in economic activity, considering the effect of the COVID-19 crisis, during the quarters from 1993Q2 to 2020Q4. Assuming that the SARS-COV-2 crisis negatively affected production in Mexico, a direct relationship between the dynamic profitability of issuers and their contribution to aggregate economic activity would be expected. The main results obtained through panel data analysis suggest that the financial performance of the issuers in the sample was significantly affected by the pandemic; the explanatory effect of the growth rate of the level of corporate participation in economic activity is perceived in order from most to least important in the variation of the return on equity, net margin, and assets. The results of the analysis extend previous literature by suggesting that efficient financial management in terms of ROE, NPM, and ROA of a company's assets can absorb unexpected shocks.

The remainder of the document is organized as follows. The second section provides a review of the relevant literature; sections three and four introduce the study's methodological aspects and present the empirical analysis results. Section five presents the conclusions of the research.

## **Literature review**

Corporate profitability is a necessary condition for sustainability over time. It allows growth in the medium and long term to the extent that there is sufficient profit to remunerate all stakeholders (Sánchez, 2003). Thus, profitability is a key indicator of financial performance as it reflects the relevant aspects of the company's activity. For example, as the company's sales increase, production efficiency improves due to economies of scale, which positively affects profitability. On the cost structure side, something similar happens since the production capacity - fixed assets - has a production limit. The higher the sales volume, the higher the total use of such assets, reducing unit fixed costs and achieving better profits.

The pace of economic activity, as measured by GDP, changes when a crisis occurs, influencing sales and, consequently, corporate profitability. As economic activity increases, companies have been shown to improve their levels of efficiency and sustainability (Bou & Satorra, 2007). Capturing the relation between company profitability and economic activity allows for greater precision in real assets

investment plans so that they respond adequately to sales volumes following the company's participation in the economic activity.

Companies competing within a market may have different levels of profitability depending on how each responds to changes in domestic economic activity (Fernández, Montes & Vázquez, 1996). For example, the profitability of assets responds, in addition to the companies' internal strategies, to a series of factors in the macroeconomic environment, which leads to significant differences between the companies operating in the market (Gallizo, Gargallo, Saladrigues & Salvador; 2011).

Economic activity, captured through the gross domestic product (GDP), measures aggregate demand. In other words, it estimates the amount consumed by the agents that make up an economy - households, companies, government - in goods and services over time; its evolution affects the operation and decisions of companies (Heath, 2012). This effect is reflected, to some extent, in their respective financial statements, where managers can identify critical factors and levels of sensitivity in order to make appropriate decisions to increase the company's value (Jaramillo, 1983, Krugman, 1999; Ortiz, 2005).

Financial ratios stand out among the elements that can be extracted from financial statements to analyze companies' general evolution in terms of their financial performance. Previous studies have applied this tool to various phenomena ranging from studying credit risk and bankruptcy processes and instrument valuation to identifying structural and organizational aspects, among other topics. In general terms, they argue that the historical behavior of financial ratios can reveal signs of deterioration that necessitate corrective action to avoid bankruptcy (Zmijewski, 1984). Within this group of studies aimed at developing bankruptcy prediction models, the most important are the works of Fitzpatrick (1931) and Beaver (1966), who use univariate analysis; Altman (1968), who proposes the Z model based on multiple discriminant analysis; Kaplan and Urwitz (1979), who use ordinary least squares (OLS); and Ohlson (1980), who uses conditional logit analysis. Other studies include, in addition to financial ratios, qualitative factors in the evaluation of credit risk (Lehmann, 2003; Altman, 2005; Benell, Crabbe, Thomas, & Gwilym, 2006).

Financial ratios have also been used to evaluate bond issues considering their level of subordination, in other words, their degree of callability and their Beta (Kaplan & Urwitz, 1979), using specific discriminant functions by industry to predict bond ratings (Perry, Henderson, & Cronan, 1984). Altman (2005) introduces a scoring model applicable to emerging markets that, unlike Altman's original model (1968), integrates macroeconomic factors that reflect specific conditions of such markets.

On the other hand, some studies claim that financial ratios can also be used as an explanatory factor for structural aspects in organizations, particularly their profitability. The results from such studies allow all stakeholders to evaluate the degree of the economic viability of the companies (Burja & Burja, 2006; Hada & Mihalcea, 2020). Some examples would be those who propose the profit-to-asset ratio to

measure the financial health of companies (Valaskova, Kliestik, Svabova, & Adamko, 2018); that return on equity and return on assets, among others, can be an explanatory factor for the stock price of trading companies in the countries belonging to the Association of Southeast Asian Nations, ASEAN (Jermstipparsert, Ambarita, Mihardjo, & Ghani; 2019); that financial ratios of net profit margin and return on assets, among others, are decisive factors in profit increase in companies in the Indonesian automotive and components subsector (Nugraha, Puspitasari, & Amalia; 2020).

