# HERDING BEHAVIOR OF BUSINESS GROUPS DURING COVID-19: EVIDENCE IN CHILE

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Manuscript received 20 October 2022; accepted 1 March 2023.

**ABSTRACT**

This article investigates whether herding behavior is present in stock returns of business groups during the COVID-19 pandemic. Using series of prices and daily traded volume of the companies that make up the General Index of Stock Prices of the Santiago de Chile Stock Exchange (S&P/CLIGPA) from January 1, 2010 to October 9, 2020 the results show herding behavior during COVID-19. Nevertheless, the herding behavior is weaker in business group firms compared to companies which are not affiliated to business groups. Then, when analyzing how herding behavior evolves in business groups during the presence of COVID-19, it is found that herding behavior changes to reverse herding behavior during May 2020 onwards. When inquiring about this point, it is found that herding behavior in business groups is lower under increasing uncertainty (number of cases and deaths due to COVID-19 increases).

**Keywords:** Herding behavior, business groups, emerging markets, COVID-19, Chilean Stock Markets.
**JEL Classifications:** G14, G15.

http://dx.doi.org/10.22201/fe.01851667p.2023.324.83713

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CONDUCTA DE MANADA DE GRUPOS EMPRESARIALES
DURANTE LA COVID-19: EVIDENCIA EN CHILE

**RESUMEN**

Este artículo investiga si la conducta de manada está presente en los rendimientos de las acciones de los grupos empresariales durante la pandemia COVID-19. Utilizando series de precios y volumen diario negociado de las empresas que integran el Índice General de Precios de Acciones de la Bolsa de Comercio de Santiago de Chile (S&P/CLIGPA) del 1 de enero de 2010 al 9 de octubre de 2020, los resultados muestran una conducta de manada durante el COVID-19. Sin embargo, esta conducta es más débil en las empresas afiliadas al grupo empresarial, en comparación con las no afiliadas. Es así como encontramos que la conducta de manada para el grupo de interés evoluciona durante el periodo del COVID-19 a tal punto que cambia a lo que se denomina conducta de manada inversa durante mayo de 2020 en adelante. Al analizar este comportamiento nos encontramos con que la conducta de manada en grupos empresariales es menor en presencia de un aumento de la incertidumbre (número de casos de muertes debido al COVID-19).

**Palabras claves:** conducta de manada, grupos empresariales, mercados emergentes, COVID-19, Bolsa de Comercio de Chile.
**Clasificación JEL:** G14, G15.

## 1. INTRODUCTION

Based on the article by Goodell (2020), who inquiries about the potential effects of this pandemic on financial markets, a series of studies have emerged on this issue. Baig *et al.* (2020) find that the increase in confirmed cases and deaths from COVID-19 is linked to a significant increase in the illiquidity and volatility of the United States stock market. Albulescu (2020) confirms an increase in volatility for this market and David, Inácio, and Tenreiro (2021) do it for 11 major stock indexes around the world. Erden (2020) reports an increase volatility, arguing that the way investors process coronavirus data depends on the level of freedom that the capital market possesses. For their part, Mazur, Dang, and Vega (2020), after studying the performance of the

US stock market at the industry level, find that stocks in the economic sectors, *e.g.*, natural gas, food, healthcare and software experience high positive returns, while the values of the stocks in the oil, real estate, entertainment and hospitality sectors plummet. Nadeem (2020) reports that the stock returns of 64 countries decreased as the number of confirmed cases increased, decreasing even more compared to the growth in the number of deaths. Goodell and Duc (2020) inquire whether US lawmakers traded stocks from late January to February 2020 anticipating that COVID-19 would have a significant impact on the financial market, finding little evidence of abnormal returns until February 26, 2020. Topcu and Gulal (2020) find that the negative impact of the pandemic has gradually decreased starting to diminish in mid-April in emerging markets. Akhtaruzzaman, Boubaker, and Sensoy (2020), report that companies from China and G7 countries show significant increases in the conditional correlations for market returns, meaning transmission of financial contagion.

During the pandemic, not only the impact that COVID-19 has on financial markets is reported, but also the change in investor behavior. One important type of behavior is called herding behavior which can simply define as "everyone doing what everyone else is doing, even when their private information suggests doing something quite different" (Banerjee, 1992). Bikhchandani and Sharma (2001) state, "An individual can be said to herd if she would have invested without knowing other investors' decision but does not invest when she finds that others have decided not to do so. Alternatively, she herds when the knowledge that others are investing changes her decision from not investing to making the investment." There are several reasons for a wealth maximizing investor to revere a planned decision after observing others. First, other investors may know something else about the performance on the investment and their actions reveal this information. Second, and this is relevant only for money managers who invest on behalf of others, the incentives provided by the compensation scheme and terms of employment may be such that imitation is rewarded. A third reason for imitation is that individuals may have an intrinsic preference for conformity. In fact, herding behavior can be rational as well as non-rational (behavioral finance). Herding results from an obvious intent by investors to copy the behavior of other investors. Among the best well-known examples, we

can cite: Bank competition and stability (Beck, De Jonghe, and Schepens, 2013); the pricing of sovereign risk (Beirne and Frastzscher, 2013); market contagion (Mezghani and Boujelbene, 2018); COVID-19 in Europe and Australia (Espinosa-Méndez and Arias, 2020, 2021).

