

Lockup periods during lockdown periods in the context of Brazilian funds

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ABSTRACT

This article aimed to test the effect of lockup periods on the performance of Brazilian equity funds and multimarket funds, considering the period affected by the 2019 coronavirus disease (COVID-19). This study contributes to better understanding the effects of redemption restrictions imposed on quotaholders, a relevant subject considering the increase in the number of funds in Brazil. This effect is analyzed with particular focus on the period affected by the COVID-19 pandemic. The results of this study have implications for individual and professional investors and may also interest large families of Brazilian funds, given that the establishment of lockup periods forms part of a long-term decision. The research has the potential to impact planning in the fund industry, the financial planning of small and large investors, as well as the literature on the subject, motivating the undertaking of new research. The sample was composed of 17,417 Brazilian funds, 13,581 of which were multimarket funds and 3,836 were equity funds, covering the period from January of 2018 to December of 2021. Various subsamples were evaluated for robustness purposes. The hypotheses were tested using a difference-in-difference model operationalized through a panel. Fund performance was estimated every quarter based on the four-factor alpha. The main results of the study reveal that lockup periods were positively associated with fund performance. On the other hand, during the period negatively affected by COVID-19, funds with greater lockup periods did not record better performance than the other funds (considering in the comparison the performance of groups with a shorter lockup and that of the funds before the pandemic), a result that may advance the discussion on the effects of redemption restrictions.

Keywords: investment funds, lockup, four-factor alpha, COVID-19 pandemic, economic stress.

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1. INTRODUCTION

Through this study we sought to broaden the discussion on the benefits and adverse effects that redemption restrictions may present for investment funds. For this, we tested the effect of lockup periods on the performance of Brazilian funds, considering the shock caused by the 2019 coronavirus disease (COVID-19).

The pandemic sparked by the coronavirus in 2020 directly affected the result of the Brazilian economy, which saw a historic 4.5% retraction in gross domestic product (GDP) (Brazilian Institute of Geography and Statistics [IBGE], 2021). Despite the adverse scenario, the investment fund industry stood out positively by growing 10.69%, comparing 2020 with 2019. Even considering inflation in the period, real growth was 5.90% (Brazilian Association of Financial and Capital Market Entities [ANBIMA], 2021a).

By analyzing recent years (December of 2009 to July of 2020), the data show an industry with continuous and sustainable growth, which obtained an evolution of net equity from R\$ 1,403 million in 2009 to R\$ 6,679 in July of 2021. With regard to the number of funds, this rose from 8,798 to 24,713 in July of 2021 (ANBIMA, 2021b). The last survey conducted by ANBIMA related to the Brazilian investor profile chose funds as the second most popular investment option, behind only the traditional savings account (ANBIMA, 2021a), which highlights the practical relevance of conducting studies on their performance.

But which actions taken by investment fund managers have contributed to the growth rates and generated wealth, attracting more investors? Even with such an atypical, turbulent, and unpredictable scenario as the year 2020 was, there was growth of the industry. Authors such as Aiken et al. (2021), Aragon et al. (2019), Borges and Malaquias (2019), Hong (2014), Liang (1999), and Juvercina Sobrinho and Malaquias (2018) highlight the lockup period (in general, a period in which investors cannot make redemptions in funds) as a mechanism for generating high returns that benefits both fund managers and quotaholders. Thus, these periods may contribute to increasing investor wealth.

From the perspective of fund managers, the adoption of lockup periods entails the following advantages that can favor performance: (i) greater cash flow predictability, by not allowing withdrawals at any time, also enabling long-term planning (Malaquias & Borges, 2019); (ii) a reduction in the risk of a lack of fund liquidity to pay out unexpected claims for withdrawals by investors,

which would oblige them to sell more valuable assets at inappropriate moments (Aragon, 2007); (iii) the possibility of investing in assets that take more time to become profitable, enabling the search for long-term liquidity premiums (Chen, 2011); and (iv) flexibility and freedom to invest in lucrative opportunities that may appear in the market (Aragon et al., 2019).

From the investors' viewpoint, the advantages of adopting lockup periods are: (i) protection of investors that seek greater gains due to longer investment periods (long-term liquidity premiums), since the implementation of lockup periods deters the short-term investor profile; and (ii) a reduction of conflicts and of information asymmetry between investors and managers, resolved through greater returns provided by the fund managers to investors, compensating for the longer periods without redemption (Hong, 2014).

In addition, authors such as Aragon et al. (2019) have shown that the hedge fund managers that adopted lockups in times of economic crises with high borrowing costs (1999-2001 technology crisis and 2008-2009 international crisis) obtained greater returns and performance, even with the unfavorable scenario. The authors argued that, by using the redemption restriction, the funds did not suffer from capital flight and therefore were able to invest in lucrative opportunities that appeared during the crises (Aragon et al., 2019). The possible effect of lockup periods on fund performance during the COVID-19 pandemic is therefore a gap to be explored, which motivated the development of this research.

Thus, the general objective of this study was to test the effect of lockup periods on the performance of Brazilian equity funds and multimarket funds, considering the period affected by COVID-19. Based on that analysis, evidence is provided regarding the possible benefits derived from lockup periods, which may have an effect on the returns of the quotaholders of Brazilian equity and multimarket funds. The main results show that the subperiods of the pandemic affected fund performance in different ways. In some, the funds (on average) achieved better performance; in others, in turn, they presented low performance. Lockup periods did not necessarily contribute to achieving better performance indicators in that case (when considering in the comparison the control variables and past performance, before the pandemic).

