

**Herding around the World:
Do Cultural Differences Influence Investors' Behavior?**

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ABSTRACT

In the last few years, culture has been found to play an important role in economic decisions. In this paper we explore the impact of cultural differences on the investors' decision to imitate the actions of others (i.e., herding behavior). We establish a theoretical relationship between Hofstede's cultural dimensions and the herding behavior among investors. Moreover, we test that relationship in a sample covering 39 countries in the period 2001-2013. The results suggest that cultural dimensions influence the investors' imitative behavior since investors deciding on more masculine cultures and on cultures characterized by a higher power distance tend to be less prone to herd. The results for individualism, uncertainty avoidance and long-term orientation were found to be statistically non-significant at conventional levels. Collectively, the results highlight the importance of some features of the cultural environment on financial decision-making.

Key-words: herding behavior; culture; Hofstede's cultural dimensions; stock markets; cross-country analysis.

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1. Introduction

The increasing awareness of the impact that investors' behavior have on stock prices has led scholars during the last decades to consider factors such as psychological biases and social interactions to explain financial decisions. There are several studies that show the importance of the social component in financial decisions. The main conclusion is that the interest in participating in financial markets is largely stimulated by other investors and is related to the number of peers that also participate (Hong *et al.*, 2004). Moreover, word-of-mouth plays a pivotal role in the decision to invest in stock markets (Hong *et al.*, 2005).

Hofstede (2001) defines culture as a collective programming of the mind that is manifested in our values and norms and reflected in our actions. According to the author, culture may be understood as a “software of the mind” that is stable over time. This implies the existence of a societal value system shared by dominant groups and the existence of institutions (e.g., family, school and law), where certain behaviors are encouraged and entail people to consistently behave the same way when facing similar situations. Since investors take into account others' opinion, it is relevant to analyze herding because this collective behavior may lead prices to deviate from fundamentals (Christie and Huang, 1995). Furthermore, it is important to notice that investors' behavior and their social interactions are also dependent on the country they live in because they have different cultural backgrounds that impact their view of reality. Although cultural finance is a recent field of research, it is possible to find several empirical contributions in the literature where cultural variables are found to shed light on financial decision-making. These contributions focus on such diverse topics as investors' trading strategies (Chui *et al.*, 2010), corporate mergers and acquisitions (Ferris *et al.*, 2013), and decisions regarding international asset allocation (Beugelsdijk and Frijns, 2010; Anderson *et al.*, 2011).

However, studies that explain herding through cultural differences among countries are very scarce. We add to this strand of the literature, exploring the impact of cultural differences on the investors' decision to herd. This paper contains two main contributions. Firstly, there is a contribution in the field of Behavioral Finance as we establish a theoretical relationship between the various cultural dimensions defined by Hofstede (2001) and the herding behavior among investors. Secondly, there is an empirical contribution to the extent that we examine the impact of culture in the investors' herding behavior. We analyze 39 countries in the period 2001-2013 using the measure of herding proposed by Chang *et al.* (2000) and applying

Hofstede's five cultural dimensions (2001). Our empirical results indicate that investors acting in societies with higher levels of masculinity and greater power distance tend to be less prone to herd. These results carry relevant implications both for researchers on the topic and for financial markets regulators.

The paper is structured as follows. In section 2 we present a selective literature review concerning herding and culture. We proceed in section 3 with the formulation of hypothesis and the description of the data and methodology used in the empirical study. The results are discussed in section 4. Section 5 concludes the paper.

2. Literature Review

2.1. Herding

Herding is a phenomenon that has been widely investigated in the last decades. It has been seen as a behavior capable of increasing volatility and destabilizing financial markets (e.g., Kremer and Neutz, 2013). Herding can be defined as investors' mutual imitation, which implies individuals to suppress their own beliefs and ignore their private information to follow other investors' actions.

According to Devenow and Welch (1996), herd behavior can be classified as irrational or rational. The irrational view consists in investors following one another blindly, being their decisions mostly based in psychological factors. The rational view has to do with the expectation of an investor to reap informational payoffs (Banerjee, 1992) and with reputational concerns (Scharfstein and Stein, 1990), mainly due to the existence of a principal-agent relationship.