Espinosa-Méndez and Arias (2020) report that COVID-19 increased herding behavior in the European capital markets, which infers that less informed investors follow the more informed during the pandemic[1]. This result is in line with the fact that investors who participate in financial markets can overcome periods of crisis by adopting herding behavior (Andrikopoulos *et al.*, 2017; Omay and Iren, 2019). However, this behavior may be different in economies with weak internal governance standards and also weak institutional environment in which companies operate, such as emerging economies in general. Indeed, Indārs, Savin, and Lublóy (2019) point out that herding behavior is more pronounced in emerging economies compared to developed economies, given the lower transparency and quality of the information that exists in emerging economies (Balcilar, Demirer, and Hammoudeh, 2013, 2014). Based on these findings, if we separate companies in two groups, in a certain country, according to information asymmetry then we would expect that the group with more information asymmetry should exhibit a higher level of herding behavior compared to the group with less information asymmetry. One of the main objectives of this study is to analyze herding behavior in business group firms which have lower level of information asymmetry compared to firms non-affiliated to business groups. The remainder of the study is structured as follows. Section 3 presents the data and methodology used in this paper. Section 4 presents the results.

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[1] Although herding behavior has been widely studied in different places around the world such as the United States (Nicolis and Sumpter, 2011), Central and East European (Pochea, Filip, and Pece, 2017), Germany (Mueller and Brettel, 2012), Spain (Blasco, Corredor, and Ferreruela, 2012), China (Yao, Ma, and He, 2014; Xie, Xu, Zhang, 2015), South Africa (Guney, Kallinterakis, and Komba, 2017), Malaysia (Pitluck, 2014), Pakistan (Chaudhry and Sam, 2018), the Gulf Arab stock markets Abu Dhabi, Dubai, Kuwait, Qatar and Saudi Arabia (Balcilar, Demirer, and Hammoudeh, 2013, 2014), Poland (Voronkova and Bohl, 2005), the Asian and Latin American markets (Kabir and Shakur, 2018), Israel (Andronikidi and Kallinterakis, 2010), Russia (Indārs, Savin, and Lublóy, 2019) and Greece (Economou, Katsikas, and Vickers, 2016), among many others, few are the studies in periods of uncertainty such as generated by COVID-19.

Section 5 discusses the empirical findings of the current study. Section 6 concludes the paper.

## 2. LITERATURE REVIEW

Emerging economies are characterized by weak institutional environments (Singh and Gaur, 2009) and by highly concentrated ownership structure, mainly in the hands of individual shareholders, families or business groups that control companies through direct ownership and/or pyramid structures (Buchuk *et al.*, 2014; Silva and Majluf, 2008). This is one of the reasons why affiliated companies are more likely to invest in emerging markets than in developed countries (Bhaumik and Driffield, 2011) because these business groups can overcome market failures (*e.g.*, Khanna and Palepu, 2000; Khanna and Tice, 2001). Thus, in these economies, business groups dominate the economic scenario (Gaur and Delios, 2015) by overcoming the inefficiencies of the external markets by relying on the internal capital market, products and labor through a network of affiliated companies, but legally independents (Pattnaik, Lu, and Gaur, 2018). In this context, companies that belong to the same chain of corporate control can not only transfer resources within the group of companies they make up, but also can share information and act in coordination, which in the case of Chile contributes to improve performance despite the pervasive incentive to extract wealth from minority shareholders to main shareholders in family firms (Torres, Jara Bertín, and López-Iturriaga, 2017). This result corroborates the bright side theory of internal capital markets for family firms (Khanna and Palepu, 2000; Khanna and Tice, 2001). Unfortunately, up to the best of our knowledge, we do not find any theoretical model in the literature which directly tackles the herding behavior of business group stocks. Nevertheless, we are able to infer the impact on herding behavior considering, market friction reduction, mitigation of asymmetric information problems and better stock performance (Guillén, 2000; Khanna and Tice, 2001; Torres, Jara Bertín, and López-Iturriaga, 2017) and then we postulate that herding is weaker in stocks of business groups than shares of firms which are not affiliated to business groups.

We argue that business group would face the current pandemic in a different manner regarding to those firms that are not controlled by

business groups. An important problem that emerge during a crisis, such as the COVID-19, is that firms have less resources available, facing financial constraints. Since business groups develop internal capital markets, then the problem at hand is less severe to them compared to companies which are not affiliated to business groups. On the other hand, firms controlled by business group have the advantage of sharing information regarding different industries which allow them to make decisions to mitigate the adverse impact of the pandemic on stock returns. In this sense, investors that demand stocks of firms controlled by business group will incorporate in their expectations the higher flexibility in managing resources as well as the lower information asymmetry. Most probable these investors will tend to have a weaker herding behavior than those investors that hold shares in other firms. However, some of these firms will perform better than others which will motivate to the investors to herd on these stocks, knowing that the rest of the firms cannot differentiate much from one another because of low flexibility in allocating resources and high asymmetric information problems.