This study considers, in its analysis, lockup periods in two segments of relevant funds for the Brazilian market:

equity funds and multimarket funds. Multimarket funds, in the Brazilian market, are the ones that most resemble the hedge funds analyzed internationally (Maestri & Malaquias, 2018). Moreover, these two categories of funds were the ones with the greatest growth in the funds industry in 2020: multimarket funds saw a 19.57% increase and equity funds experienced 22.85% growth (ANBIMA, 2021a).

2. THEORETICAL FRAMEWORK AND HYPOTHESES

The capacity of multimarket funds to generate greater liquidity and, consequently, positive results for their investors is connected and susceptible to their financing conditions (Çötelioglu et al., 2021). For managers to be able to better invest resources and generate greater returns for their shareholders, the financial flow of funds needs to be predictable and there has to be flexibility to enable investments (Agarwal et al., 2009; Liang, 1999).

In this sense, previous studies (Aiken et al., 2021; Ben Khelifa, 2018) have shown the benefit of the liquidity restrictions imposed by funds on investors, which are related with superior fund performance and greater liquidity. Examples of liquidity restrictions include lockup periods (in general, periods in which investors need to give advance warning to make withdrawals); notice periods (the time in advance that investors are required to give notification to make withdrawals); and withdrawal frequencies (restrictions on the number of withdrawals in a particular period) (Stafylas & Andrikopoulos, 2020).

One variable frequently used as a redemption restriction in the literature and that has contributed to increasing funds' returns and liquidity refers to the lockup period (Aiken et al., 2021; Stafylas & Andrikopoulos, 2020). By restricting redemptions of funds' resources, lockup periods enable managers to achieve greater predictability of the amount of resources and time available for investment; with this, managers can better plan and carry out long-term strategies and investments (Malaquias & Borges, 2019). This additional return can also be seen as a premium derived from the short-term illiquidity of securities (Aragon et al., 2019; Chen, 2011).

Besides the benefit of generating greater results for investors, the lockup reduces the fund's risk and level of indebtedness (Aragon, 2007). By not allowing withdrawals during certain periods, managers are able to better plan and control the fund's cash flows (Aragon, 2007). This better planning and control inhibits the fund's risk of a

The results of this research are also expected to contribute to the advancement of the literature in the area of investments, complementing findings of previous studies that have shown the positive relationship between lockup periods and hedge fund performance in periods without a crisis (Aiken et al., 2021; Stafylas & Andrikopoulos, 2020) and with a crisis (Aragon et al., 2019).

lack of liquidity, avoiding the sale of more valuable assets before the specific period or reducing the need for loans, in order to cover unexpected redemption demands from its shareholders (Aragon, 2007).

The adoption of lockups by funds also has the function of protecting investors with a long-term profile, as those that generally make redemption and disbursement requests in funds are short-term ones; that is, they invest and withdraw in shorter periods (Hong, 2014). Thus, by restricting withdrawals for a certain period, funds protect themselves from this short-term investor profile and allow for long-term investments to become more profitable, reducing managers' concerns regarding the efficient management of fund liquidity (Hong, 2014).

Conversely, hedge funds that do not have lockups as a restriction on investors present an implicit effect over the fund managers, who are pressured to perform positively since the start of the operation, as they are subject to the loss of investors and resources at any time (Agarwal et al., 2009). In addition, it is estimated that, for investors, the lockup linked to the notice periods in hedge funds can cause costs of around 1% of the initial investment, and in some cases, in which the investors have high risk aversion, these costs can reach 10% of the investment (Ang & Bollen, 2010).

Lockup periods, together with notice periods, can play an important role in the information asymmetry between managers and investors, since, due to the longer period for withdrawals and return on investments, future cash flows are unknown for most quotaholders (Ozik & Sadka, 2016). In the search to mitigate this information asymmetry between managers and investors, hedge funds generate excess returns for their shareholders, which compensates for the periods without redemption (Hong, 2014). Thus, funds with longer lockup periods show greater performance when compared to those that do not have a lockup (Liang, 1999).

Therefore, considering the benefits of adhesion to lockup periods for investment funds, the first hypothesis of the study is as follows:

H₁: lockup periods present a positive effect on the performance of Brazilian funds.

The study of Falato, Goldstein, and Hortaçsu (2021) on mutual investment funds during the crisis triggered by the COVID-19 pandemic showed two main weaknesses of the funds that made them lose performance during situations of extreme economic stress: (i) the greater presence of assets with low liquidity in their portfolios; and (ii) asset fire sales or forced liquidation of assets (Falato, Goldstein, & Hortaçsu, 2021).

Investment funds that present in their portfolios a greater number of assets with low liquidity and that periodically promise liquidity with high rates of returns for investors are in a weaker position and more susceptible to greater redemption demands in situations of economic adversity (Jiang et al., 2021). The economic crisis triggered by the pandemic generated a flight effect among investors, which because they faced no restrictive barriers in the panic and risk aversion scenario, made large withdrawals from funds (Falato, Goldstein, & Hortaçsu, 2021).

These mass capital outflows generate low performance in funds, as they affect cash flows by generating discrepancies between investor remuneration and the return on low-liquidity investments (Goldstein et al., 2017). This difficulty perceived by investors may also intensify redemption requests (Goldstein et al., 2017). This capital outflow movement is around three times more intense in funds with low liquidity, as funds that have a greater number of high-liquidity assets are not expected to have problems selling and being able to remunerate their investors (Goldstein et al., 2017).