Previous studies have analyzed how unexpected shocks have affected profitability in companies, including the Asian market crisis of the 90s, the subprime mortgage crisis in the US, and the COVID-19 crisis, among others. A notable example within the first group is the study by Prasad, Puri and Jain (2015), which examined the recovery time of the profitability of industrial companies in Indonesia, Korea, and Thailand amid the crisis, dividing the period 1994-2004 into five sub-periods and taking as references the net margin and return on assets ratios, among others. They found differentiated effects by period and between countries.

Regarding the effect of the subprime crisis on financial performance, Dencic (2014) evaluates the impact of reduced economic activity caused by the 2008 mortgage crisis on the profitability of 108 companies, finding that ROA increases through sales growth and efficiency in asset management. Notta and Vlachvei (2014) find that the profitability and competitiveness of companies increase to the extent that they have a high market share and maintain their level of sales through customer loyalty; Grau and Lassala (2015) quantify the effects of financial crisis announcements on Spanish companies between 2007 and 2009, confirming negative abnormal returns in five of the six sectors studied. Jaramillo and Jaramillo (2016) evaluate the reaction of stock prices and returns in 87 companies in the BMV to the 2008 crisis. Their results show that the news of the US investment bank Lehman Brothers' bankruptcy caused negative returns in the housing construction subsector and significant declines in related shares. Kontogeorgos, Pendaraki, and Chatzitheodordis (2017) document the negative effects of the subprime crisis on the profitability of Greek companies as a direct consequence of the recession of the Greek economy and the decline in demand for food products. Fuertes and Cuellar (2019) analyze the dynamics of adaptation of growth and profitability of 2000 Spanish companies in the manufacturing sector to the US mortgage crisis, demonstrating that an adverse economic context does not necessarily prevent a reduction in profitability.

Siqueira and Gottschalk (2020) show that the economic impact of the twin crises (currency and banking crisis) affects profitability in companies differently; in their study, they separate companies from emerging and mature countries and divide the period into two stages: 1990-2004 and 2005-2014. The authors claim that the effect of crises is greater in emerging economies and that lagged profitability positively impacts the company's profitability, regardless of macroeconomic conditions, even if one or more crises affect the country.

Regarding the COVID-19 crisis, the studies by Blanco, Mayordomo, and Menéndez (2020) analyze the impact of the pandemic on the financial situation of 900 Spanish companies through financial ratios; the results showed that the crisis caused a contraction in economic activity and reduced the profitability of a large number of companies, with differentiated effects by sector of economic activity. According to the survey conducted by the General Council of Economists of Spain (CGE) and the General Council of Official Associations of Graduates and Industrial Technical Engineers of Spain (COGITI) (2020) describing the impact of the health pandemic on the business fabric, in the professional offices of economists and industrial technical engineers in Spain, profitability was affected in 90.7% of the total number of companies; the most affected sectors were commerce, construction, industry, and services.

Landier and Thesmar (2020) note that analysts' forecasts for company profits in the first half of 2020 were down 16% and that a lasting impact of the crisis is expected. In addition to the fact that analysts' bullish bias has declined sharply since the 1990s, their analysis was based on 1000 top companies by market capitalization as of December 31, 2019, from the various US stock exchanges and availed of analysts' average forecasts issued through May 2020 for the 2020-2024 period. Spitsin, Ryzhkova, Vukovic, and Anokhin (2020) analyze the factors affecting the profitability of 6134 companies in unstable economies, such as the case of Russia between 2012 and 2016. They demonstrate that production efficiency and economies of scale positively impact profitability. However, the amount of investment in fixed assets and increases in interest rates have negative effects, as these depend on economic activity. The studies presented above show that corporate profitability deteriorates due to companies' inability to adapt to the different dynamics of economic activity in the macroeconomic environment.

Governments around the world have adopted a series of health and economic measures to address the negative effects of the health crisis caused by the SARS-COV-2 virus. For example, in the United States, significant economic support was granted to the population. The Mexican government's strategy included measures such as prepayments to beneficiaries of social programs for senior citizens and student scholarships, to name just two. It would be expected that by providing liquidity to the most vulnerable sectors of the population, the Mexican economy would better cope with the negative effects of the restrictions on social mobility and economic activity by maintaining consumption, at least in part.

## Variables and methodological aspects

The analysis considers as proxy variables for financial performance the returns<sup>1</sup> on i) assets (ROA), ii) stockholders' equity (ROE), iii) net revenue (NPM) of companies listed on the Mexican Stock Exchange. The explanatory variable represents the company's demand in the national economy and is captured by the growth rate of the relation between the issuer's sales and GDP. Issuers' financial information was obtained from the Economática database, while the GDP series, expressed in constant 2013 base pesos, comes from Banxico reports. The period analyzed is from 1993Q2 to 2020Q4 and 1573 longitudinal observations were analyzed. Table 1 presents the 15 BMV-listed issuers<sup>2</sup> within the frequent consumer sector and the quarters in which financial information is available, while Table 2 provides important information on the modeled variables.