Given the above, the main objective of this article is to investigate herding behavior in stocks of companies controlled by business groups[2] during the COVID-19 pandemic. For this, series of prices and daily traded volume of the companies that make up the General Index of Stock Prices of the Santiago Stock Exchange (S&P/CLIGPA) are used from January 1, 2010 to October 9, 2020. Chile is chosen because, first, according to STF Capital[3], in 2022 Chile is among the most advanced emerging countries in the world. Among other things, it became the first member of OECD in 2010 regarding to other countries in South America. It is also one of the most open economies to international trade of goods and services in the world. It has had a strong capital market development, which is dominated by well-regulated institutions and under sound fiscal and monetary policies. Among the most important participants in this market, we find: Pension funds, General investment funds, Insurance

[2] In this study we use the definition of business group employed by Jara, López-Iturriaga, and Torres (2019), business groups are defined as any business organization in which a number of firms are linked through ownership or where a single individual, family, or coalition of families own a number of different firms.

[3] See: https://stfcapital.cl/eng/mercado-de-valores-de-chile/

Companies and non-financial firms. On the other hand, Dias, da Silva, and Dionísio (2019) report evidence of partial integration of Chile to other Latin American financial markets. The corporate system is based fundamentally on bank financing where banks play an important role in the creation of business groups who create an internal capital market (Jara-Bertín, Lopez-Iturriaga, and Espinosa, 2015); second, the companies that participate in the Chilean stock market have a high concentration of ownership (Lefort and González, 2008) but pyramidal ownership structure is not as common as in other countries (Almeida and Wolfenzon, 2006); third, Chile is a French civil law country (La Porta *et al.*, 1998), which entails weak protection for minority shareholders (La Porta *et al.*, 1998), which facilitates the formation of business groups; fourth, a large part of the companies listed on the Chilean Stock Market Exchange (Santiago) are controlled by family business groups; fifth, the business groups are required, by the regulator, to report information regarding their composition, being able to work with reliable information since it is publicly available. All these features make the Chilean stock market a conducive scenario to study whether business groups act or not in droves during COVID-19. Since Chile is a Civil law country and therefore is more susceptible to information asymmetry and agency problems between main shareholders and minorities, herding behavior may cause stock prices to move more apart from the fundamental prices. Therefore, a good allocation of resources might be in danger and this is particularly important in a capital market where resources are more restricted, particularly in scenarios of bear markets. On the other hand, we distinguish between business groups and non-business groups since business groups have the flexibility to move resources internally, they will have a clear advantage over the non-clustered, particularly when the economy is experiencing a positive and low growing rate and even negative rate. For example, the internal capital market may play an important role considering the restricted financial resources in the market due to the general increase in the default probability.

Herding behavior exists in the Chilean stock market during COVID-19, although it is of lesser magnitude in business groups. This result is consistent with findings reported by Chang and Lin (2015) for the period 1989-2011 and contrary to results reported by Chiang and Zheng (2010) for the period 1989-2009 for the Chilean market. To corroborate the

results, robustness tests are applied. Thus, the models are re-estimated considering asymmetric effects that the literature has usually reported to strengthen the results on herding behavior, these are asymmetric effects of market return, asymmetric effects of volatility and asymmetric effects of trading. In general, the results are maintained. Second, to observe how herding behavior evolves during the presence of COVID-19, a rolling estimation is performed using a 100-day window. The results show that in the business groups herding behavior changes to reverse herding behavior during May 2020 onwards. To investigate this aspect, econometric tests are carried out to observe if the advance of COVID-19 (considering the number of reported cases and the number of deaths) has an effect on the behavior of business groups. It is found that in business groups herding behavior is lower as the number of cases and deaths increase, while for companies not affiliated to a business group it is higher.

## 3. DATA AND METHODOLOGY

### 3.1. Data

The data correspond to the series of prices and daily traded volumes of the companies that compose the S&P/CLIGPA from January 4, 2010 to October 9, 2020. Companies that delisted during this time or that did not have data from the beginning of the selected period were not considered. In turn, data starts in 2010 to isolate the effect of the subprime crisis. Furthermore, to ensure that the share price reflects the value of the company, three criteria were applied: First, the share had transactions on at least 50% of the days over the total period of the sample; second, during the last three years there were transactions in at least 45% of the days; and third, that during the last year of the sample, the stock was traded in at least 40% of the days. Those companies that did not meet these criteria were not considered in the sample. Thus, the final sample consists of 51 companies and 2,684 observations for each of them[4]. The information on the affiliation of the companies to business groups was

[4] In order to avoid non-synchronous problems which will bias the coefficients estimated we have to assume the cost of having only 51 companies in the sample.

obtained from the Commission for the Financial Market according to Circular No. 1,664 of the Securities Market Law, which requires said groups to report their composition.

Table 1 reports information on the sample. The Industrial sector has the largest number of companies in the sample. In the case of the business groups, the Industrial and Construction and Real Estate sectors are the most representative. At the industrial sector level Raddatz and Schmukler (2013) and Bravo and Ruiz (2015) report herding behavior in the Financial Management Services sector, more specifically in the Pension Fund Administrators. In turn, Lavin and Magner (2014) find herding behavior in the Mutual Fund market.

**Table 1. Sample information**

| | Total | | BG | | No BG | |
|---|---|---|---|---|---|---|
| **Industry** | **Number of firms** | **% Number of firms** | **Number of firms** | **% Number of firms** | **Number of firms** | **% Number of firms** |
| Food and Beverages | 6 | 12 | 3 | 14 | 3 | 10 |
| Construction and Real Estate | 6 | 12 | 5 | 23 | 1 | 3 |
| Industrial | 12 | 24 | 6 | 27 | 6 | 21 |
| Mining | 4 | 8 | 2 | 9 | 2 | 7 |
| Retail | 4 | 8 | 1 | 5 | 3 | 10 |
| Basic Services | 8 | 16 | 2 | 9 | 6 | 21 |
| General Management Services | 3 | 6 | 1 | 5 | 2 | 7 |
| Financial Management Services | 8 | 16 | 2 | 9 | 6 | 21 |
| Total | 51 | 100 | 22 | 100 | 29 | 100 |

Source: Based on the information reported by the Commission for the Financial Market according to Circular No. 1,664 of the Securities Market Law.