Asset fire sales or forced liquidation, in turn, initially occurs due to a shock in the prices of shares in the financial market that generates instability and risk aversion in investors (Mirza et al., 2020). This scenario makes fund managers liquidate assets before the planned period in order to be able to meet investors' remuneration expectations; as a result of this forced liquidation, the price of the assets sold is reduced, since in order to achieve the total potential gain initially estimated they would require more time (Meier & Servaes, 2019). Due to these sales below the market price, there is a loss of value and performance of peer funds that have the same assets, which leads to a second round of sales, again depreciating asset prices and resulting in worse instability and volatility

in the market, widening the effects of the initial shock (Falato, Hortaçsu, Li, & Shin, 2021).

Due to this fact, fund managers need strategies that help them to reduce weaknesses in economic stress situations and that drive them to obtain superior returns. By analyzing the 1999-2001 international bubble and 2007-2009 international crisis periods, Aragon et al. (2019) showed that the use of lockup periods in hedge funds in crisis periods enabled the funds to achieve better returns and performance. By not suffering from major capital outflows, the funds analyzed were able to make investments in trading opportunities that appeared in these periods (Aragon et al., 2019).

In the theory regarding the market efficiency hypothesis (MEH), share prices fully and quickly reflect all and every type of information or alteration that could impact the value of shares (Fama, 1970). Thus, new information is fully reflected in share prices, which after the period relating to the release of that new information tend to enter into equilibrium again, eliminating the possibility of abnormal gains or arbitrage in the market (Fama, 1970). However, Vasileiou et al. (2021) demonstrated that, during major economic stress, such as that sparked by COVID-19, the market behaves inefficiently, as it is incapable of quickly absorbing all available information to enter into a new equilibrium, which makes arbitrage and abnormal gains possible during a pandemic (Dias et al., 2020).

Thus, due to the inefficiency of the market in the period affected by COVID-19, together with the possibility of the benefits of lockup periods for investment funds in crisis periods, the second hypothesis of the study is as follows:

H₂: during the pandemic period, funds with greater lockup periods presented better performance.

Using another line of reasoning, arguments can also be made regarding the adverse effects derived from the adoption of lockup periods. Sophisticated investors tend to be more sensitive to poor performance. So, in times of financial crisis, funds with redemption restrictions that present poor performance can generate fear in their investors that this will persist for long periods (Ben-David et al., 2012). Hence, funds with greater lockup periods and that have recorded unfavorable performance may arouse in their quotaholders an interest in redeeming their resources as soon as possible, thus representing an adverse effect of redemption restrictions over the period affected by the crisis.

3. DATA AND METHODS

The sample was composed of 17,417 Brazilian funds, 13,581 of which were multimarket funds and 3,836 were equity funds, covering the period from January of 2018 to December of 2021. Thus, the analysis period involves two years (2018 and 2019) prior to the COVID-19 pandemic and two years (2020 and 2021) that were affected in different ways by that pandemic. To compose the database and with the aim of avoiding survival bias, we considered both funds that began their activities after January of 2018 and funds that ended their activities before December of 2021. The data were collected in the Economatica database.

The dependent variable of the study is represented by the four-factor alpha, including three factors from Fama and French (1993) and the momentum factor from Carhart (1997). Based on daily data, using a regression analysis, we calculated the alpha of each fund every quarter. Funds with fewer than 45 daily returns in the quarter were excluded from the respective quarter. Thus, for example, in a quarter that contains 8,000 funds with at least 45 daily returns, 8,000 regressions are estimated (one for each fund) and 8,000 measures are obtained for the alpha (this is the four-factor alpha per fund, per quarter). The four factors were collected from the Center for Financial Economics Research of the University of São Paulo (NEFIN/USP, 2022), namely: the market factor; the SmB (size) factor; the HmL factor (a factor based on the book-to-market ratio); and the WmL factor (the momentum factor, which considers the past performance of the shares). Positive or negative alphas that were not statistically significant at

10% were substituted by 0; the research of Malaquias and Eid (2013) used a similar procedure. We conducted an additional robustness test considering the alphas without substitution by 0. The returns were calculated based on simple returns, without multiplying by 100.

To carry out the hypothesis test, we used the differences-in-differences methodology (Schiozer et al., 2021). In this case, the period negatively affected by COVID-19 was considered the period of shock, therefore being represented by a dummy (COVID) that takes the value of 1 for the period of shock and 0 for the period before the shock. In this case, the treatment could also be considered a dummy, that is, funds with a lockup period greater than or equal to a certain value, or even a scale variable. We chose to use the LockUP variable in scale terms, but we conducted robustness tests with dummies for the treatment. Thus, in line with what was presented by Schiozer et al. (2021), the differences-in-differences model used in this study refers to a panel with cross-sectional observations and observations over time. The objective will be to evaluate the difference in the change of the dependent variable, comparing the period before and after the treatment for the “treated” group (funds with a greater lockup period) and the change of the dependent variable, comparing the period before and after the treatment for the control group (funds with a shorter lockup period), following the tutorial made available by Schiozer et al. (2021). Equation 1 indicates the model used for the hypothesis test, with particular interest in the coefficient β_3 .

$$\begin{aligned} \text{Alpha}_{it} = & \beta_1 * \text{LockUP(NL)}_{it} + \beta_2 * \text{Covid}_t + \beta_3 * \text{Covid} * \text{LockUP(NL)}_{it} + \beta_4 * \text{Funds of Funds}_{it} + \\ & \beta_5 * \text{Performance Fee}_{it} + \beta_6 * \text{Administration Fee}_{it} + \beta_7 * \text{Age(NL)}_{it} + \beta_8 * \text{Size(NL)}_{it} + \varepsilon_{it} \end{aligned} \quad \boxed{1}$$

in which Alpha_{it} represents the fund performance (four-factor alpha) for fund i in quarter t ; LockUP(NL)_{it} represents the natural logarithm of the lockup period, in days, for fund i in quarter t ; Covid_t is the dummy variable that takes the value of 1 for the periods affected by COVID-19 and 0 for the other periods; $\text{Covid} * \text{LockUP(NL)}_{it}$ represents the interaction between the COVID dummy and the scale value for LockUP(NL) ; $\text{Funds of Funds}_{it}$ is the dummy variable that takes the value of 1 for funds of funds and 0 for the other funds; $\text{Performance Fee}_{it}$ is the dummy variable that takes the value of 1 for funds that have a performance fee and 0 for the other funds;

