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Protecting Investors in Equity Crowdfunding: An Empirical Analysis of the Small Investor Protection Act

Abstract

During the past decade, equity crowdfunding (ECF) has emerged as an alternative funding channel for startup firms. In Germany, the Small Investor Protection Act became binding in July 2015, with the legislative goal to protect investors engaging in this new asset class. Since then, investors pledging more than 1,000 EUR now must self-report their income and wealth. Investing more than 10,000 EUR in a single ECF issuer is only possible through a corporate entity. We examine how the Small Investor Protection Act has affected investor behavior at Companisto, Germany's largest ECF portal for startup firms. The results show that after the new law became binding, sophisticated investors invest less on average while casual investors invest more. Moreover, the signaling capacity of large investments has disappeared.

JEL-Codes: E220, G180, G380, K220, L260.

Keywords: equity crowdfunding, crowdinvesting, investor protection.

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1. Introduction

The regulation of securities markets and investor participation are crucial policy instruments to ensure strong investor protection and, as a consequence, stock market development (La Porta et al., 1997, 1998; La Porta, et al. 2006). During the past decade, novel and less regulated securities markets that allow privately held companies to sell their stocks to ordinary investors have emerged. The online economy has brought with it the opportunity for equity crowdfunding (ECF), which has now become a mainstream source of funding for small and medium-sized enterprises all around the world (Block et al., 2018a; Rau, 2019). ECF constitutes a sub-category of crowdfunding, in which a crowd of investors makes small investments with the common goal to participate in the future cash flows of a firm. Moreover, it constitutes a market segment, in which the projects of the issuers who seek funding are often too risky for banks, their absolute returns too small for business angels and venture capitalists, and their capital needs often too large for family and friends to support fully (Klöhn and Hornuf, 2012). To close this funding gap, many regulators have offered exemptions to prospectus and registration requirements (Gabison, 2015, Hornuf and Schwienbacher, 2017), which would otherwise hamper issuers from obtaining funding for their projects. While these exemptions have the potential to foster entrepreneurial activities and economic growth, laxer disclosure standards can also result in weaker investor protection and thus potentially jeopardize the integrity of the market (BMF, 2017).

The law and finance literature often focuses on the impact of legal rules on stock market development and economic growth and has traditionally investigated measures of investor protection that apply to large and publicly traded corporations (La Porta et al., 1997, 1998). However, there is growing literature on how the law affects entrepreneurship and the financing of privately held companies. For example, research indicates that the minimum capital requirement affects incorporations and entrepreneurship more generally (Becht et al., 2008; Braun et al., 2013), that there is a link between bankruptcy law and entrepreneurial activities (Armour, 2004; Armour and Cumming, 2006, 2008; Fan and White, 2003), and that extensive labor regulations can have a dampening effect on new firm formations (Klapper et al., 2006). With regard to securities regulation, the effect of regulation on privately held companies is less clear. For example, Rajan and Zingales (2003) argue that the absence of investor protection regulation might be an effective barrier to new firm creation; however, too extensive regulation of entry hampers financial development.

The study of investor protection in ECF enables us to better understand how securities regulation affects investor behavior and the propensity of firms to tap the capital market. In particular, policy changes such as the Small Investor Protection Act (SIPA) in Germany allow for the study of hard paternalistic measures, such as investment limits, that are rarely implemented on traditional stock markets and thus difficult to investigate. Insights from less regulated markets that exhibit high degrees of uncertainty can provide novel insights into effective policy measures on traditional capital markets. To the best of our knowledge, little empirical research has been undertaken on regulatory measures taken in ECF.

Some of the first studies on ECF were conducted by legal scholars and have outlined what the new law is (Bradford, 2012a, 2012b). Hornuf and Schwienbacher (2017) were among the first economics scholars to theoretically investigate the ECF exemptions in securities law. They evidence that the optimal regulation of ECF depends on the availability of alternative early-stage financing, such as venture capital and angel finance, and argue that in the absence of these funding sources, exemptions to prospectus and registration requirements might be warranted. Cumming and Johan (2013) study survey data from Canada and investigate whether ECF results in a race-to-the-bottom or race-to-the-top. They infer from the data that cross-jurisdictional investment and investor demands will give rise to a race to the top. More recently, empirical studies have investigated the contractual terms in ECF. Cumming et al. (2019a) investigate dual-class ECF offerings and find that the separation between ownership and control lowers the probability of campaign success and the long-term prospects of the issuer. Hornuf et al. (2020a) investigate 256 campaigns on 19 different German ECF platforms and find that crowd investors are asked to pay higher prices if they receive more cash flow and exit rights, while these rights have no impact on campaign outcomes, the likelihood of securing follow-on funding, or the likelihood of liquidation of the venture. Rossi and Vismara (2018) provide cross-platform evidence and show that, in particular, post-campaign services, such as exit assistance or periodical updates, increase the annual number of successful campaigns.