### 3.2. Methodology

Following Tan *et al.* (2008), who claim that herding is more evident with daily data than with weekly or monthly, daily stock returns are computed as $R_{it} = \left(\left(P_{it} - P_{it-1}\right)/P_{it-1}\right) * 100$ from the daily closing price of the shares of the companies in the sample. To detect herding behavior, we use the model proposed by Chang, Cheng, and Khorana (2000), which is a modification of original model proposed by Christie and Huang (1995).

Christie and Huang (1995) point out that rational asset pricing models predict that dispersion of the returns will increase with the absolute value of market return in normal periods. On the other hand, in periods with extreme movements, investors are more likely to follow the market consensus, leaving aside their own beliefs. Thus, dispersion in returns increases during these periods but at a decreasing rate, showing non-linear behavior with the dispersion of the return of the stock. Christie and Huang (1995) recognize that the measure they propose can be affected by the existence of atypical values. Under this scenario they propose the Cross-Sectional Absolute Deviation model (CSAD) as an alternative to solve this estimate problem. With this idea Christie and Huang (1995) mitigate extreme returns. On the other hand, Chang, Cheng, and Khorana (2000) introduce a methodology that includes the complete distribution of stock market returns to solve this problem. Tan *et al.* (2008) point out that the methodology of Christie and Huang (1995) is too strict and requires a much greater magnitude of non-linearity to find herding.

Given the above, we use the CSAD methodology proposed by Chang, Cheng, and Khorana (2000) since that the COVID-19 period can be characterized by an important turbulence in the stock market and the presence of atypical values. In this context, the measure proposed by Christie and Huang (1995) is less appropriate because it is less able to capture the magnitude of non-linearity. On the other hand, Chang, Cheng, and Khorana (2000) show that herding is more likely to be present during periods of relatively large price changes and suggest that variations in investment activity can be reflected in the dispersions of the returns. In addition, his method has been widely used in the financial literature (Espinosa-Méndez and Arias, 2020; Mobarek, Mollah, and Keasey, 2014; Yao, Ma, and He, 2014; Lao and Singh, 2011; Tan *et al.*, 2008, among other). Specifically, they suggest using the following CSAD model:

$$CSAD_t = \alpha + \gamma_1 \left| R_{m,t} \right| + \gamma_2 \left( R_{m,t} \right)^2 + \varepsilon_t \quad [1]$$

Where $R_{m,t}$ is the market return (equal-weighted average stock return) and $CSAD_t$ is a measure of return dispersion computed as:

$$CSAD_{m,t} = \frac{1}{N} \sum_{i=1}^{N} \left| R_{i,t} - R_{m,t} \right| \quad [2]$$

Where $|R_{i,t} - R_{m,t}|$ is the absolute value of the difference between the individual stock return of stock *i*, and the market return. If herding behavior is present in the market then we will expect $\gamma_2$ to be negative and statistically significant.

To assess the effect of COVID-19 the following specification of Equation [1] is estimated:

$$\begin{aligned} CSAD_t = {} & \alpha + \gamma_1 D^{covid} \left| R_{m,t} \right| + \gamma_2 D^{covid} \left( R_{m,t} \right)^2 \\ & + \gamma_3 \left( 1 - D^{covid} \right) \left| R_{m,t} \right| + \gamma_4 \left( 1 - D^{covid} \right) \left( R_{m,t} \right)^2 + \varepsilon_t \end{aligned} \quad [3]$$

Where $CSAD_t$ is the cross-sectional absolute deviation defined in Equation [2], $R_{m,t}$ is the market return, $D^{covid}$ is a dummy variable that takes the value of 1 as of March 03, 2020 ( first case of COVID-19 in Chile) onwards and zero in any other case. A negative and statistically significant value of $\gamma_2$ would indicate the presence of herding behavior due to COVID-1. Equations [1] and [3] are estimated applying ordinary least squares.

The research is conducted as follows. First, an analysis of the descriptive statistics for the CSAD (measure of return dispersion) and the market return is performed for the entire sample, *i.e.*, business groups and companies that are not affiliated with business groups. The mean values and standard deviations of CSAD are highest during COVID-19 for all groups. For its part, profitability during COVID-19 fell in business groups, while for companies that are not affiliated with these groups have positive profits. Second, the model proposed by Chang, Cheng, and Khorana (2000), which is a modification of the model proposed by Christie and Huang (1995), is employed to investigate the effect of COVID-19 on herding behavior in business groups.