$\text{Administration Fee}_{it}$ is the scale variable that indicates the maximum administration fee that the fund can charge a year; Age(NL)_{it} indicates the natural logarithm of the fund's age, in years, at the start of each year; Size(NL)_{it} indicates the natural logarithm of the net equity of fund i at the start of quarter t ; and $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \varepsilon_{it}$ represent parameters of the model.

The LockUP(NL) variable was calculated based on the natural logarithm of the variable in days. The control variables chosen in the study are linked to fund performance according to the literature, namely: size, age, funds that invest in funds, administration fee, and

performance fee of the fund. Size was calculated by the logarithm of the fund's net equity and its expected relationship with fund performance is negative, where the bigger the fund is, the lower its performance will be (Aiken et al., 2021; Guimarães & Malaquias, 2020; Mendonça et al., 2017). Explanations for this behavior suggest that: (i) the distance of the manager with the fund's assets makes the decision-making process difficult; (ii) the diseconomy of scale may hinder the performance of the funds in which, due to the greater capital to be accommodated in investments, the managers end up making less profitable choices; and (iii) due to the smallest funds having greater flexibility and agility to invest in more profitable options, bigger funds would have lower performance (Stafylas & Andrikopoulos, 2020).

The age of the funds is measured by the natural logarithm of the fund's age in years, at the start of each year, and its expected relationship with performance is negative (Aiken et al., 2021; Storck & Motoki, 2021) due to the fact that smaller funds have agility and flexibility to invest at the right time and generally arise in response to certain demands, such as a recession (Stafylas & Andrikopoulos, 2020). In addition, because they do not have a stabilized career in the market, executives of newer funds take more risks and expose themselves more to risk in investments than their already-established peers, which may indicate better performance (Correia et al., 2018).

With relation to the fund's performance fee, this represents a percentage to be paid to the fund's managers by the investors, if a certain performance target is achieved (Cumming et al., 2020). Therefore, funds with higher performance fees tend to present greater returns (Guimarães & Malaquias, 2020; Mendonça et al., 2017). In addition, the performance fee works as an incentive for fund managers to always deliver better results to investors due to their remunerations being directly linked to the increase in the fund's wealth. Moreover, the performance fee can mitigate conflicts and align interests between fund

managers and investors for superior returns (Hutchinson et al., 2021).

The fund's administration fee is calculated as a percentage over the value of the net equity in the hands of the fund managers and its expected relationship with performance tends to be positive (Guimarães & Malaquias, 2020). This behavior can be highlighted by the fact that higher administration fee charges also serve as incentives to managers (Malaquias & Eid, 2014), who engage in investments with greater exposure and higher risks to compete with funds that charge lower fees (Cui et al., 2019).

Among the control variables, there is also the variable for funds of funds (Cui & Yao, 2020; Sialm et al., 2019). Funds that invest in funds have a positive expected relationship with performance (Mendonça et al., 2017). This behavior can be highlighted as being due to the abilities of the managers of the funds (Cui & Yao, 2020) and of investments with funds with greater proximity, which enables access to private information and monitoring.

Before starting the formal stage of the hypothesis test, a graphical analysis was carried out with the aim of illustrating the performance of the funds in the sample before and after COVID-19. For this, two distinct groups were considered: (i) the treatment group, that is, the group of funds with greater lockup periods; and (ii) the control group, that is, containing funds without lockup periods or with shorter lockup periods. This analysis involves the comparison of the two groups (treatment vs. control) before and after the pandemic period.

For the formal analysis of the hypothesis, the Breusch-Pagan/Cook-Weisberg test was applied to evaluate whether the heteroscedasticity of the residuals would be a concern, as well as evaluating the serial autocorrelation. In all the models, it was necessary to estimate the coefficients with robust standard errors. The variance inflation factor (VIF) statistic was also evaluated, with the aim of identifying problems related to multicollinearity.

4. RESULTS

Table 1 represents the descriptive statistics of the study variables. The sample was composed of 17,417 investment funds, 13,581 of which were multimarket and 3,836 were equity, resulting in an unbalanced panel of 178,176 fund x quarter level observations. On average, the funds presented

positive performance in the period, considering that non-significant alphas at 10% were substituted by 0 (as explained in the study methodology). Moreover, 26.5% of the funds charge a performance fee, and the maximum administration fee is, on average, 0.766% a year.

Table 1*Descriptive statistics of the variables*

Variables	N. Obs.	Mean	St. Dev.	Min.	p25	p50	p75	Max.
Performance	178,178	0.00002	0.0003	-0.0013	0.0000	0.0000	0.0000	0.002
LockUP(NL)	178,178	1.482	1.213	0.000	0.693	1.099	1.792	7.497
Funds of Funds	178,178	0.454	0.498	0.000	0.000	0.000	1.000	1.000
Performance Fee	178,178	0.265	0.441	0.000	0.000	0.000	1.000	1.000
Administration Fee	178,178	0.766	0.834	0.000	0.150	0.440	1.100	3.000
Age(NL)	178,178	1.644	0.829	0.000	1.099	1.792	2.303	4.007
Size(NL)	178,178	17.659	1.505	14.531	16.581	17.493	18.623	21.247

Note: This table contains observations considering the fund x quarter level. The reported statistics refer to the mean, standard deviation, minimum, and maximum, as well as position measures based on quartiles and percentiles. The scale variables were subjected to the winsorize procedure at 2% (1% at each extremity).