Since herd behavior consists in an increased correlation in investors' decisions, even if there is theoretical grounding to justify this behavior, to prove it empirically is a difficult task. This happens because when investors trade in the same direction one does not know whether they are imitating each other intentionally or whether they are just reacting to the same piece of information. Nevertheless, it is possible to find several empirical studies about this topic contemplating different periods, geographies and measures of herding. An important stream in the literature analyzes the herding in the market as a whole. For example, Christie and Huang (1995) studied the US stock market to conclude that herding levels declined during periods of higher price volatility. These results were later confirmed by Caparrelli *et al.* (2004) for the

Italian market. Most authors conclude that imitative tendencies tend to be exacerbated during bear market periods (e.g., Yao *et al.*, 2014; Gong and Dai, 2017) contributing to an increase in price volatility (e.g., Blasco *et al.*, 2012).

Another set of studies focus on the herding among mutual funds. Most authors conclude that the level of herding among these agents is modest (e.g., Grinblatt *et al.*, 1995; Wermers, 1999). Despite this, there seem to be important exceptions: for example, Lobão and Serra (2007) report a level of herding among Portuguese mutual funds 4 to 5 times higher than that observed in the US. There are studies for the US and Taiwan stock markets that suggest that herding tends to be more pronounced in low-capitalization stocks (Wermers, 1999; Hsieh, 2013), although there are also contradictory results in this respect for European markets (Lobão and Serra, 2007; Kremer and Neutz, 2013). In general, the herding among mutual funds seems to have a significant effect on prices (Zheng *et al.*, 2015) contributing to speed up its adjustment process (Hsieh, 2013).

Although there is still no consensus about the prevalence of herd behavior around the world, the phenomenon seems to be more significant in less mature markets. This may be related to the fact that the development of the mutual funds in less developed countries is still recent, which implies that managers in charge of those funds tend to be more inexperienced and tend to be more prone to follow other investors' decisions.

2.2. Culture and Finance

Although culture may seem a concept difficult to quantify, there have been over the years some attempts to measure it through a dimensionality approach, based on large-scale surveys. The dimensions most widely used in empirical studies are the ones of Schwartz (1994) and Hofstede (2001). In this study we will apply Hofstede's five dimensions. This choice is motivated by the extensive support that this theoretical framework has been gathered and by the indications that there is a significant convergence between the dimensions proposed by other authors and Hofstede's dimensions (Soares *et al.*, 2007).

It is important to understand the five cultural dimensions that according to Hofstede (2001) describe a country's culture. The first dimension opposes individualism to collectivism, reflecting the degree of reinforcement of individual or collective achievements and interpersonal relationships. In individualistic societies, people tend to be more autonomous, independent, give more weight to their individual opinion, value differences of opinion and

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focus on their own attributes and abilities. On the other hand, collectivism implies individuals to be more dependent on the group and group opinions usually prevail to personal opinions. The second dimension confronts masculinity and femininity and is related to the social role that is attributed to each gender. Men are usually associated with values such as firmness, competitiveness and toughness, so they tend to be more autonomous and ambitious. Women, on the contrary, are usually associated with values such as protection, generosity and concern with human relations, so they tend to be more cooperative and solidary. The third dimension contrasts countries with high and low uncertainty avoidance, referring to the extent to which people are uncomfortable with ambiguous situations. Countries characterized with high uncertainty avoidance enjoy predictability, so they tend to have stricter rules and safety measures. The fourth dimension compares countries with high and low power distance. This has to do with the degree of acceptance of an unequal power distribution within a society by those who have less power. Countries characterized by high power distance tend to be more obedient and respectful of an authority, being more dependent and having less own initiative. Finally, the fifth dimension confronts long-term orientation with short-term orientation. Long-term oriented countries value thrift, stability and perseverance towards future outcomes, while short-term oriented countries give more weight to immediate results.