For robustness of the results, we consider other variables that can affect herding behavior: Asymmetric effects of market return; high and low volatility states; and high and low domestic market trading volume. First, Demirer and Kutan (2006) point out that dispersions in equity returns are significantly higher during periods of large changes in the aggregate market index. Different authors find that herding behavior is higher when the market is down (Demirer, Kutan, and Chen, 2010; Lao and Singh, 2011). More recently, Batmunkh *et al.* (2020) report for Mongolia an asymmetric herding behavior which is more pronounced when the market is down. Second, different studies analyze herding behavior in states of high and low volatility (Lam and Qiao, 2015; Vo and Phan, 2019). For example, Tan *et al.* (2008) find herding behavior in periods of high volatility in the Chinese market and Batmunkh *et al.* (2020) meanwhile find the opposite for Mongolia. Finally, the literature has reported that the level of herding behavior may be associated with trading volume (Tan *et al.*, 2008; Lao and Singh, 2011). In the case of China herding behavior is more pronounced when the trading volume is high.

Two asymmetric effects of market return examine whether there is any asymmetry in herd behavior when the market is rising or falling; pre and during COVID-19. In the case of high and low volatility states, it is considered high volatility when the observed volatility becomes higher than the moving average of volatility over the previous 30 days and low volatility when it does not exceed the moving average over the same period (Chang, Cheng, and Khorana, 2000). The volatility is calculated as the standard deviation of market return times the square root of 252 trading days. In the last case we consider high domestic market trading volume when the observed volume is higher than the moving average of volume trading over the previous 30 days and low volume when it does not exceed the moving average over the same period.

## 4. RESULTS

### 4.1. Descriptive statistics of sample

Table 2 reports the descriptive statistics for the CSAD measure and the market return for the full sample, business groups, and companies that are not affiliated with business groups. The mean values and standard

deviations of CSAD are the highest during COVID-19 for all three groups. A higher mean value of CSAD suggests significantly higher market variations across stock returns which may suggest that markets have unusual cross-sectional variations due to unexpected events (Chiang and Zheng, 2010), which is consistent with the significant increase in the standard deviation of CSAD in the full sample, business groups and companies that are not affiliated with business groups. In the period before COVID-19 the CSAD of business group is statistically and significantly lower than the non-business group, while during COVID-19 there is not significant difference in CSAD between both groups.

**Table 2. Descriptive statistics of CSAD and market return of stock markets (%)**

| | | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| **Total sample** | | | | | |
| Before COVID-19 | *CSAD* | 1.047 | 0.363 | 0.308 | 5.158 |
| | $R_{m,t}$ | –0.008 | 0.776 | –5.958 | 5.835 |
| During COVID-19 | *CSAD* | 1.660 | 0.810 | 0.684 | 5.545 |
| | $R_{m,t}$ | 0.010 | 1.817 | –9.856 | 4.973 |
| **Business group** | | | | | |
| Before COVID-19 | *CSAD* | 0.998 | 0.362 | 0.387 | 4.304 |
| | $R_{m,t}$ | –0.007 | 0.945 | –6.580 | 8.313 |
| During COVID-19 | *CSAD* | 1.689 | 0.863 | 0.583 | 5.574 |
| | $R_{m,t}$ | –0.044 | 2.173 | –10.785 | 6.408 |
| **No business group** | | | | | |
| Before COVID-19 | *CSAD* | 1.183 | 0.545 | 0.201 | 6.507 |
| | $R_{m,t}$ | –0.006 | 0.820 | –5.343 | 5.606 |
| During COVID-19 | CSAD | 1.693 | 0.873 | 0.323 | 4.928 |
| | $R_{m,t}$ | 0.071 | 1.681 | –8.735 | 4.101 |

Note: This Table reports descriptive statistics of *CSAD* and $R_{m,t}$, where $R_{m,t}$ is the market return (equal-weighted average stock return) and $CSAD_t$ is a measure of return dispersion defined in Equation [2].

## 4.2. Effect of COVID-19 on herding behavior in business group

Table 3 reports the results of Equation [3]. A negative and statistically significant (at the 1% level) coefficient ϒ2 is found for both groups of firms. The VIF (variance inflation factors) statistic does not report multicollinearity for both groups (3.66 and 3.86 respectively) and the errors are calculated using Huber-White robust standard errors.

**Table 3. Effect of COVID-19 on herding behavior in business group**

| Variables | Business group | No business group |
|---|---|---|
| ϒ1 | 0.597*** | 0.787*** |
| | (0.039) | (0.050) |
| ϒ2 | –1.459*** | –3.749*** |
| | (0.393) | (0.636) |
| ϒ3 | 0.367*** | 0.530*** |
| | (0.020) | (0.039) |
| ϒ4 | 0.022 | 4.174** |
| | (0.639) | (1.676) |
| α | 0.008*** | 0.009*** |
| | (0.000) | (0.000) |
| Observations | 2,402 | 2,402 |
| R-squared | 0.575 | 0.526 |
| t-stat1 ($H_0$: ϒ1 = ϒ3) | 284.4*** | 174.9*** |
| t-stat2($H_0$: ϒ2 = ϒ4) | 6.925*** | 22.76*** |

Notes: This Table reports the results of estimating the Equation:
$CSAD_t = \alpha + \gamma_1 D^{covid} \left|R_{m,t}\right| + \gamma_2 D^{covid} \left(R_{m,t}\right)^2 + \gamma_3 \left(1 - D^{covid}\right) \left|R_{m,t}\right| + \gamma_4 \left(1 - D^{covid}\right) \left(R_{m,t}\right)^2 + \varepsilon_t$
where $CSAD_t$ is the cross-sectional absolute deviation define in Equation [2], $R_{m,t}$ is the market return calculated as the equal-weighted average stock return, $D^{covid}$ is a dummy variable that takes the value of 1 from March 3, 2020 onwards and zero in any other case. Between parentheses t-statistics based on Huber-White robust standard errors. *** and ** represent statistical significance at the 1%, and 5% levels, respectively.

