



Contents lists available at ScienceDirect

Physica A

journal homepage: www.elsevier.com/locate/physa

Relating group size and posting activity of an online community of financial investors: Regularities and seasonal patterns

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HIGHLIGHTS

- We analysed the relation between the number of active users and posts shared on an online forum for financial investors.
- We found that the relation follows a power law, with exponent greater than 1.
- We found day-of-the-week and hour-of-the-day patterns in the fluctuations of the exponent.

ARTICLE INFO

Article history:

Received 16 June 2016

Received in revised form 2 November 2017

Available online 7 December 2017

Keywords:

Financial forum

Group size

Collective learning

Post contribution

Densification law

ABSTRACT

Group size can potentially affect collective activity and individual propensity to contribute to collective goods. Mancur Olson, in his *Logic of Collective Action*, argued that individual contribution to a collective good tends to be lower in groups of large size. Today, online communication platforms represent an interesting ground to study such collaborative dynamics under possibly different conditions (e.g., lower costs related to gather and share information). This paper examines the relationship between group size and activity in an online financial forum, where users invest time in sharing news, analysis and comments with other investors. We looked at about 24 million messages shared in more than ten years in the *finanzaonline.com* online forum. We found that the relationship between the number of active users and the number of posts shared by those users is of the power type (with exponent $\alpha > 1$) and is subject to periodic fluctuations, mostly driven by hour-of-the-day and day-of-the-week effects. The daily patterns of the exponent showed a divergence between working week and weekend days. In general, the exponent was lower before noon, where investors are typically interested in market news, higher in the late afternoon, where markets are closing and investors need better understanding of the situation. Further research is needed, especially at the micro level, to dissect the mechanisms behind these regularities.

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1. Introduction

Understanding determinants of collective learning is one of the most important ambitions of scientists from several disciplines, both in social and hard sciences: biologists, philosophers, sociologists, psychologists and mathematicians, among others, have dealt with this issue, either theoretically or empirically [1–4]. The study of knowledge sharing mechanisms and information transfer within a group is central in this respect: psychologists and sociologists look at knowledge sharing dynamics with regard to relational and personal cognitive aspects [5]. In managerial and organizational settings these issues are key for the maximization of value creation [6]. Opinion dynamics, conflicts, consensus formation and, more in general, human interactions in collaborative environments have also been studied in statistical physics and network science [7–12].

From an economic perspective, the potential value associated to shared information implies that collective learning depends on some forms of public-good dilemma, where an individual has to balance *self*-interest against *common* interest at the group level. Several studies have addressed the dependence of cooperation and collective learning on a variety of factors, such as group size, members' heterogeneity, the presence and role of leaders, the access to relevant information, monitoring effects and costs and benefits related to participation [1,13–18]. Mancur Olson's milestone book *The Logic of Collective Action* [19], published in 1965, proposed a paramount hypothesis that is commonly referred to as *group-size paradox* and can be summarized as follows: individual contribution to a collective good tends to be lower, the larger the size of the group. This hypothesis and the effect of group heterogeneity have been extensively examined in a variety of fields (see [16] for a recent review). More specifically, group-size paradox has been related to the nature of the collective good, in particular to its degree of privateness/publicness [20]. Oliver and Marwell pointed out that "Olson's group size argument is clearly correct *only* when the good has zero jointness of supply, i.e., when the cost of providing the good is proportional to the number who share it" [21]. Conversely, they argued that complete jointness of supply (the good costs the same no matter how many individuals enjoy it), "translates into a positive effect of group size on (1) the probability that *someone* in a group will provide the good, and (2) the total amount of contributions from the group".

Recently, the disruptive evolution and diffusion of new communication technologies has created a new context to understand these topics better. [22], for instance, contended that evolving technologies and electronic communication have substantially lowered organizational costs, introducing possibilities that Olson could not have imagined in the Sixties. On the same line, [23] noticed that, in general, self-organizing online groups, forums and meetups could hardly fit the paradigm implied by Olson's theory. In fact, they proposed an extension of the traditional collective action theory that could also account for circumstances of low coordination, information and communication costs. As an example of these lowered costs, many online platforms stimulated an increase of information sharing among users: *Wikipedia* and the open-source philosophy are examples of this. It is worth noting that in many cases these communication systems make even valuable information progressively less *excludable* and, consequently, more distant from the ideal *private good*.

In this paper, we studied the relationship between group size and overall post production in an online forum for financial investors. This is an online platform where any registered user can read and share posts about financial assets, stocks, news and any other topic related to finance. Given that registration and participation are totally free, there is no way to prevent anyone from registering and accessing the information shared by other members without contributing in turn. Although it is actually possible to create private groups where only selected users are allowed to read and write messages, this is the exception to the rule. Therefore, we can consider the content shared in this forum as non-excludable goods. Non-excludability is, indeed, a fundamental characteristic of a public good; the other one is non-rivalry: a good is non-rivalrous if the consumption by a consumer does not prevent other consumers from simultaneously consuming it. This point is not trivial, given the type of content. On the one hand, recent studies in empirical finance have shown that messages shared on online financial forums are far from being just noise; on the contrary, they contain valuable information, which might be collected and analysed to predict some market dynamics [24–26]. On the other hand, this kind of forum could provide even an ordinary user with good opportunities for gains. Let us assume that *user 1* has reasons to believe with a high degree of confidence that a stock will perform very well the next day. After taking a large long position on that stock, he/she might see no reasons to hide his/her motivations. In fact, if other users were convinced by his/her argument and took themselves a long position, they would just contribute to push the price of the stock in the direction that *user 1* expected. The point is: would that piece of information be non-rivalrous? If one assumes that all members of the forum are price takers, it would probably be the case and this is probably a good approximation for most stocks and futures. However, it cannot be excluded that stocks with low market capitalization might be sensitive to rumours [27]. The fact that a post might disclose a good trading opportunity suggests that there might be some rivalry in the exploitation of that information. As a consequence, the information shared on a financial forum cannot be classified as a pure public good, nor as a private one.

To understand these problems better, we focused on the *finanzaonline.com* forum, the leading Italian financial online community. Established at the end of 1999 by *Brown Editore*, an independent and highly influential publishing company specializing in high quality economic and financial information, *finanzaonline.com* immediately became the main information and communication online platform for Italian investors. The forum grew impressively in size and activity, from less than a thousand monthly posts shared in 2002 to hundreds of thousands in 2008. Moreover, the time span we analysed included periods of high tension and uncertainty on the markets, such as the 2008 financial crisis and the European sovereign debt crisis. This allowed us to observe the relationship of the variables across orders of magnitude and to check for its robustness.

We found robust regularities consistent with a power functional form between the number of active users and the number of posts. We then focused on the value of the parameters in order to understand to which extent an increase in size of the

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