These five cultural dimensions are been found to be useful to understand the decisions made by investors and corporate managers. For example, Chui *et al.* (2010) related individualism to the momentum phenomenon, realizing that investors from individualistic countries produce higher momentum profits. Ferris *et al.* (2013) applied Hofstede's dimensions to mergers and acquisitions and concluded that CEOs from countries characterized by higher individualism, lower uncertainty avoidance and lower long-term orientation tend to underestimate the risk underlying mergers and to overestimate synergy gains. Also, Mihet (2012) and Li *et al.* (2013) noticed that managers from countries with higher individualism, lower uncertainty avoidance and lower power distance tend to be more prone to make high-risk decisions. Beugelsdijk and Frijns (2010) and Anderson *et al.* (2011) concluded that agents in countries with higher individualism invest more in foreign markets and agents in long-term oriented countries tend to hold more diversified portfolios. More recently, Dodd *et al.* (2013) showed that firms from developed countries cross-list in markets with greater cultural similarities measured by Hofstede's cultural dimensions and Ahern *et al.* (2015) found that

three key dimensions of national culture (trust, hierarchy, and individualism) affect merger volume and synergy gains.

The empirical literature regarding the influence of culture on herding among investors is rather limited, especially when it comes to market-wide studies. In a study of 47 countries around the world, Zhan (2013) concludes that less individualistic nations tended to exhibit a higher number of synchronized stock price movements, which he attributes to the presence of herding behavior. Zheng (2015) analyses the impact of cultural variables on the volatility patterns of fifteen stock markets. The main conclusion is that countries with lower power distance, higher masculinity and higher uncertainty avoidance are more prone to transit from low volatility states to high volatility states, which the author relates to the presence of heightened herding behavior in the market. Beckmann, Menkhoff and Sutto (2008) examined the behavior of 1025 asset managers operating in the US, Germany, Japan and Thailand with the help of a questionnaire survey. They found clear evidence that more individualistic countries have asset managers that show less herding. In a related paper, Zouaoui *et al.* (2011) used the measure of individualism developed by Hofstede (2001) to identify those national stock markets that were expected to be more affected by herd-like behavior and by episodes of crisis led by sentiment.

3. Hypothesis, Data and Methodology

3.1. Hypothesis

In the existing literature, individualism seems to be associated with overconfidence and self-attribution biases (e.g., Chui *et al.*, 2010). In fact, individualism encourages independent action and individual choices (Li *et al.*, 2013), which leads individuals to have more confidence in their own abilities, overestimating the precision of their predictions and being more tolerant to risk (e.g. Barber and Odean, 2009; Ferris *et al.*, 2013). On the contrary, in collectivistic cultures investors give less importance to their private information and rely more in others' opinion (Chui *et al.*, 2010). Therefore, the hypothesis we formulate regarding individualism is the following:

H1: Individualistic countries tend to exhibit less herding.

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Current studies show that masculinity is usually associated with overconfidence and risk-taking behavior (e.g., Beckmann and Menkhoff, 2008). Barber and Odean (2001) found that overconfident investors tend to trade more. Studying a US sample, those authors showed that men in their sample have traded more 45% than women. Moreover, Anderson *et al.* (2011) concluded that masculinity leads to a stronger international portfolio diversification since male investors tend to believe they possess superior information than others. This leads us to formulate the following hypothesis:

H2: Masculine countries tend to exhibit less herding.

Furthermore, existing studies that test the influence of uncertainty avoidance in financial decisions suggest a positive association between that cultural dimension and risk-aversion (e.g., Nguyen and Truong, 2013). According to Beugelsdijks and Frinjs (2010) and Anderson *et al.* (2011), investors from countries with higher uncertainty avoidance tend to exhibit a stronger home bias because they prefer to hold safer and familiar investments. On the other hand, Hofstede (2001) states that uncertainty avoidance captures a propensity people have to follow the same set of rules, which may denote the tendency to track others' decisions. Considering this, we formulate the following hypothesis:

H3: Countries with high uncertainty avoidance tend to exhibit more herding.