Before COVID-19, herding behavior is not present in business groups (ϒ4 = 0.022). During COVID-19 herding behavior is statistically significant (ϒ2 = –1,459) although it is of smaller magnitude compared to the group of firms that are not affiliated to a business group (ϒ2 = –3,749). In this latter group of companies, prior to COVID-19, they present statistically significant inverse herding behavior (ϒ4 = 4,174). The difference between the ϒ2 and ϒ4 estimates is statistically significant in both cases. In summary, COVID-19 causes a significant drop in the return of the stock market and firms affiliated with business groups show herding behavior, although of lesser magnitude compared to the other group of firms.

#### *4.2.1. Robustness of the results*

Table 4 reports the results of estimating Equation [3] incorporating the asymmetric effects of market return, high and low volatility state and high and low domestic market trading volume. Thus, column 1 and 2 report the results considered asymmetric effects of market return ($R_{m\text{HIGH}} > 0$ and $R_{m\text{LOW}} < 0$, called "Market up" and "Market down" respectively). Column 3 and 4 show the results considered high and low volatility state ($\sigma_{\text{HIGH}} > \sigma_{\text{MAt-30}}$ and $\sigma_{\text{LOW}} < \sigma_{\text{MAt-30}}$, called "High volatility" and "Low volatility" respectively). Column 5 and 6 report the results considering asymmetric effects of high and low domestic market trading volume ($\text{vol}_{\text{HIGH}} > \text{vol}_{\text{MAt-30}}$ and $\text{vol}_{\text{LOW}} < \text{vol}_{\text{MAt-30}}$, called "High volume" and "Low volume" respectively). In business groups herding behavior is present during COVID-19. Regarding the asymmetric effect of market return, it is observed that herding behavior is greater when the market is up compared to when it is down, although it is not statistically significant in both cases. For the asymmetric effect of volatility herding behavior is stronger in the case of low volatility. Finally, in the case of volume traded, herding behavior is stronger when the volumes traded are smaller.

For companies that are not affiliated with business groups, the results differ from the other group during COVID-19. On the one hand, when the market return is falling, statistically significant herding behavior arises. In the case of volatility effect, herding behavior is present in both scenarios but it is more pronounced in the state of low volatility. Finally,

in the case of the volume traded, herding behavior is present in both states but is stronger when there is low volume traded.

Although the results generally support the existence of herding behavior in business groups after COVID-19, differences are observed with respect to companies that are not affiliated with business groups. One explanation may be that the dummy variable does not reflect the level of uncertainty in the market due to COVID-19 but other factors may be changing at the same time. For example, the coefficient that capture herding behavior might be stochastic and not constant as it is assumed in Table 3. It is also possible that other factors might be impacting stock prices in such a way that may not allow to clearly observe the herding behavior of investors in the time period called COVID-19. One important factor is how uncertainty may change during COVID-19. Two variables are used as proxy of uncertainty: The number of reported cases and the number of deaths. We analyze how the herding behavior of business groups stocks is related to these two variables[5].

### *4.2.2. Effect of number of cases and deaths by COVID-19 on herding behavior in business group*

Here we study how the daily number of cases and number of deaths from COVID-19 impact herding behavior in both groups of companies. We run the herding behavior parameter estimate obtained from the rolling window analysis against number of cases and number of death reported. In the business group case we observe that both a greater number of cases registered by COVID-19 and a greater number of death are negatively associated to herding behavior[6].

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**5** In the case of business groups, herding behavior appears towards the end of March (less than 0), which reverts at the beginning of May. Since then, a reverse herding behavior has been observed until October. On the other hand, companies that are not affiliated with a business group show a different behavior. In this case herding appears in mid-March and is maintained throughout the whole sample period. Results are available upon request from the authors.

**6** Results are available upon request from the authors.

**Table 4. COVID-19 asymmetric effects on herding behavior in business groups**

| | Business group | | | | | | |
|---|---|---|---|---|---|---|---|
| **Variables** | **Model 1** | **Model 2** | **Model 3** | **Model 4** | **Model 5** | **Model 6** | |
| | **Market up** | **Market down** | **High volatility** | **Low volatility** | **High volume** | **Low volume** | |
| $\Upsilon 1$ | 0.635*** | 0.515*** | 0.718*** | 0.671*** | 0.646*** | 0.731*** | |
| | (0.088) | (0.056) | (0.071) | (0.056) | (0.067) | (0.072) | |
| $\Upsilon 2$ | –0.774 | –0.718 | –2.666*** | –7.812*** | –1.926*** | –9.231*** | |
| | (2.385) | (0.514) | (0.695) | (2.224) | (0.643) | (2.520) | |
| $\Upsilon 3$ | 0.398*** | 0.357*** | 0.363*** | 0.392*** | 0.365*** | 0.271*** | |
| | (0.021) | (0.024) | (0.026) | (0.024) | (0.029) | (0.055) | |
| $\Upsilon 4$ | 0.319 | –1.068* | 0.210 | –1.798** | –0.196 | 4.744 | |
| | (0.353) | (0.590) | (0.677) | (0.780) | (0.784) | (3.439) | |
| $\alpha$ | 0.008*** | 0.007*** | 0.008*** | 0.007*** | 0.008*** | 0.007*** | |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | |
| Observations | 1,204 | 1,198 | 1,177 | 1,225 | 1,017 | 1,385 | |
| R-squared | 0.586 | 0.585 | 0.627 | 0.469 | 0.636 | 0.464 | |
| t-stat1 ($H_0$: $\Upsilon 1 = \Upsilon 2$) | 193.2*** | 130.1*** | 140.1*** | 166.7*** | 113*** | 55.12*** | |
| t-stat2 ($H_0$: $\Upsilon 3 = \Upsilon 4$) | 0.479 | 2.333* | 7.450*** | 8.271*** | 4.493** | 8.451*** | |