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<sup>1</sup>The three financial ratios (ROA = return on assets; ROE = return on equity, NPM = net profit margin) have been highlighted in the literature as good indicators of corporate returns, see Fenny and Rogers (1999), Hawawini *et al.* (2003), Raza *et al.* (2012), Pervan *et al.* (2012), Kontogeorgos (2017), and Fuertes and Cuellar (2019), to mention some studies.

<sup>2</sup>Issuers with less than 76 complete quarterly observations available and/or not trading until 2020Q4 are excluded from the sample.

Table 1  
Issuers

No.	Code	Corporate Name	Start	Quarters
1	AC	Arca Continental, S.A.B. de C.V.	1992Q1	76
2	BACHOCO	Industrias Bachoco, S.A.B. de C.V.	1996Q1	100
3	BAFAR	Grupo Bafar, S.A.B. de C.V.	1996Q3	98
4	BIMBO	Grupo Bimbo, S.A.B. de C.V.	1993Q2	111
5	CULTIBA	Organización Cultiba, S.A.B. de C.V.	1993Q2	111
6	FEMSA	Fomento Económico Mexicano, S.A.B. de C.V.	1996Q1	100
7	GIGANTE	Grupo Gigante, S.A.B. de C.V.	1993Q2	111
8	GRUMA	Gruma, S.A.B. de C.V.	1993Q2	111
9	HERDEZ	Grupo Herdez, S.A.B. de C.V.	1993Q2	111
10	INGEAL	Ingeal, S.A.B. de C.V.	1994Q2	107
11	KIMBER	Kimberly - Clark de México S.A.B. de C.V.	1993Q2	111
12	KOF	Coca-Cola Femsa, S.A.B. de C.V.	1994Q1	108
13	MINSA	Grupo Minisa, S.A.B. de C.V.	1997Q1	96
14	SORIANA	Organización Soriana, S.A.B. de C.V.	1993Q2	111
15	WALMEX	Wal-Mart de México, S.A.B. de C.V.	1993Q2	111

Table 2  
Variables

Name	Variable	Formula	Description
Return on assets	VROA	$ROA = \frac{\text{net profit}}{\text{total assets}}$	Net profit from investment in assets
Return on equity	VROE	$ROE = \frac{\text{net profit}}{\text{capital}}$	Net profit from shareholder investment
Net margin	VNPM	$NPM = \frac{\text{net profit}}{\text{revenue}}$	Net profit margin
Changes in participation *	TCVTA/GDP	sales/GDP	Issuer's demand relative to economic activity

\* Changes in the share, by issuer, of GDP



In order to capture the dynamism of financial performance, the three profitability indicators presented in Table 2 are integrated into the modeling in terms of their respective variations. For example, the variation of ROA is calculated as follows:

$$VROA = ROA_{i,t} - ROA_{i,t-1} \quad (1)$$

The dependent variable is obtained from the sales-GDP indicator, which shows the relation between a company's sales and economic activity; its rate of change provides information on the degree of elasticity of corporate income in the face of changes in output. The spirit of this indicator has been used, for example, to evaluate the performance of the 500 largest companies in Latin America during the period 1995-2011, finding a significant relation between sales and GDP dynamics in the region (Alarco, 2015). As with the dependent variables, the following captures the dynamics of the explanatory variable through its corresponding growth rate:

$$0 < Z_{i,t} = \frac{VTA}{GDP} = \frac{sale_{i,t}}{GDP_t} < 1 \quad (2)$$

$$\infty < \Delta Z_{i,t} = Z_{i,t} - Z_{i,t-1} \leq 1 \quad (3)$$

$$g = \frac{\Delta Z_{i,t}}{Z_{i,t-1}} = \text{growth rate of } Z_{i,t} = TCVTA/GDP \quad (4)$$

The analysis of how the financial performance of issuers responds to the growth rate of each issuer's economic share of GDP is carried out using the panel data technique, which reveals an essential aspect of the process that generates the data, i.e., the unobservable heterogeneity between cross-sectional units and over time. Thus, for the variable  $y_{it}$   $i = 1, \dots, N$  cross-sectional observations and  $t = 1, \dots, N$  time series observations are presented. In this case  $i$  represents the 15 BMV issuers, and  $t$  refers to the number of observations between the second quarter of 1993 and the fourth quarter of 2020. The general model is shown in Equation 5:

$$y_{it} = \alpha + x_{it}\beta + u_{it} \quad (5)$$

$(i = 1, \dots, N; t = 1, \dots, T)$

$y_{it}$  alternatively, ROA, ROE or NPM of issuer  $i$  at time  $t$ ;  $\alpha$  = the intercept;  $x_{it}$  is a vector of  $k \times 1$ , which contains the independent variable, the growth rate of issuer demand in GDP dynamics;  $\beta$  = the vector of parameters to be estimated to capture the effect of the growth rate of the corporate share of GDP on the financial performance of issuers;  $u_{it}$  = the random disturbance or white noise term.