According to Hofstede (2001), in countries that exhibit a high power distance people tend to be more dependent and have less own initiative, which is consistent with the presence of higher levels of herding. Moreover, Mihet (2012) noticed that in countries characterized by low power distance, values that encourage competition and that hinder herding like trust and equality, are of importance. Therefore, we posit the following:

H4: Countries with high power distance tend to exhibit more herding.

Finally, when it comes to long-term orientation, it is well established that mutual funds managers that are evaluated on a short-term basis (e.g., every quarter) have incentives to follow their peers as this may help maintaining their reputation (Scharfstein and Stein, 1990). Furthermore, Shiller (2000) argues that short-term investors tend to join the bandwagon (i.e., they herd) and enter or exit the market ignoring such crucial factors such as the intrinsic value of the assets they are trading. Considering these contributions, we posit that:

H5: Countries with short-term orientation tend to exhibit more herding.

3.2. Data

We use daily data for 39 countries for the period 2001-2013.³ The stock market indices representing each one of the national markets were collected from Datastream Global Equity Indices and the World Bank, being all the variables measured in local currency. In this study we use the logarithm of returns.

As for the cultural dimensions, data was obtained from Hofstede (2010) and Hofstede's website (www.geerthofstede.nl). Each of the five Hofstede's cultural dimensions (individualism, masculinity, uncertainty avoidance, power distance and long-term orientation) assumes a value between 0 and 100 in each of the 39 countries of the sample. When the value is closer to zero, the country scores lower on that dimension and when the value is closer to 100, the country scores higher on that dimension. The value that a country obtains for each dimension is the one to be applicable during the entire sample period, since the cultural dimensions are time-invariant.

3.3. Methodology

a) Measure of herding

We apply in our work the measure proposed by Chang *et al.* (2000) that captures herding through the cross-sectional dispersion of asset returns (CSAD), as specified below:

$$CSAD_t = \frac{1}{N} \sum_{i=1}^N |R_{i,t} - R_{m,t}|$$

where N is the number of firms, $R_{i,t}$ is the observed return of firm i at time t and $R_{m,t}$ is the cross-sectional average stock of N returns in the portfolio at time t .

According to this measure, a low dispersion would indicate that individual returns do not diverge considerably from the overall market return, pointing to the presence of herding. The rationale is that in the presence of herding investors suppress their own opinions in favor of the market consensus. Then this makes individual returns to cluster around the market return.

³ The countries included in the sample are the following: Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Denmark, Finland, France, Germany, Greece, Hong Kong, Hungary, Indonesia, Ireland, Israel, Italy, Japan, Korea, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Pakistan, Peru, Philippines, Portugal, Romania, Singapore, Spain, Sweden, Switzerland, Thailand, Turkey, the US and the UK.

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Since the measure of Chang *et al.* (2000) focuses on tendencies that are observable in the market as a whole, it adopts a market wide approach. For this reason, in our study we also capture the existence of herd behavior in the market as a whole, without concerns to the class of investor (e.g., individual investors, institutional investors, etc.) that causes it.

b) Control variables

Since our objective is to test the additional power of cultural variables to explain the herd behavior, it is necessary to consider as control variables the main determinants of herding that are usually found in the literature. Table 1 shows the factors that, according to the existing studies, are expected to influence the intensity of herding behavior in financial markets.

Table 1 – Determinants of herding according to the existing literature

Determinants of herding	Variable	Relevant literature
Book-to-market ratio	$\frac{\text{Book value of balance sheet}}{\text{Market capitalization}}$	Lakonishok <i>et al.</i> (1994); Blasco, <i>et al.</i> (2009)
Price volatility	$\frac{\sum_{i=1}^n R_{it}^2}{n}$	Chang <i>et al.</i> (2000); Lobão and Serra (2007); Chui <i>et al.</i> (2010)
Firm size	$\frac{\sum_{i=1}^n \text{Share price}_{i,t} * \text{Number of common shares}_{i,t}}{\text{Number of firms}}$	Wermers (1999); Sias (2004)
Turnover	$\frac{\text{Total value of shares traded}}{\text{Average market capitalization}}$	Wang (1998); Suominen (2001); Christoffersen and Tang (2010)
Bull and bear markets	Algorithm proposed by Bry and Boschan (1971)	Bry and Boschan (1971); Chauvert and Potter (2000)
Extreme market movements	Dummy – 5% lower tail and 5% upper tail of returns' distribution	Christie and Huang (1995); Chang <i>et al.</i> (2000)
Market capitalization to GDP ratio	$\frac{\text{Market Capitalization}}{\text{GDP}}$	Beugelsdijks and Frijns (2010); Nguyen and Truong (2013)
GDP per capita	$\frac{\text{GDP}}{\text{Population}}$	