Notes: This Table reports the results of estimating Equation:
$CSAD_t = \alpha + \gamma_1 D^{covid} \left|R_{m,t}\right| + \gamma_2 D^{covid} \left(R_{m,t}\right)^2 + \gamma_3 \left(1 - D^{covid}\right) \left|R_{m,t}\right| + \gamma_4 \left(1 - D^{covid}\right) \left(R_{m,t}\right)^2 + \varepsilon_t$
where $CSAD_t$ is the cross-sectional absolute deviation defined in Equation [2], $R_{m,t}$ is the market return calculated as the equal-weighted average stock return, $D^{covid}$ is a dummy variable that takes the value of 1 from March 3, 2020 onwards and zero in any other case. Column 1 and 2 report the results considering asymmetric effects of market return ($R_{m,t} > 0$ and $R_{m,t} < 0$ respectively). Column 3 and 4 show the results considering high and low volatility state ($\sigma_{HIGH} > \sigma_{MAt\text{-}30}$ and $\sigma_{HIGH} < \sigma_{MAt\text{-}30}$ respectively). Column

| | No business group | | | | | |
|---|---|---|---|---|---|---|
| | **Model 1** | **Model 2** | **Model 3** | **Model 4** | **Model 5** | **Model 6** |
| | **Market up** | **Market down** | **High volatility** | **Low volatility** | **High volume** | **Low volume** |
| | 0.743*** | 0.654*** | 0.783*** | 0.758*** | 0.811*** | 0.764*** |
| | (0.095) | (0.072) | (0.072) | (0.161) | (0.083) | (0.071) |
| | 0.995 | –2.246** | –3.732*** | –1.729 | –4.041*** | –3.653*** |
| | (4.136) | (0.886) | (0.866) | (8.555) | (0.826) | (1.257) |
| | 0.531*** | 0.488*** | 0.547*** | 0.556*** | 0.543*** | 0.497*** |
| | (0.072) | (0.045) | (0.051) | (0.068) | (0.057) | (0.056) |
| | 6.573* | 3.531** | 4.413** | –0.719 | 3.558* | 3.916 |
| | (3.377) | (1.758) | (1.818) | (3.762) | (1.947) | (2.949) |
| | 0.009*** | 0.008*** | 0.009*** | 0.008*** | 0.009*** | 0.008*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| | 1,197 | 1,205 | 1,208 | 1,194 | 933 | 1,469 |
| | 0.560 | 0.507 | 0.597 | 0.370 | 0.614 | 0.378 |
| | 44.90*** | 86.29*** | 95.04*** | 39.04*** | 76.35*** | 79.45*** |
| | 1.894 | 5.747*** | 13.97*** | 0.0356 | 15.31*** | 5.706*** |

5 and 6 report the results considering asymmetric effects of high and low domestic market trading volume ($vol_{HIGH} > vol_{MAt\text{-}30}$ and $vol_{LOW} < vol_{MAt\text{-}30}$ respectively). Between parentheses *t*-statistics based on Huber-White robust standard errors. ***, ** and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

## 5. DISCUSSION

Recent evidence shows that COVID-19 increased herding behavior in the capital markets of Europe (Espinosa-Méndez and Arias, 2020) proving that our initial results are in line with the fact that, at a general level, COVID-19 has caused a behavioral change of the actors that participate in the capital market. However, in companies that are affiliated with business groups, this impact is of lower magnitude.

Since the companies affiliated with business groups are part of a network governance model (Singla and George, 2013) which is not only used for the transfer of resources, but also to seek and monitor strategies and actions of the companies (Lin, Ma, and Su, 2009), learn from other companies in the network (Singla and George, 2013), facilitate access to capital and in turn have greater access to labor and product markets in an easier way compared to companies that are not part of any business group (Khanna and Rivkin, 2001). It is to be expected that under this scenario business groups can make strategic decisions in order to protect the full value of the group by transferring resources and information and acting in a more coordinated manner among the companies that comprise it. This coordination is plausible given that several of the companies that belong to business groups participate in the stock market. Indeed, a sample of 15 business groups out of the 124 that report information to the Commission for the Financial Market (Chilean Stock Exchange Authority) in June 2020 (See Table 5) shows that on average 64% of the companies in each business group participates in the stock market. In turn, most of these business groups are family-type where it is common to observe relationships between members of the controlling families of said groups. The lower level of information asymmetry and the higher flexibility in the use of resources allow business group to mitigate the impact of COVID-19 on the firm. These particular characteristics are incorporated by investors in their investment decisions which are translated in an individual analysis generating a weaker herding behavior in this group compared to the non-affiliated firms to business groups.