Much empirical research in the domain of ECF has focused on investor behavior. Vismara (2018a, 2018b) shows that information cascades affect the investment process. Block et al. (2018b) investigate whether updates by the founders affect investment dynamics during a campaign. They find that updates on new firm developments, such as funding events, business developments, and cooperation projects, provide credible signals about the quality of the venture. Ahlers et al. (2015) find that retaining equity and providing more detailed information about venture risks constitute effective signals and impact the probability of funding success. Hornuf and Schwienbacher (2018) show that the investment behavior and comments of other

crowd investors affect investors' willingness to financially engage. Niemand et al. (2018) conduct a choice-based conjoint experiment to analyze factors contributing to a home bias in ECF and find that investors in central Europe avoid foreign currencies and decide against national legislation in favor for EU legislation. Using a mixed-methods approach and data from Crowdcube, Kleinert and Volkmann (2019) find that investors are concerned about information asymmetry and agency risk. They also provide evidence that dialogues on discussion boards on the ECF portal generally drive investments. Nitani et al. (2019) evidence that to reduce risk, investors in ECF chose larger firms, which are managed by more experienced and educated managers, and maintain a larger equity share after the venture was successfully funded by the crowd. Wallmeroth (2019) uses a sample of more than 42,200 investments from Germany's largest ECF portals and finds that investment amounts differ significantly and that the crowd is not a homogeneous community. Furthermore, Nguyen et al. (2019) show that investors in ECF delay their investments to gain information. None of these studies, however, empirically examine how the regulation of ECF has affected investor behavior and composition. A notable exemption is Goethner et al. (2020), who investigate the different strategies and motivations of investors who finance projects on Companisto. However, they do not investigate regulatory changes.

Regulators around the world have passed similar legislation with regard to ECF. While under the recently implemented securities regulation startups in many jurisdictions are allowed to raise a certain amount of capital without having to draft and register a prospectus, investors are often limited in the amount of capital they can pledge (Hornuf and Schwienbacher, 2017). In Germany, SIPA allows firms to raise 2.5 million EUR[1] without the obligation to register a prospectus, but only if investments are offered exclusively by means of investment consulting or investment brokerage via an Internet portal. The exemptions from the prospectus requirement do not extend to issuers executing a direct offering. German law limits the amount an investor can invest in the same issuer (*single issuer limit*), but it does not limit the amount an investor can invest in the entire ECF market (*aggregate limit*) (Klöhn et al., 2016). Similar regulations are in place in Belgium, the United Kingdom, and the United States (Hornuf and Schwienbacher, 2017).

This article adds to the recent and growing literature on how to regulate ECF by investigating the types of investors who participate in the market (Goethner et al., 2020, Klöhn et al., 2016).

[1] On July 15, 2019, an amendment to the Investment Act became binding. Since then, the threshold has been raised to 6 million EUR. However, this regulatory change falls outside the observation period of our study.

Moreover, we examine how the investor composition changes when the amount an investor can invest in a single issuer changes because of regulatory constraints. Using a control group from German-speaking Austria, where SIPA does not apply, we conduct a difference-in-differences (DID) analysis to determine whether the restriction of large investments by ordinary investors affects investment behavior more generally. In particular, we analyze whether the amounts pledged differ after SIPA became binding and whether the signaling capacity of large investments breaks down.