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The book-to-market ratio can be seen as a proxy for risk and as such it can be responsible for cross-section variability. For example, Lakonishok *et al.* (1994) noticed that a higher book-to-market ratio was related to investors' underreaction, since they tend to lower their expectations by extrapolating past prices to the future. In the field of herding, Blasco *et al.* (2009), in a study of the Spanish market, concluded that a lower book-to-market ratio led to a higher level of imitation.

Volatility can be used as a proxy for information uncertainty, making information more ambiguous and less reliable, which leads investors to seek information in other agents' signals (Chui *et al.*, 2011). Overall, in the literature, volatility tends to be related with higher levels of herding since correlations tend to rise in periods of high volatility. Nevertheless, Lobão and Serra (2007) found a negative relationship between volatility and level of herding while studying the Portuguese market. According to the authors, higher volatility can be considered a proxy for new and unexpected information, thus reflecting more information, leading to a lower level of herding.

The size of firms influence herd behavior since is associated with the information flows that companies produce. Wermers (1999) claimed that herding is more prone to occur in small stocks, since they provide less information thus forcing investors to decide in an ambiguous environment.

Turnover can be seen as a synonym of better quality information. This is the perspective supported by Suominen (2001), for example. However, Wang (1998) argued that turnover may be seen as a proxy for investors' consensus in the market. Empirically, Christoffersen and Tang (2010) supported the first view when analysing the US market, thus concluding that herding tends to be higher when turnover is lower.

Investors can react differently when facing a rising or falling market. Several authors have confirmed this conjecture empirically (e.g., Siganos and Chelley-Steeley, 2006). Moreover, Chang *et al.* (2000), in an analysis of five developed markets, conclude that herding tended to be significantly stronger during bear markets. We define bull and bear market periods using the measure proposed by Bry and Boschan (1971). The algorithm is based on the identification of potential peaks and troughs, i.e. points higher or lower than a window of surrounding points, and on the length of the cycles between those points. We used a window of 6 months to identify the peaks and troughs and eliminated cycles with duration less than 15 months.

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The asymmetric behavior may be intensified in the presence of extreme market conditions. Therefore, we take into account the possible asymmetry between the upside and downside of the market extreme conditions, considering as a control variable the fact that the returns are located on the 5% lower tail or in the 5% upper tail of the returns' distribution. Market capitalization to GDP ratio can be viewed as a proxy for economic and institutional development, as well as a proxy for a country's liquidity (e.g., Beugelsdijks and Frijns, 2010; Nguyen and Truong, 2013). This implies a positive association with stock market development, which would attract more investors to the market.

Finally, GDP tends to be related with institutional quality and financial development, implying that in a country with higher GDP per capita investors should exhibit a lower level of herding.

c) Model specification

In our model, the dependent variable is the cross-sectional absolute deviation (CSAD) proposed by Chang *et al.* (2000). To analyze whether culture may have an impact on herd behavior, we include as explanatory variables the five cultural dimensions defined by Hofstede (2001) and control herding for the abovementioned determinants. Our regression is thus specified as follows:

$$CSAD_{i,t} = \beta_1 + \beta_2 * BTM_{i,t} + \beta_3 * VOL_{i,t} + \beta_4 * SIZE_{i,t} + \beta_5 * TURN_{i,t} + \beta_6 * EXTREME_UP_{i,t} + \beta_7 * EXTREME_DOWN_{i,t} + \beta_8 * BULL_BEAR_{i,t} + \beta_9 * MC/GDP_{i,t} + \beta_{10} * GDPpc_{i,t} + \beta_{11} * IND_i + \beta_{12} * MAS_i + \beta_{13} * UA_i + \beta_{14} * PD_i + \beta_{15} * LTO_i + \varepsilon_{i,t}$$

where

$CSAD_{i,t}$ = cross-sectional absolute deviation of individual returns to market returns in country i at moment t ,