Due to the heterogeneity in the specific characteristics of each of the companies in the sample and the consequences of the decisions they may adopt in the same scenario of the country's economic activity, biases may arise in the model. One way to incorporate this random disturbance attributable to the company is to include an intercept for each cross-sectional unit in the specification. Instead of the general intercept as in Equation (5), it is now allowed to change from company to company, keeping constant the values of the slope parameters  $\beta$ . If the effect caused by the company is considered to be non-random, the fixed effects model is obtained:

$$y_{it} = \alpha_i + X' \beta + u_{it}$$

$$\alpha_i = \alpha + \mu_i \tag{6}$$

If the individual effect is considered to be random, the random effects model is obtained:

$$y_{it} = \alpha_i + X' \beta + u_{it}$$

$$u_{it} = v_i + \varepsilon_{it} \tag{7}$$

## Empirical analysis

Figure 1 shows the behavior of economic activity in Mexico; panel (a) shows the evolution of GDP levels, while panel (b) shows their respective growth rates. As can be noted, economic activity, except for declines due to the Mexican peso devaluation crisis in 1994 and the subprime crisis of 2008, continued to increase through 2019. In the first quarter of 2020, the period that corresponds to the outbreak of the COVID-19 pandemic, Mexican GDP showed a significant decrease to 2009 levels. As seen in both sections of Figure 1, the production indicator was severely affected by the pandemic, with a substantial drop in GDP levels and a notable increase in the volatility of its respective growth rate - panel (b).

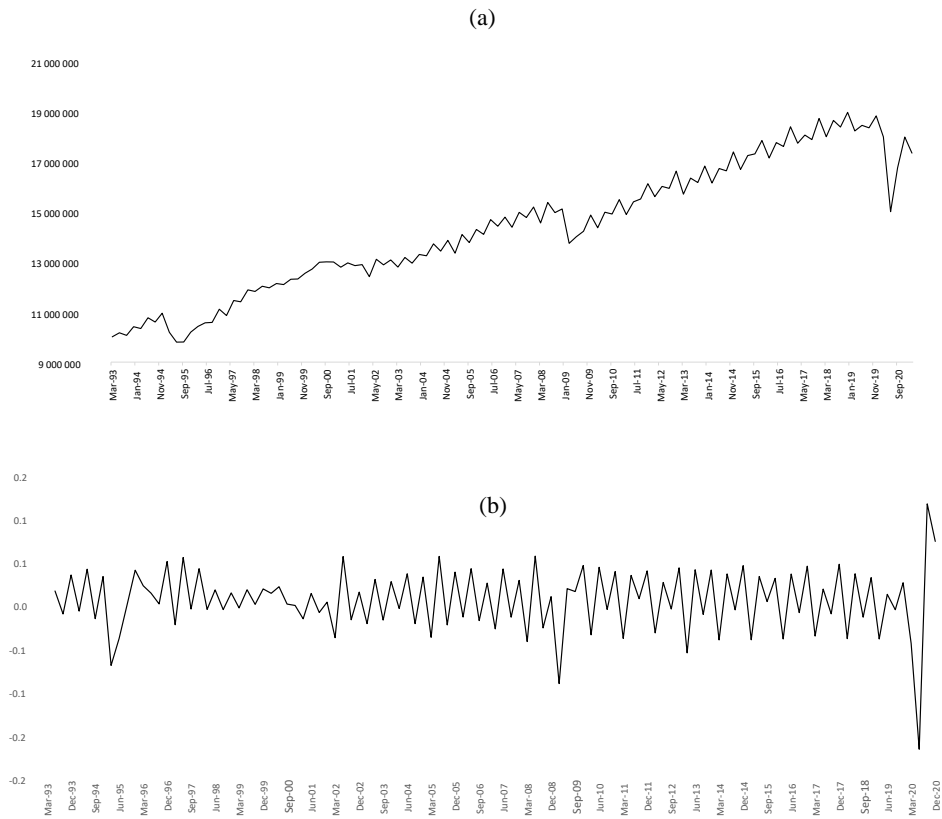


Figure 1. GDP performance  
Source: created by the author

The independent variable of the study is an indicator that results from dividing the sales of each issuer by GDP. The result approximates the level of participation of business demand in economic activity; the respective growth rate is shown in Figure 2.