Administration Fee = maximum percentage that the fund can charge in the year as an administration fee; Age(NL) = natural logarithm of the fund's age, in years, at the start of each year; Funds of Funds = dummy variable that takes the value of 1 for funds that invest in other funds and 0 for the rest; LockUP(NL) = natural logarithm of the lockup period in days; Performance = four-factor alpha for the fund, for each quarter (calculated based on daily data); Performance Fee = dummy variable that takes the value of 1 for funds that charge a performance fee and 0 for the rest; Size(NL) = natural logarithm of the fund's net equity at the start of each quarter.

Source: Elaborated by the authors.

As presented in the study methodology, before beginning the hypothesis test, a graphical analysis of the funds' performance was carried out involving the effect of the pandemic and segregating the sample between two groups: a treatment group and a control group. The treatment group included funds with a lockup greater than or equal to 30 days. The control group, in turn, included the funds without a lockup period or funds with a lockup shorter than 30 days. It is important to highlight that a procedure was also adopted for pairing the groups in this graphical analysis, implemented to analyze the

performance of funds with similar characteristics. Previous studies on mutual funds have already implemented pairing procedures based on fund characteristics. Chen and Malaquias (2018), for example, analyzed exclusive and non-exclusive funds under the responsibility of the same managers. In the case of the study of Chen and Malaquias (2018), the pairing was carried out based on the information about the fund manager. For this study, as summarized in Table 2, we considered five characteristics of the funds to create the groups and, consequently, to establish the pairing criteria.

Table 2*Criteria used to create groups and pairing of the funds with similar characteristics*

	Group 1	Group 2	Group 3	Group 4	Group 5
Perf. Fee	Perf. Fee: yes	Perf. Fee: no			
Funds of Funds	It is a FoF	It is not a FoF			
Age	Age ≤ P20	P20 < Age ≤ P40	P40 < Age ≤ P60	P60 < Age ≤ P80	Age > P80
Size	Size ≤ P20	P20 < Size ≤ P40	P40 < Size ≤ P60	P60 < Size ≤ P80	Size > P80
Adm. Fee	Ad. Fee = 0	0 < Ad. Fee ≤ 0.15%	0.15% < Ad. Fee ≤ 0.45%	0.45% < Ad. Fee ≤ 1.0%	Ad. Fee > 1.0%

Source: Elaborated by the authors.

According to the information in Table 2, for the Performance Fee and Funds of Funds variables, two groups were created for each; for the other variables (Age, Size, and Administration Fee), in turn, five groups were created for each. For the Age and Size variables, the groups were based on quintiles. After classifying all the funds in the sample based on the procedures specified for this graphical analysis, we preceded to consider those groups that contained observations for all cases: the control group before the pandemic, the control group during the pandemic, the treatment group before the pandemic, and

the treatment group during the pandemic. In this case, 319 groups fulfilled that criterion.

So, for example, take a randomly-chosen group called "example-group." This example-group contains: funds without a performance fee; funds that are not quota funds; funds in the first quintile in relation to age; funds in the first quintile in relation to size; and funds with an administration fee higher than 1%. In the database, the observations of this example-group can be divided between funds of the control group and funds of the treatment group and there are observations for the analysis

of average performance before and during the pandemic for both (treatment and control). It is assumed that the average performance of these groups is therefore comparable, as these funds are similar in relation to the five characteristics considered, differing in terms of having a lockup period ≥ 30 days or not. According to

the information in the previous paragraph, 319 groups fulfilled that criterion of containing observations for the treatment group and control group, before and during the pandemic period. Table 3 presents the descriptive analysis for these groups and that analysis is also illustrated in Figure 1.

Table 3
Analysis of the difference in performance based on lockup periods

Group	2018-2019 (A)	2020 (B)	2021 (C)	Diff. (B – A)		Diff. (C – A)	
Without lockup	0.0000074	0.0000555	-0.0000072	0.0000482	***	-0.0000146	***
With lockup	0.0000179	0.0000725	0.0000066	0.0000546	***	-0.0000113	***
Difference	0.0000106	0.0000170	0.0000138	0.0000065		0.0000033	-0.0000032

Note: To elaborate this table, the funds were paired between groups that presented similar characteristics; thus, performance is compared between equivalent groups. Five variables were used as a pairing criterion, as previously presented in Table 2: Performance Fee, Funds of Funds, Age, Size, and Administration Fee. Funds with a lockup greater than or equal to 30 days were classified in the “With lockup” group and the other funds were put in the “Without lockup” group. After carrying out all the combinations of groups based on the five variables mentioned, 319 groups presented observations for the treatment group and for the control group, before and during the pandemic period. The table reports the statistics based on the average performance of the funds classified in these 319 groups. The statistic used in this table refers to the t test for difference of means. Performance = four-factor alpha for the fund, for each quarter (calculated based on daily data), subjected to the winsorize procedure at 2% (1% at each extremity).
***, **, * = significant at 1, 5, and 10%, respectively.

Source: Elaborated by the authors.