$BTM_{i,t}$ = book-to-market ratio in country i at moment t ,

$VOL_{i,t}$ = daily volatility in country i at moment t ,

$SIZE_{i,t}$ = average size of firms expressed by the market capitalization, in country i at moment t ,

$TURN_{i,t}$ = the turnover rate of the market in country i at moment t ,

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EXTREME_UP_{*i,t*} = the dummy variable, with a value of 1 if the returns lie on the 5% upper tail of the returns' distribution in country *i* at moment *t* and 0 otherwise,

EXTREME_DOWN_{*i,t*} = the dummy variable, with a value of 1 if the returns lie on the 5% lower tail of returns' distribution in country *i* at moment *t* and 0 otherwise,

BULL_BEAR_{*i,t*} = the dummy variable, with a value of 1 if the market is in an upward trend and 0 otherwise,

MC/GPD_{*i,t*} = the market capitalization relative to gross domestic product in country *i* at moment *t*,

GDPpc_{*i,t*} = the gross domestic product per capita in country *i* at moment *t*,

IND_{*i*}, MAS_{*i*}, UA_{*i*}, PD_{*i*} and LTO_{*i*} = levels of individualism, masculinity, uncertainty avoidance, power distance and long-term orientation, respectively, of country *i*.

To estimate the model we use panel data, applying the EGLS method with cross-section random effects (since we have time-invariant variables) and White period correction to control for heteroskedasticity. To assess the possibility of multicollinearity of the dependent variables, one of the major issues in panel data analysis, we computed the variance inflation factors recurring to a Tikhonov regularization procedure (ridge regression) having found no such problem.

4. Empirical results and discussion

Table 2 contains the results obtained with the application of the model.

Table 2 – Results for the determinants of herding and cultural dimensions

Table 2 shows the results of the regression of herding on cultural factors and control variables. Daily cross-sectional absolute dispersions of returns are regressed on Hofstede's cultural dimensions, (Individualism – IND, masculinity – MAS, uncertainty avoidance – UA, power distance – PD and long-term orientation – LTO) and a set of control variables (book-to-market ratio – BTM, volatility – VOL, size of the firms – SIZE, turnover rate – TURN, market capitalization related to GDP – MC/GDP, gross domestic product per capita – GDPpc and dummies expressing extreme up and down movements – EXTREME_UP and EXTREME_DOWN – as well as market trend – BULL_BEAR). The model is estimated using Panel EGLS with cross-country random effects and White Period (PCSE) consistent estimates of standard errors and covariance are used to compute *t*-statistics. F_1 (F -statistic test) is used to test the hypothesis that all the estimated slope coefficients, except the coefficients of cultural dimensions, are jointly equal to zero, while F_2 is used to test the hypothesis that all the estimated slope coefficients are jointly equal to zero. The *p*-values are in parenthesis. A positive sign in the coefficient means that the variable has a positive impact in the dispersion of returns, which means that it has a negative impact on herding. *, ** and *** represent significance at the 10%, 5% and 1% levels respectively.

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Dependent variable: CSAD					
Method: Panel EGLS (cross-section random effects)					
Periods included: 3.392					
Total panel (unbalanced) observations: 130.661					
	Variable	Coefficient	Std. Error	t-statistic	Prob.
Control variables	C	0.284887	0.100592	2.83	0.0046
	BTM	0.103345***	0.012202	8.47	0.0000
	VOL	0.017374***	0.002532	6.86	0.0000
	SIZE	0.000001***	0.000000	-2.59	0.0095
	TURN	0.128775**	0.056666	2.27	0.0231
	MC/GDP	-0.000219*	0.000132	-1.66	0.0973
	GDPpc	0.000004**	0.000001	2.15	0.0312
	EXTREME_UP	0.485705***	0.024428	19.88	0.0000
	EXTREME_DOWN	0.411216***	0.023331	17.63	0.0000
	BULL_BEAR	-0.004424	0.009148	-0.48	0.6287
Cultural variables	IND	0.001157	0.000788	1.47	0.1422
	MAS	0.001863*	0.001015	1.84	0.0664
	UA	-0.001017	0.000672	-1.51	0.1298
	PD	0.001815*	0.001060	1.71	0.0869
	LTO	0.000307	0.000910	0.34	0.7356
Adjusted R ² = 0.382610 F ₁ = 177.14 (0.00) F ₂ = 207.87 (0.00)					