In line with Goethner et al. (2020), we distinguish three types of investors in our dataset: casual investors, crowd enthusiasts, and sophisticated investors. Casual investors are foremost interested in the financial returns of their investment, crowd enthusiasts are also motivated by pro-social factors, and sophisticated investors are comparatively more experienced and pledge higher amounts. While we find that these three investor types exist before and after SIPA became binding, the amount sophisticated investors pledged dropped by almost 53% on average. This development has important implications for the signaling capacity within the crowd. Sophisticated investors can provide credible signals to other investors in the spirit of Spence (1973) through their easily observable, large, and, thus, costly investments. Restricting crowd investors in the amounts they can invest—as many regulators currently do—may be costly to ordinary investors. In the context of ECF, Block et al. (2018b), Hornuf and Schwienbacher (2018), Kleinert et al. (2020), and Vismara (2016, 2018a, 2018b) all show that signaling is an important instrument for ordinary investors to make an investment decision and to overcome the transaction costs of information gathering. We find that sophisticated investors leave the market after the implementation of SIPA, which significantly restricts casual investors' prospects to react to signals of sophisticated investors.

The structure of this article is as follows: in Section 2, we describe the regulatory changes that SIPA introduced, in particular how the new law affected investment amounts. In Section 3, we formulate hypotheses on the influence of these regulatory changes on investment behavior. Section 4 presents the data and method. Section 5 outlines the empirical results, and Section 6 concludes.

2. The SIPA

2.1. General regulation

Unlike in reward-based crowdfunding, investors in ECF expect some form of financial compensation for their investment. In return for their investment, they often receive equity shares in a private limited liability company (LLC). In Germany, the transfer of equity shares requires the involvement of a notary (Braun et al., 2013), which makes transferring small stakes practically too costly for brokering on an ECF portal. German startups therefore often use mezzanine financial instruments, such as subordinated profit-participating loans or silent partnerships, which offer a virtual share in the future cash flows of the startup and do not require the involvement of a notary. In the United States, Indiegogo—the main competitor of Kickstarter—allows startups to run campaigns that use similar financial contracts to those offered on the German market. These investments generally rank above ordinary shares but below all ordinary liabilities and cannot be sold on a secondary market. In Germany, the contracts used are regulated under the German Investment Act (*Vermögensanlagengesetz*, short: VermAnlG).

When ECF appeared on the stage in Germany in 2011, legislators quickly realized a trade-off between supporting startup firms and investor protection. As a result, SIPA was introduced in the summer of 2015 with the goal to amend the German Investment Act. SIPA has expanded the regulatory outreach of the Investment Act to encompass types of investments that previously were not covered by the Investment Act. Moreover, it introduced a prospectus requirement and subscription limits for publicly offered investments. An offer is public if it is not restricted to a specific group of people and is not public if an existing personal relationship between investor and issuer exists (Zwissler, 2013). Investments covered by the Investment Act are generally not subject to the prospectus requirement if they do not exceed an aggregate value of 100,000 EUR within 12 months. For issuers of profit-participating loans, sub-ordinated loans, and similar investments, the threshold has even been increased to 2.5 million EUR.[2]

2.2. Regulation of investment amounts

For the issuer to benefit from the exemption from the prospectus requirement, investors must stay within the single issuer investment limit. In general, the maximum allowed investment was

[2] See footnote 1.

set at 10,000 EUR,[3] but this does not apply if the investor engages through a corporate entity. Until recently, only 4% of Companisto investors had used a corporate entity for their investments (Hainz and Hornuf, 2019). Moreover, investors must self-report their income and wealth to the portal if the overall value of an investment exceeds 1,000 EUR.

Austria constitutes the control group in our empirical analysis because it is a direct neighboring country of Germany, the population is German speaking, and Austria is in many other respects similar to Germany. In Austria, the Alternative Financing Law (*Alternativfinanzierungsgesetz*, short: AltFG) became binding the same year SIPA did, but it did not establish a hard cap on single investments. Instead, the single issuer limit is 10% of net investable financial assets or twice the investors monthly net income. Investors must self-report their income and wealth to the portal if the overall value of an investment exceeds 5,000 EUR.[4] The rules in the Alternative Financing Law allow sophisticated investors to invest as much as they want regardless of whether they invest through a corporate entity or not.