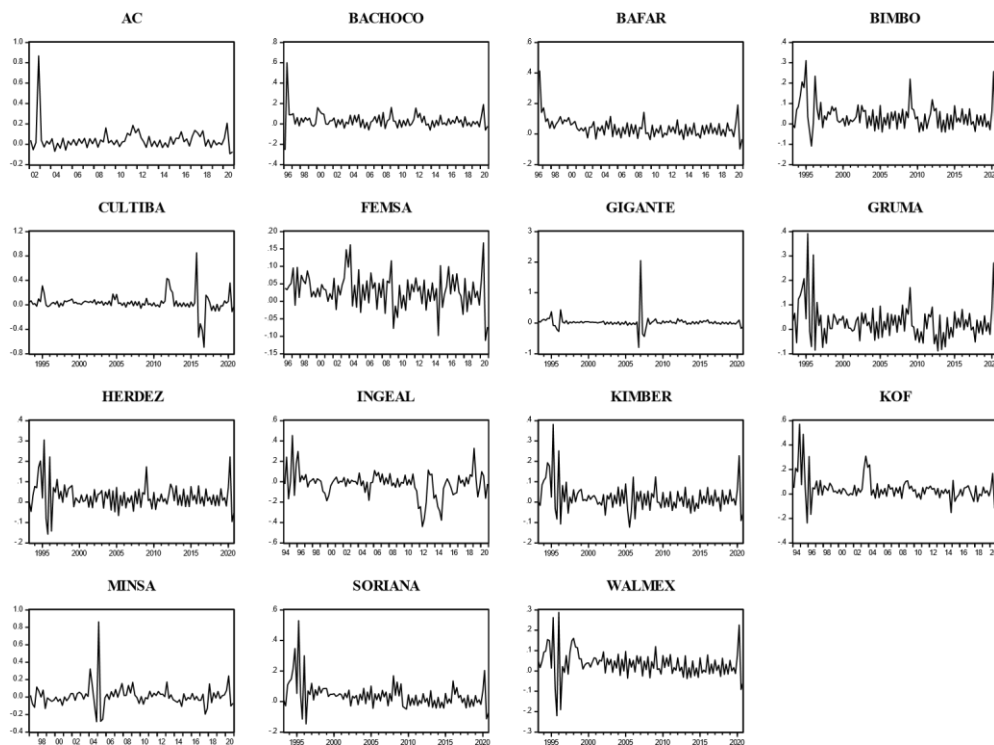


Figure 2. VTA/GDP growth rate

Figure 3 shows the variation of ROA by issuer<sup>3</sup>; it can be observed in each of the panels of this figure that the behavior of asset returns shows differences among the issuers in the sample; however, the different patterns suggest a relatively inelastic behavior.

<sup>3</sup>Due to space limitations, only the ROA graphs are included. However, Table 3 does provide descriptive statistics for all the variables proposed as proxies for financial performance.

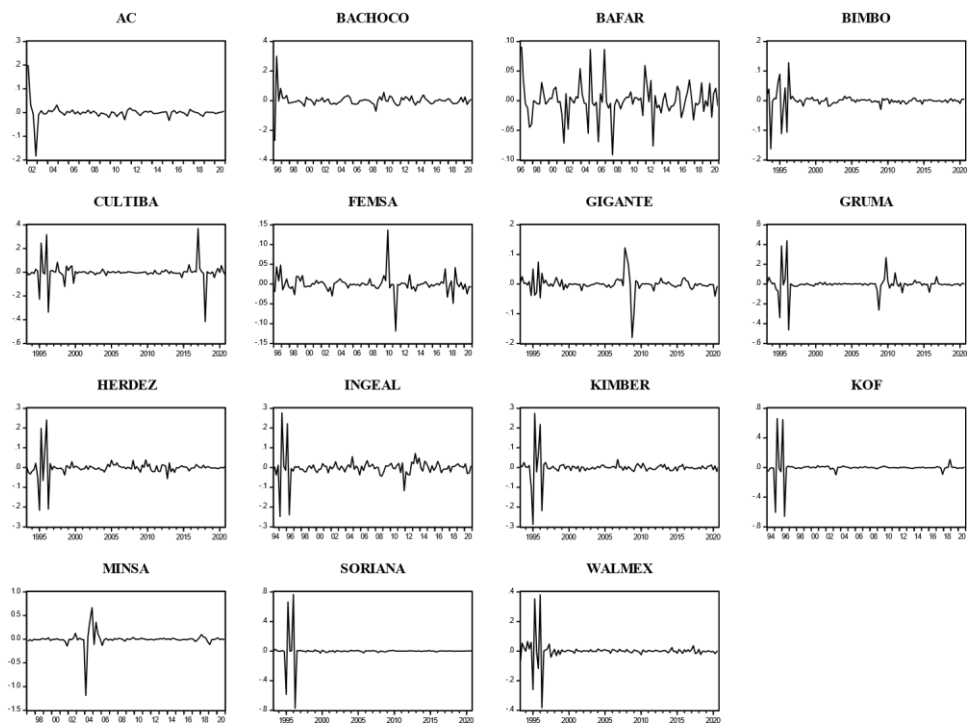


Figure 3. ROA per issuer

The descriptive statistics of the variables representing the financial performance of the issuers in the sample can be seen in Table 3.