a) Control variables

Our results show that all control variables except the one representing market trends is statistically significant at a 10% level.

From the results obtained, we can observe that book-to-market ratio, volatility, turnover, GDP per capita and both dummies reflecting extreme market movements, reveal a positive relationship with CSAD, meaning that an increase in those variables (or the evidence of the situation to which the dummies refer) will cause a decrease in the level of herding. On the other hand, size and market capitalization to GDP exhibit a negative relationship with CSAD, thus evidencing that an increase in these variables leads to an increase in the level of herding.

Regarding the book-to-market ratio, the results are consistent with Lakonishok *et al.* (1994) and Blasco *et al.* (2009), supporting the vision that investors are uninformed and so, they herd more when the indicator is lower. Firms that present a lower book-to-market ratio tend to show worse financial indicators (for example, a lower volume of sales or a higher price-

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earnings ratio). In these circumstances, uninformed investors tend to be attracted, as a group, to firms that show better financial indicators, disregarding the fact that they may be paying too much for those shares (Lakonishok *et al.*, 1994). This may justify a higher level of herding when firms have lower book-to-market ratios.

In what concerns volatility, our results go in the same direction as the ones found in Lobão and Serra (2007), meaning that volatility is probably associated with the arrival of unexpected public information.

The coefficient of size is also positive and statistically significant which supports the assertion that smaller firms may be more susceptible to herding due to lack of information. Our findings also show that a higher turnover is associated with lower levels of herding. This may happen because low turnover is associated with poorer information and a higher turnover reflects higher differences of opinion among investors with respect to a stock's intrinsic value. For the extreme movements, we found, against our expectations, that herding is less likely to occur under these extreme situations. However, these results are consistent with Hwang and Salmon (2004), who consider herding to be more intense in quiet periods, and that investors during periods of crisis tend to be more analytical and to look more attentively to fundamentals. Regarding market capitalization to GDP, our results show that a higher ratio would lead to more herding. This may be related to the fact that more developed stock markets are more liquid and attract more investors to trade. Then, if there are more opportunities to trade stocks in the market, investors are more able to pursue herding strategies in that market. On the other hand, the result obtained may be capturing spurious herding instead of "pure" herd behavior. In fact, in more developed stock markets, information quality is better and investors may trade in the same direction just because they had access to the same piece of information.

Our results for GDP per capita are in consonance with Anderson *et al.* (2011), showing that tends to exist less herding in countries characterized by a higher GDP per capita. This result is consistent with the view that institutional development plays an important role in the development of financial markets. In fact, it is plausible to admit that the development of market institutions like regulators and producers of information (e.g., credit agencies and financial analysts) may provide investors with better and cheaper information, which may make herding relatively less attractive.

The results related to bull and bear markets obtained are not statistically significant, which suggest that herd behavior is not significantly influenced by the market trend.

b) Cultural dimensions

The results obtained allow us to conclude that culture may in fact play a significant role in financial decision-making and, in particular, on herd behavior. In fact, our findings show that masculinity and power distance have a statistically significant explanatory power for this phenomenon at the 10% significance level.

Regarding masculinity, the results for this dimension are in tune with the predictions from previous literature that suggest that herding tends to be less significant in more masculine cultures, *ceteris paribus*. The results also confirm our second hypothesis (H2). Thus, the evidence is consistent with the view that men tend to be more self-confident and ambitious, which leads them to trust their own abilities and to adopt risk-taking behaviors. Our evidence is also consistent with the results found by Barber and Odean (2001), who have established a significant relationship between gender and trading.