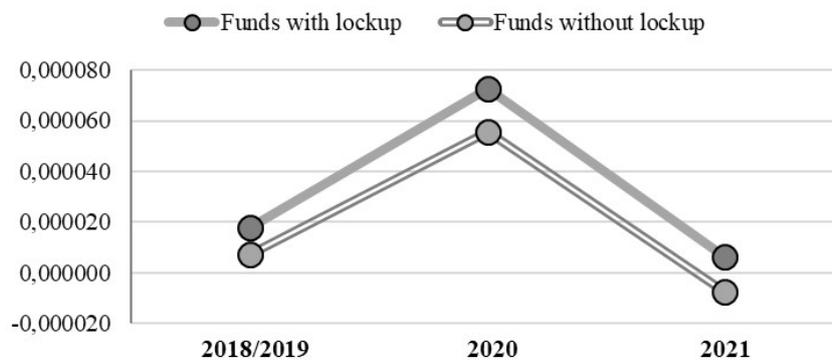


Figure 1 Average performance of the funds, considering lockup periods and the pandemic period

Note: To elaborate the figure, the funds were paired between groups that presented similar characteristics; thus, performance is compared between equivalent groups. Five variables were used as a pairing criterion, as previously presented in Table 2: Performance Fee, Funds of Funds, Age, Size, and Administration Fee. Funds with a lockup greater than or equal to 30 days were classified in the “With lockup” group and the other funds were put in the “Without lockup” group. After carrying out all the combinations of groups based on the five variables mentioned, 319 groups presented observations for the treatment group and for the control group, before and during the pandemic period. The figure reports the statistics based on the average performance of the funds classified in these 319 groups.

Performance = four-factor alpha for the fund, for each quarter (calculated based on daily data), subjected to the winsorize procedure at 2% (1% at each extremity).

Source: Elaborated by the authors.

Descriptively, the results available in Table 3 and in Figure 1 indicate that, in the 2020 period, the funds presented better performance than in 2018-2019 (both the treatment group and the control group). In contrast, the performance of the funds presented a reduction in 2021, dropping lower than the average recorded in 2018-

2019. Analyzing period by period, funds with a lockup, on average, recorded better performance than the other funds in 2020 and in 2021. The last line for the difference columns (last three columns of Table 3) indicates that the difference-in-difference was not significant in any of the cases. It warrants mentioning that the results of Table 3

and of Figure 1 are of a descriptive nature and consider a subsample from which funds of groups without the counterpart in the pairing procedure were excluded.

The results for the hypothesis test are presented in Table 4. In all cases, the VIF statistic suggests there are no problems related with multicollinearity. The tests are initiated with a parsimonious model, which does not consider the dummies for the quarters affected by COVID-19. In this case (Model 1), it can be observed that the effect of the scale variable of lockup periods on performance was positive and statistically significant. The R-squared of the models presented modest values, being below 10% in all the cases reported in Table 4. This indicates that there are still other variables that can

help in understanding the variations in performance of the Brazilian funds. Thus, the models contain variables that are statistically significant at 1%, showing that these factors also reflect important characteristics to be considered in the analysis of investment funds. We should also comment on the value for the coefficients that are shown to be apparently small. The explanation lies in the construction of the database, in which the returns were considered without the respective multiplication by 100. To get an idea about the expressiveness of these coefficients, they can be compared with the descriptive statistics. For example, the coefficient for Funds of Funds, in the modulus, represents half of the average alpha of the funds in the sample.

Table 4

Effect of the interaction between lockup periods and periods affected by the 2019 coronavirus disease (COVID-19) on fund performance

Variables	Model 1				Model 2				Model 3			
	Coef.	t	P>t		Coef.	t	P>t		Coef.	t	P>t	
LockUP(NL)	0.00001	7.20	0.000	***	0.00001	7.49	0.000	***	0.00001	9.91	0.000	***
Covid 2020, 1 st Quart.					0.00005	14.10	0.000	***				
Covid 2020, 2 nd Quart.					0.00009	24.96	0.000	***				
Covid 2020, 3 rd Quart.					0.00000	1.81	0.070	*				
Covid 2020, 4 th Quart.					0.00002	7.80	0.000	***				
Covid 2021, 1 st Quart.					0.00000	0.48	0.632					
Covid 2021, 2 nd Quart.					-0.00002	-8.87	0.000	***				
Covid 2021, 3 rd Quart.					-0.00002	-11.53	0.000	***				
Covid 2021, 4 th Quart.					-0.00005	-21.60	0.000	***				
Covid 2021, 2 nd , 3 rd , and 4 th Quart.									-0.00003	-16.17	0.000	***
Covid 2021, 2 nd , 3 rd , and 4 th Quart. * LockUP(NL)									-0.00001	-7.28	0.000	***
Funds of Funds	-0.00001	-5.90	0.000	***	-0.00001	-5.96	0.000	***	-0.00001	-5.66	0.000	***
Performance Fee	-0.00001	-3.38	0.001	***	-0.00001	-3.76	0.000	***	-0.00001	-3.63	0.000	***
Administration Fee	-0.00001	-9.56	0.000	***	-0.00001	-9.43	0.000	***	-0.00001	-9.71	0.000	***
Age(NL)	-0.000003	-3.40	0.001	***	-0.000005	-6.03	0.000	***	-0.000004	-5.02	0.000	***
Size(NL)	0.00001	14.60	0.000	***	0.00001	15.56	0.000	***	0.00001	15.48	0.000	***
Constant	-0.00011	-11.40	0.000	***	-0.00012	-12.27	0.000	***	-0.00011	-11.35	0.000	***
Dummy for Fund Manager:	Yes				Yes				Yes			
N. Obs.:	178,176				178,176				178,176			
Maximum VIF:	1.40				1.40				3.02			
Adjust. R-squared:	0.0474				0.0612				0.0527			

Note: The results reported in this table consider the data panel analysis with fixed effects for the fund managers. For the estimates, robust standard errors are considered. The scale variables were subjected to the winsorize procedure at 2% (1% at each extremity).