Table 3  
Descriptive statistics

Issuer	ROA			ROE			NPM		
	Mean	$\sigma$	CV*	Mean	$\sigma$	CV*	Mean	$\sigma$	CV*
AC	0.098	0.047	2.080	0.152	0.069	2.199	0.119	0.072	1.650
BACHOCO	0.080	0.057	1.418	0.105	0.072	1.469	0.079	0.071	1.116
BAFAR	0.086	0.052	1.648	0.141	0.076	1.850	0.065	0.034	1.934
BIMBO	0.048	0.034	1.420	0.099	0.050	1.976	0.037	0.025	1.462
CULTIBA	0.061	0.092	0.666	0.084	0.114	0.740	0.113	0.346	0.327
FEMSA	0.070	0.035	2.038	0.125	0.051	2.455	0.086	0.043	1.977
GIGANTE	0.042	0.052	0.821	0.068	0.073	0.928	0.069	0.156	0.444
GRUMA	0.053	0.094	0.563	0.099	0.299	0.329	0.050	0.089	0.555
HERDEZ	0.088	0.049	1.799	0.158	0.085	1.855	0.084	0.035	2.390
INGEAL	-0.033	0.060	-0.553	-0.070	0.128	-0.544	-0.208	0.366	- 0.569
KIMBER	0.126	0.045	2.816	0.534	0.478	1.117	0.155	0.067	2.311
KOF	0.073	0.093	0.779	0.139	0.189	0.735	0.077	0.076	1.010
MINSA	-0.017	0.220	-0.079	-0.072	0.529	-0.137	-0.019	0.175	- 0.107
SORIANA	0.066	0.104	0.639	0.106	0.133	0.796	0.045	0.066	0.679
WALMEX	0.108	0.056	1.920	0.172	0.081	2.119	0.059	0.032	1.823

\*CV (coefficient of variation) =  $\frac{\bar{x}}{\sigma}$

Table 3 shows that the average return on equity (ROE) is higher than the return on assets (ROA) for all issuers in the sample; the same is true for the standard deviation. It is worth noting that the issuers that "reward" best the risk assumed in the case of ROA are KIMBER, AC, and FEMSA with coefficients of variation of 2.82%, 2.08%, and 20.3%, respectively; for ROE they are WALMEX, AC, and FEMSA with CVs of 2.12%, 2.2%, and 2.46%, respectively, while the indicators for NPM reach values of 1.98%, 2.31%, and 2.4% in FEMSA, KIMBER, and HERDEZ, respectively.

In order to test for significant differences in ROA, ROE, and NPM among the issuers in the sample, tests of mean differences and variances were run, the results of which are shown in Table 4.

Table 4  
Differences in mean  $\mu$  and variance  $\sigma^2$

		$\mu$			$\sigma^2$	
		Anova F-test	Welch F-test*	Barlett	Levene	Brown-Forsythe
VROA	coef.	0.0047	0.0077	1618.7520	10.6293	10.5396
	sig.	1.0000	1.0000	0.0000	0.0000	0.0000
VROE	coef.	0.0179	0.0261	1808.7690	7.3596	6.9598
	sig.	1.0000	1.0000	0.0000	0.0000	0.0000
VNPM	coef.	0.0208	0.0080	1038.3100	1.9928	1.9905
	sig.	1.0000	1.0000	0.0000	0.0153	0.0155

\* The test considers differences in variance

As can be seen in Table 4, although there is no evidence of a difference between the means, all the tests suggest differences in the variances between the issuers in the sample, which is an additional reason to use an analysis tool that considers cross-sectional differences when analyzing the relation between the financial performance of a group of BMV issuers and the level of corporate participation in economic activity.

In general terms, it can be affirmed that the different domestic agents respond to the dynamics of economic activity in Mexico (Heath, 2012); nevertheless, in addition to such empirical and theoretical support, the data were evaluated for the presence of unit roots in order to avoid modeling spurious relations, considering the longitudinal structure of the data, through the Levin, Lin, and Chu, Im, Pesaran and Shin, Augmented Dickey-Fuller (ADF), and Phillips-Perron tests. The first considers a common unit root process and the rest of the tests consider individual processes; Table 5 shows the main results.

Table 5  
Unit root tests

		VROA		VROE		VNPM		TCVTA/GDP	
H0	test	est.	sig.	est.	sig.	est.	sig.	est.	sig.
Unit root, assuming common process	Levin, Lin, & Chu	-7.0483	0.0000	-11.7092	0.0000	-5.0160	0.0000	-3.62	0.0001
	Im, Pesaran, & Shin	-23.33	0.0000	-28.37	0.0000	-23.20	0.0000	-17.14	0.0000
Unit root, assuming individual processes	ADF *	454.17	0.0000	448.37	0.0000	450.78	0.0000	339.92	0.0000
	PP *	331.52	0.0000	394.96	0.0000	446.65	0.0000	734.32	0.0000

As can be seen in Table 5, all the tests allow the presence of unit roots to be rejected and the series to be considered stationary.