As for power distance, our results seem to support the idea suggested by Mihet (2012) that low power distance is closely related to values such as trust, equality and cooperation. The explanation may lie in the link between power distance and institutions quality. It is plausible to admit that high power distant countries usually have institutions protecting the existing level of welfare, which includes a stronger protection of shareholders. Therefore, these countries tend to have higher institutional quality which is associated with a more abundant flow of information (Chui *et al.*, 2010). These conditions favor a decrease in the levels of herding.

Individualism, uncertainty avoidance and long-term orientation are cultural dimensions that were found to be not statistically significant. This means that the first, the third and the fifth hypothesis that were posited in section 3.1. do not find support in the results of our empirical study.

Overall, our findings suggest that some cultural dimensions have an impact in investors' decision-making and should be considered when one wants to understand the behavior of investors in financial markets. Specifically, we reached the conclusion that masculinity and power distance influence negatively the existence of herding in the market.

5. Conclusion

Financial investors do not decide in isolation. On the contrary, they interact with each other, and that social interaction may lead them to adopt a different decision from the one they would choose if they were deciding on their own. Also, culture permeates virtually every aspect of people's decisions, including financial decisions.

Considering this, we explored in this paper the influence that culture may exert on investors' decisions to imitate the actions of others (i.e., herding behavior). We established a theoretical relationship between the various cultural dimensions defined by Hofstede (2001) and the herding behavior among investors. Then we tested those relationships in a sample of 39 countries using those cultural dimensions and the measure of herding proposed by Chang *et al.* (2000).

The results suggest that some dimensions of culture have the ability to influence investor's imitative behavior. Countries characterized by a higher level of masculinity and power distance are less prone to herd behavior. The results for individualism, uncertainty avoidance and long-term orientation were not statistically significant at conventional levels. Collectively, these results highlight the importance of considering some features of the cultural environment when predicting how investors in a specific market will behave.

The results presented in this study are also relevant in the perspective of the regulator of financial markets. In fact, one important implication is that regulators should act more attentively in countries where the culture propitiates a higher level of herding. This is the case of countries characterized by a more masculine culture (the cases of Japan, Hungary and Austria, for example), where the levels of power distance are more significant (the cases of Malaysia, the Philippines and Romania, for example) or where the two cultural traits reach, in aggregate, a higher level (the cases of the Philippines, Malaysia and Mexico, for example). In countries with these characteristics, the authorities should be more severe in the application of regulatory measures that aim to reduce the harmful effects of herding in the formation of prices. Our study presents some limitations. First, the measure of herding we employed may be affected by spurious herding, since it does not distinguish changes in returns' dispersion driven by sentiment from those driven by prices adjusting to the coming of new information to the market. Furthermore, that indicator of herding may be affected by factors that are not directly related to the phenomenon such as informational inefficiencies. Secondly, we assume that the herding observed in one country is influenced by cultural dimensions that affect investors from that

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country. The fact that a relevant portion of the investments made in a country may come from investors that are located in another country may limit the implication of our results as well as the results of several of the studies in the field of cultural finance. Finally, although Hofstede's dimensions are widely used due to their clarity and simplicity, there are criticisms made to these dimensions. For example, Kirkman *et al.* (2006) argue that something as complex as culture cannot be reduced to just five dimensions.

The current paper represents a first attempt to investigate the impact of culture of herding. However, much remains to be known about this topic. For example, it would be interesting to have studies including other cultural dimensions such as those suggested by Schwartz (1994) and GLOBE Project (2004) and considering different herding measures (e.g., Christie and Huang, 1995; Hwang and Salmon, 2004) not only for the market as a whole but also for specific industries. Further avenues of research on the relationship between culture and herding may include the examination of the impact of factors such as the informational efficiency of the markets, the presence of institutional investors, the volatility of the macroeconomic environment and the level of investors' financial literacy.

Cultural finance is a fertile field of research and much of the influence of cultural variables on financial decision-making is yet to be discovered. We hope that our study will help to motivate future research on this subject.

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