Administration Fee = maximum percentage that the fund can charge in the year as an administration fee; Age(NL) = natural logarithm of the fund's age, in years, at the start of each year; "Covid 2020, 1st Quart" to "Covid 2021, 4th Quart" = dummies that take the value of 1 for the respective quarter and 0 for the other periods; "Covid 2021, 2nd, 3rd, and 4th Quart" = dummy that takes the value of 1 for the last three quarters of 2021 and 0 for the other periods; Funds of Funds = dummy that takes the value of 1 for funds that invest in other funds and 0 for the rest; LockUP(NL) = natural logarithm of the lockup period in days; Performance = four-factor alpha for the fund, each quarter (calculated based on daily data); Performance Fee = dummy variable that takes the value of 1 for funds that charge a performance fee and 0 for the rest; Size(NL) = natural logarithm of the fund's net equity at the start of each quarter.

***, **, * = significant at 1, 5, and 10%, respectively.

Source: Elaborated by the authors.

Widening the analysis, in the second model eight dummy variables are included, representing each one of the quarters affected by the COVID-19 pandemic. It can be observed that the effect of the scale variable for lockup periods on performance continued to be positive and statistically significant. The coefficients for the different dummies related to the COVID-19 periods presented different effects on performance. The negative effect of the pandemic on the performance of the funds was negative and significant in the last three quarters of 2021, which motivated combining these three quarters in a single dummy variable. This was then the variable that represented the shock that occurred in the funds segment, with a negative and significant effect. The third model considers the interaction between the dummy for the three periods of COVID-19 and the scale variable for lockup periods. This is the coefficient of interest for the test of H_2 , that is, the coefficient β_3 of equation 1. Before beginning the discussion of the results, a number of rounds of robustness tests were carried out.

For the first round of tests, the scale variable for redemption restrictions was substituted by a dummy that took the value of 1 for funds with 30 or more days of lockup and 0 for the other cases. The interaction variable for COVID-19 periods was also updated. The results were shown to be equivalent for the tests of H_1 and H_2 . In two additional tests, considering dummies with 45- and 60-day lockup periods and the respective interaction with the pandemic period, the results for H_1 and H_2 continued to be equivalent to those observed in Model 3 of Table 4.

The coefficients of Model 3 of Table 4 were also estimated: i) with the exclusion of exclusive funds and funds closed to investments; and ii) considering only funds with complete data for the whole period (that is, only funds that remained as survivors during the pandemic period). In both cases, the results remained the same as those observed previously, leading to the same conclusion for the tests of H_1 and H_2 . Finally, Model 3 was estimated again considering the four-factor alpha independently of its significance level; the results also indicated the same conclusion for the tests of H_1 and H_2 .

In general, the results highlighted that funds with greater lockup periods have better performance than funds that have no restriction (or funds that have shorter lockup periods), which is in line with H_1 and consistent with the findings in the literature (Aiken et al., 2021; Ben Khelifa, 2018).

By analyzing the effect of the pandemic on fund performance, it was found that, in general, the reflections of COVID-19 occurred in different ways throughout the quarters of 2020 and 2021. In the last three quarters of

2021, the average performance of the funds was negatively impacted by the COVID-19 pandemic (Table 4, Model 2). In turn, 2020 was, on average, marked by better fund results. According to the results of Table 4, and considering a differences-in-differences approach, funds with greater lockup periods did not present better performance than the comparison groups (funds with a shorter lockup or observations before the pandemic) during the periods most affected by the pandemic (2nd, 3rd, and 4th quarter of 2021). Thus, H_2 was rejected, considering the results of the multivariate analysis.

On one hand, lockup periods in times of economic crisis benefited the performance achieved by the funds, as in the 1999-2001 technology crisis and in the 2008-2009 international crisis (Aragon et al., 2019). On the other hand, according to the criteria adopted in this study for Brazilian funds, lockup periods were not shown to be an essential variable for achieving better performance indicators during the COVID-19 pandemic (when the comparison is made with funds that have a shorter lockup and with the past performance of the funds, before the pandemic).

The idea that funds with greater lockup periods can achieve better performance during the pandemic as they are less exposed to capital flight is partially adherent to the study sample. In the analysis based on paired groups (Table 3 and Figure 1), evaluating the pandemic period in isolation (particularly 2021), there are indications that the group of funds with a greater lockup period presented better performance than the other funds. A liquidity premium (Chen, 2011) was partially observed in the pandemic period and, similarly, partial evidence was observed that in 2021 alone the market opportunities (Aragon et al., 2019) may have been better explored by funds with a greater lockup. However, in the analysis that considers the comparison with previous periods, as well as the effect of control variables, we can see that the funds with a greater lockup also suffered the negative effects derived from the pandemic.

Arguments can also be made regarding a possible adverse effect of the redemption restrictions during the pandemic. In situations of financial crises and economic stress, investors may lose confidence in the economy's reaction (Zhou & Meng, 2021), as well as reducing their expectations regarding the returns they will receive and showing lower tolerance of the risk they are exposed to, thus raising the perception of increased risk in the market (Hoffmann et al., 2013). Following the reasoning of Ben-David et al. (2012), at the first signs of a drop in fund performance due to the economic crisis, investors tend to react by withdrawing their investments, as they

fear their resources will get stuck during economic crises. This sentiment may also be more intense in funds with long periods of redemption restrictions, as in this case the exposure to the period of poor performance would be longer (Ben-David et al., 2012). The formal test of this argument requires a new round of analyses using the categorization of past performance, which opens up opportunities to carry out new studies on the subject.