Once the stationarity of the series was confirmed, estimations were made for the model in Equation (5). The first estimates show that, notwithstanding the high statistical significance of the  $\beta$  parameters obtained, the pooled method is not appropriate since the cross-sectional units induce unobservable effects and the LR and Durbin Watson tests suggest that the OLS estimators are neither efficient nor consistent since the regression residuals are heteroskedastic and autocorrelated. Accordingly, the fixed effects model was used as the estimation method; in the case of the ROA variation, the coefficient of the slope of the explanatory variable showed a t-statistic of 5.5163 and a p-value of 0.0000, which suggests that when estimating the parameters it is important to recognize the differences between the cross-sectional<sup>4</sup> units of the issuers.

The next step was to estimate the parameters using the random effects method defined in Equation (7) and then compare them with the previously obtained fixed effects estimators<sup>5</sup>. It is worth noting that in order to analyze the impact of the COVID-19 pandemic on the modeled relation, the period under study was divided into three sections: a) the entire period (1993Q2-2020Q4); b) the period prior to the health crisis (1993Q2-2020Q1); and c) the SARS-COV-2 pandemic period (2020Q2-2020Q4). Table 6 summarizes these results.

Table 6  
Random effects model and Hausman test

		1993Q2-2020Q4		1993Q2-2020Q1		2020Q2-2020Q4	
Dependent variable		coef.	p-value	coef.	p-value	coef.	p-value
	Intercept	-0.0029	0.1458	-0.0030	0.1430	-0.0018	0.4231
ROA variation	TC VTA/GDP	0.0971	0.0000	0.1014	0.0000	0.0076	0.6630
	Hausman test*	0.4838	0.4867	0.6058	0.4364	4.2372	0.0395
	Intercept	-0.0041	0.3815	-0.0034	0.4785	0.0000	0.9993
ROE variation	TC VTA/GDP	0.1588	0.0001	0.1739	0.0000	-0.0671	0.8372
	Hausman test*	0.2751	0.6000	0.5265	0.4681	0.0832	0.7730
	Intercept	-0.0037	0.1988	-0.0030	0.2990	-0.0160	0.3892
NPM variation	TC VTA/GDP	0.1153	0.0000	0.1121	0.0000	0.1991	0.1666
	Hausman test*	0.0246	0.8753	0.7755	0.3785	1.0672	0.3016

\*  $\chi^2$  test

<sup>4</sup>The results obtained for ROE and NPM lead to the same conclusions.

<sup>5</sup>This comparison was made using the Hausman test, which evaluates the null hypothesis that there are no significant differences between the robust parameters - fixed effects - and the consistent ones - random effects.



The information contained in Table 6 shows several interesting aspects. First, the three indicators proposed as proxy variables for financial performance respond directly, linearly, and significantly to the growth rate of business participation in economic activity, taking the first two periods. Likewise, the  $\chi^2$  value of the Hausman test does not allow the null hypothesis to be rejected, suggesting that consistent estimators are the most appropriate to capture such a relation, in other words, the estimates indicate that there is no significant correlation between the individual cross-sectional effects and the independent variable, so the most appropriate model is the random effects model. On the other hand, the results presented in Table 6 show that the influence of the explanatory variable is higher for VROE, followed by VNPM, and finally, VROA. For example, before the official declaration of the pandemic, the slope acquires values of .17, .11, and .10, respectively. Another interesting result is that the outbreak of the COVID-19 pandemic had a negative effect on the variations of ROE (8.7%, going from 0.1739 to 0.1588) and ROA (4.2%), while for VNPM the effect was the opposite: the response increased by 2.8%. Finally, the last two columns of Table 6 show that the modeled relation was insignificant during quarters 2, 3, and 4 of 2020.

Complementing the previous results, a dummy variable, COVID, was integrated into the specification of Equation (5), which acquires values of 1 during quarters 2, 3, and 4 of 2020 and 0 in the other cases, according to Equation (8):

$$y_{it} = x_{it}\beta + \text{COVID} + \eta_i + v_{it} \quad (i = 1, \dots, N; t = 1, \dots, T) \quad (8)$$

The results are presented in Table 7.

Table 7  
Random effects model, COVID and Hausman test

	VROA		VROE		VNPM	
	coef.	p-value	coef.	p-value	coef.	P-value
Intercept	-0.0029	0.1534	-0.0029	0.5407	-0.0031	0.2905
TCVTA/GDP	0.0971	0.0000	0.1576	0.0001	0.1147	0.0000
COVID	-0.0004	0.9723	-0.0406	0.1366	-0.0209	0.2136
Hausman test	0.4833	0.7853	0.2730	0.8724	0.0235	0.9883

\*  $\chi^2$  test

The information shown in Table 7 confirms that the COVID-19 pandemic had a negative effect on the variations in ROA, ROE, and NPM of the companies analyzed. However, this influence's statistical significance assumes a significant error level if it is decided to reject the null hypothesis. In addition to

the low level of statistical significance of COVID, it is noteworthy that its explanatory effect, compared to the other independent variable, is also low. For example, for VROA the effect is  $-0.0004$  vs.  $0.0971$ , while in the case of VROE the response of COVID barely exceeds 4% versus almost 16% for TCVTA/GDP.