The creation of an internal capital market within each business group allow the transfer of resources. Financing and information sharing among the group's member companies contributes to a business group making

**Table 5. 15 Business groups in Chile**

| | Business groups | Owner | Business type | Business group enterprises | Enterprises listed in the Chilean Stock Market | % Business group enterprises listed |
|---|---|---|---|---|---|---|
| 1 | Grupo Angelini | Roberto Angelini | Family | 6 | 4 | 67 |
| 2 | Grupo Matte | Eliodoro Matte | Family | 18 | 6 | 33 |
| 3 | Grupo Luksic | Andrónico Luksic | Family | 14 | 7 | 50 |
| 4 | Grupo Duncan Fox | Sergio Lecaros Menendez | Family | 2 | 2 | 100 |
| 5 | Grupo Errázuriz | Francisco Javier Errázuriz Talavera | Holding | 4 | 1 | 25 |
| 6 | Grupo Claro | María Luisa Vial Lecaros | Holding | 6 | 6 | 100 |
| 7 | Grupo Guilisasti Gana | Eduardo Guilisasti Gana | Family | 3 | 3 | 100 |
| 8 | Grupo Rassmuss | Juan Enrique Rassmuss Raier | Family | 6 | 4 | 67 |
| 9 | Grupo Yarur | Luis Yarur | Family | 12 | 1 | 8 |
| 10 | Grupo Enel | Enel spa | Multinational | 7 | 6 | 86 |
| 11 | Grupo Consorcio | Familia Fernández León y Familia Garcás Silva | Family | 7 | 1 | 14 |
| 12 | Grupo Gen | José Manuel Urenda | Family | 8 | 4 | 50 |
| 13 | Grupo Naturgy | Francisco Reynés | Multinational | 4 | 3 | 75 |
| 14 | Grupo Sigdo Koppers | Juan Eduardo Errázuriz Ossa | Holding | 5 | 4 | 80 |
| 15 | Grupo Ponce Lerou | Julio Ponce Lerou | Family | 7 | 7 | 100 |
| | Total | | | 109 | 59 | 64 |

decisions more individually absent of the need of being guided by the market beliefs. This is captured by the investors, in the face of an event of uncertainty, abandoning the trends and beliefs of the market, acting more independently, involving the group's member companies and potentially other groups in their decisions. As the uncertainty becomes greater (in the case of COVID-19: First, the number of cases increased; second, the number of deaths raised) herding behavior will decrease. On the other hand, investors interested in companies that are not affiliated to a business group face more information asymmetry and face firms without a similar flexibility in the use of resources compared to companies controlled by business groups. Thus, under these circumstances, they might be better off following the behaviors of the "most informed". In fact, under more uncertainty, the greater the natural tendency of these investors to follow the beliefs of the market.

This implies that in a scenario of full uncertainty, investors in firms controlled by business groups act more individually. In critical times, each business group will make the most appropriate decisions to preserve the group's wealth, which may not necessarily coincide between these groups. The investor will assess each one of these firms individually since asymmetric information, agency problem and recourse allocation flexibility differ among them. Therefore, a herding strategy in these stocks might not be the most appropriated decision. For the other group of firms there is a need to identify better informed investors and follow them creating a herding behavior.

This study has at least three limitations. First, the sample could be bigger if the study is extended to other Latin American countries where business groups are also important. Second, the study is focused on COVID-19 phenomenon and does not allow to generalize the conclusions in terms of herding behavior under pandemic. Finally, with a bigger sample it is possible to include more variables that may explain herding behavior.

## 6. CONCLUDING REMARKS

This article investigates whether herding behavior is present in firms controlled by business groups during the COVID-19 pandemic in an emerging economy like Chile. Using series of prices and daily volume

traded of the companies that make up the S&P/CLIGPA from January 1, 2010 to October 9, 2020 and using the model proposed by Chang, Cheng, and Khorana (2000), which is a modification of the model proposed by Christie and Huang (1995), it is found that herding behavior exists in the Chilean stock market during COVID-19, although it is of lower magnitude in business groups. The results are robust to different tests (asymmetric market return, asymmetric volatility and asymmetric volume trading). To analyze in more detail how herding behavior evolves during COVID-19 period we perform a rolling estimation using a 100-day window for business groups, it is found a reverse herding behavior from May 2020 onwards. Finally, it is found that in business groups herding behavior is lower as the number of cases and deaths increases, while for companies not affiliated to a business group it is higher.

The evidence reported in this article shows that stocks of firms controlled by business groups have a different behavior in the stock market compared to shares of companies that do not make up said groups when they are faced with events of uncertainty such as that produced during 2020 by COVID-19, specifically with regard to herding behavior. Although, in the first instance, both groups of companies (those that are affiliated with business groups and those that are not) exhibit herding behavior, this is of different magnitude between them as the pandemic progresses, herding behavior decreases in business groups.

This work contributes to the financial literature reporting evidence of how investors in companies controlled by business groups react to an uncertain scenario such as the pandemic in an emerging economy. Future lines of research in this area could be focused on better understanding the motives, incentives and determinants that lead to investors in stocks of business groups firms to behave in this way during periods of uncertainty, as well as to study whether this behavior is similar in countries with a culture and degree of freedom different from Chile, among others. Finally, the findings of this study are relevant for the financial sector (investors, regulators, brokers), the political sector (government, congress), analysts and academics. ◄

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