It is also important to highlight that, during 2020, on average, the performance achieved by the funds was superior to that recorded in other periods, suggesting that, even in an adverse scenario, various fund managers identified good trading opportunities. These gains at a time of extreme economic crisis also suggest the inefficiency of the market in the crisis caused by COVID-19, as highlighted by Vasileiou et al. (2021). In this case, a greater delay may have occurred in reaching the equilibrium price of financial assets in the market, enabling the obtainment of abnormal gains by some fund managers (Dias et al., 2020).

In contrast, in 2021, on average, the funds presented worse performance than in 2020 (see Table 3 and Figure 1, for example). Thus, although the average performance of the funds with lockups was better than the average performance of the funds without lockups in 2021 alone, compared with 2020, both groups suffered the negative effects of the pandemic.

With relation to the control variables, the size of the funds presented a positive and significant relationship with fund performance, suggesting that bigger funds

presented better performance. The arguments related to possible advantages of size, provided by economy of scale and greater bargaining power due to the greater volume traded by bigger funds (Ferreira et al., 2013; Malaquias & Eid, 2014), were shown to be adherent to the study sample.

The age of the funds presented a negative and significant effect on performance, in line with the argument that younger funds would have better performance due to the greater risk exposure of managers not established in the market (Correia et al., 2018). The funds that invest in funds (Funds of Funds) also presented lower performance than the rest. With relation to the management compensation structure of the funds in the sample, as opposed to what was predicted in the study, the administration fee presented a negative relationship with performance. Funds with higher administration fees, on average, achieved lower levels of performance during the period analyzed, corroborating previous studies (Silva et al., 2020; Vasconcelos et al., 2019). Along the same lines, the performance fee presented a negative relationship with fund performance, unlike in most of the literature, which shows a positive relationship between the management incentive fee and fund performance (Guimarães & Malaquias, 2020; Hutchinson et al., 2021). This negative relationship suggests that, in the specific case of the sample analyzed, the performance fee did not act as a great incentive for managers to achieve better returns; this function is perhaps being carried out by the variable related to the redemption restrictions.

5. CONCLUDING REMARKS

In a context marked by unprecedented events in the financial market, the general aim of this study was to test the effect of lockup periods on the performance of Brazilian equity funds and multimarket funds, considering the period affected by COVID-19.

The results showed that, in general, funds with greater lockup periods presented better risk-adjusted performance. On the other hand, during the periods negatively affected by the COVID-19 pandemic, funds with greater lockup periods recorded lower performance (considering, in the comparison, the performance of groups with a shorter lockup and the performance of the funds before the pandemic, in a multivariate analysis); analyzing 2021 in isolation in a bivariate test, funds with greater lockup periods recorded better average performance than funds with shorter lockup periods (or funds without a lockup).

If, on one hand, the redemption restrictions contribute to the achievement of better performance, during the pandemic period, the strategy that is expected to benefit from the imposition of a lockup does not appear to provide extraordinary gains for the quotaholders of these funds.

It is important to highlight that the crisis affected the funds in the sample in waves. During 2020, on average, the funds achieved better performance in comparison with the other periods. However, in the last three quarters of 2021, the average fund performance was negative. These periods of different impacts and relatively distant from the epicenter of the COVID-19 financial crisis, covering February to March of 2020 (Vasileiou et al., 2021), were not expected and show that, even one year after the start of the crisis, its effects have implications for the investment fund industry.

The control variables indicated that Brazilian funds with higher administration fees tended to present lower levels of risk-adjusted performance; the performance fee does not appear to have acted as an incentive for achieving superior performance to the performance of peers. Conversely, bigger and younger funds presented better performance indicators.

As contributions to the literature on investment fund performance, this article reinforces the relevance of management using lockup periods to obtain better performance in economic situations with no crisis (Aiken et al., 2021; Aragon, 2007). In addition, the results highlight the need to exercise caution when evaluating the execution of investments in funds with high redemption restrictions during periods of economic stress. These results complement previous studies, such as that of Aragon et al. (2019), who evaluated the benefits of lockup periods in crisis situations. For the literature linked to market efficiency (Fama, 1970), the study elucidates that, in Brazil, during the start of the COVID-19 pandemic, the adjustment of prices to the new information available in the market may have occurred more slowly, enabling fund managers to engage in arbitrage in the market and obtain abnormal gains, which corroborates the studies conducted in other markets during the pandemic (Dias et al., 2020; Vasileiou et al., 2021).

The practical implications for fund management relate to the benefits and challenges that both managers and investors encounter in relation to the adoption of lockups

in funds in economic cycles of extreme crisis, such as the COVID-19 pandemic. Investment funds are becoming an option with growing interest from small investors in Brazil, so the selection of which funds to invest in should take into consideration the effects derived from redemption restrictions.

In addition, it warrants highlighting that the establishment of lockup periods represents a strategic decision, whether for the funds, for the management team, or for the fund family in general, as the alteration of this variable, when possible, is not made in a short space of time and without possible adverse effects. Thus, this variable can represent a competitive differential, even in the fund family itself, but caution is needed in scenarios with high financial losses for investment funds.

As a limitation related to this study, we highlight the quantitative analysis carried out based on the four-factor alpha. Although there is agreement about the relevance of this measure for evaluating investment funds, an analysis based on other metrics could lead to different results. For new research, we suggest carrying out qualitative analyses, considering a possible comparison between the perception of managers and quotaholders regarding the establishment of lockup periods. Although they are considered important mechanisms for obtaining better performance for quotaholders, these same quotaholders may not be willing to restrict the redemptions of their investments in the segment of equity funds and multimarket funds, which are mostly characterized as variable income investments.

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