The results shown in Tables 6 and 7 complement each other and suggest that because the COVID effect appears marginal, statistically speaking, one would think that the rate of change of the level of business participation in economic activity is already capturing this fact.

To summarize, the analysis carried out confirms the statistically significant influence of the growth rate of the level of participation of the BMV issuers included in the sample in the economic activity in Mexico on the variations of the profitability indicators proposed as proxy variables of the financial performance; the dynamics in this relation decreased as a consequence of the COVID-19 pandemic in the variations of ROE and ROA, and increased for VNPM.

The present analysis results are similar to the findings of Malinić and Milicević (2012) and Grau and Lassala (2015). They provide evidence that corporate profitability changes when domestic economic activity changes. The COVID-19 crisis had little effect on the variation in the return on assets of the analyzed issuers, which could suggest that they managed to react to the decline in economic activity. This explanation is similar to that found in previous studies, for example, Notta and Vlachvei (2014) and Kontogeorgos et al. (2017), who claim that companies adjust their asset management strategies in periods of crisis.

## **Conclusions**

The study offers an analysis of the response of changes in the profitability of a group of issuers of the consumer products sector in the BMV to the growth rate of the level of corporate participation in domestic economic activity during the period between 1993Q2 and 2020Q4, contrasting the influence of the COVID-19 pandemic.

The analysis conducted through a panel data study contributes to the literature in several respects. First, this is the first study to address the effect of the COVID-19 pandemic on the relation between the companies' share of national production and the profitability indices of a group of BMV issuers. In general terms, the results show that in the modeled relation, it is important to recognize the heterogeneity of issuers and that the effects attributable to their particular characteristics are not correlated with the independent variable. The characterization of the speciation modeled through random effects shows that although the issuers analyzed are part of the same economic activity sector, it is necessary to consider specific characteristics attributable, for example, to internal financial strategies.

Secondly, the results of the study show that changes in returns on equity, revenue, and assets of the company respond directly, linearly, and significantly, as would be expected, to the rate of growth in the level of company participation in economic activity; this, in addition to confirming previous findings, demonstrates the importance of the market participation of companies, especially in periods of crisis. Thirdly, the estimations carried out reveal that of the three dimensions of profitability that were addressed, that related to variations in stockholders' equity (ROE) was not only the most important, taking into account the slope of the function, but that this relation reaches the highest level of significance, followed by variations in the NPM, while the variation in the return on assets showed the lowest response. This implies that the return on equity capital was more sensitive to the COVID crisis than the profit generated by the companies' revenue and investment in real assets. Finally, the results show that the SAR-COV-2 crisis caused statistically significant changes in the response of profitability to the independent variable. The variations in ROE and ROA decreased with the outbreak of the pandemic, while the variations in NPM increased. One possible explanation is that the companies, responding to the demands of the crisis, such as health control measures, faced extraordinary expenses that were probably financed with some capital budget item. On the other hand, despite the decline in GDP, the increase in NPM dynamics could be because the issuers in the sample increased their participation in economic activity and/or their operating efficiency through government support implemented to face the effects of the crisis and economies of scale, respectively.

In conclusion, the results of the present study could be explained by the reduced elasticity of the consumer goods economic sector to the pandemic whereby, despite restrictive policies on social mobility and economic activity, it continued to operate in more or less the same way as it had been doing before the outbreak of SARS-COV-2. On the other hand, the significance levels of the modeled functions could suggest that the decisions adopted by the Mexican government, particularly the economic support provided to the most vulnerable sectors of the population in response to the pandemic, were appropriate to the extent that they encouraged consumption, at least in part.

The empirical evidence could have implications for the decisions of various economic agents since the strategy for market share and efficient financial management in terms of ROE, NPM, and ROA can absorb unexpected shocks. Finally, the results can guide company policies regarding financing and dividends, changes in supply/demand, and real asset management, as well as the response of this sector to crises and even the preparation of portfolios, among other aspects.

Of course, the effect of crises on financial performance is a topic that still leaves many avenues to be explored. In future research, it would be interesting to compare these results with those of other sectors of economic activity. On the other hand, it would be useful to evaluate the differentiated effect of different crises -health, economic, and financial, among others- on profitability. It would also be

interesting to integrate other dimensions of financial management, such as liquidity or leverage, into the analysis, but for the time being, such efforts are left for the future.

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