3. Hypotheses

SIPA stipulates that above the thresholds of 1,000 EUR, investors must report their income and wealth to the platform. It could be argued that the threshold of 1,000 EUR is of little concern, given the limited attention consumers often pay to the processing of their data (Ben-Shahar and Schneider, 2016). However, before SIPA became binding, the industry association BITKOM conducted a survey among investors and asked them the extent to which they would be willing to provide information about their income and wealth. According to the results, more than 70% of investors reported that they would not be willing to disclose their financial situation.[5] To be precise, disclosing the *exact* financial situation is also not necessary under SIPA. The investor must, however, confirm that he or she has at least 100,000 EUR in terms of wealth, or the sum of the investment is not more than double its net monthly income. Platforms cannot actually check the truthfulness of the information provided by the investor, and one of the market leaders has made this point very clear to investors on its investors blog.[6] Nevertheless, investors might

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3 On July 15, 2019, an amendment to the Investment Act became binding. Since then, crowd investors have been able to invest a total of 25,000 EUR in a single issuer. However, this regulatory change falls outside the observation period in our study.

4 While investigating the 5,000 EUR threshold in Austria might be of interest by itself, in our empirical analysis we are interested in the extent of investments of precisely 1,000 EUR before and after SIPA became binding. Because investments up to 5,000 EUR (and, thus, of precisely 1,000 EUR) are not regulated differently after the Alternative Financing Law became binding, Austria constitutes a valid control group in our empirical analysis testing Hypothesis 1.

5 See https://blog.seedmatch.de/spielregeln-kleinanlegerschutzgesetz/.

6 See https://blog.seedmatch.de/spielregeln-kleinanlegerschutzgesetz/.

still have good reasons not to lie about their income and wealth. For example, if an investment fails and investors have violated the law by lying about their financial situation, they might jeopardize their chances to recover from the financial loss. Moreover, by lying about their financial situation, people may no longer be able to maintain a positive and honest self-concept (Ariely, 2009; Mazar et al., 2008).

The disclosure of personal financial information to ECF websites—even if this information is not verified in all cases—can expose users to greater privacy risks. On many ECF websites, the amounts invested are often openly published, and in some cases, investors even have attached their name and location to their public investor profile (Hornuf and Schwienbacher, 2018). In combination with the new SIPA rules, third parties might infer the income and wealth of investors from the amounts they invest. Privacy calculus theory (Dinev and Hart, 2006) suggests that investors conduct a cost–benefit analysis when deciding whether to disclose their financial situation or not. In particular, people consciously weigh the risks and benefits of disclosing their income and wealth. However, O'Donoghue and Rabin (1999) show that people procrastinate immediate-cost activities and preproperate immediate-reward activities. With regard to privacy concerns, disclosing private information often leads to an immediate gratification (e.g., the possibility to make an investment), while the privacy risks are difficult to assess and quantify in the future (Acquisti, 2004), which again implies that the threshold of 1,000 EUR may be of little concern to investors.

The privacy risks in ECF depend on the individual platforms that emerged only some months or years ago. Given the nascency of the ECF industry, most portals are not yet considered repeat players (Coffee, 2006). Evidence even shows that some portals have actively engaged in fraudulent activities. For example, the Chinese crowdlending portal Ezubao had attracted USD 9.14 billion from around 900,000 investors over the course of one and a half years. The portal operated a Ponzi scheme, which was identified in January 2016, when it was found that senior executives had spent considerable amounts of investors' money on private expenses.[7] Some fraudulent portals might also be willing to sell investor data to make a profit. If such activities become public in the media, privacy risks become salient and the loss of privacy an immediate cost to investors. We therefore expect that investors care about their privacy and avoid

[7] See https://www.reuters.com/article/us-china-fraud/leader-of-chinas-9-billion-ezubao-online-scam-gets-life-26-jailed-idUSKCN1BN0J6.

information disclosure by investing amounts of precisely 1,000 EUR more frequently than before SIPA.[8]

In addition, SIPA stipulates a single issuer limit of 10,000 EUR for investors who do not invest through a corporate entity. Setting up a corporate entity to circumvent the single issuer limit of 10,000 EUR is costly. The cost of involving a notary is twofold: First, investors who digitally invested in an LLC via an ECF platform would suffer from significant transaction costs, because they need to physically meet the notary to be able to transfer their shares. Second, notaries often charge a minimum of around 250 EUR for transferring shares in an LLC, which appears disproportionate especially if investment amounts are many times smaller than the notary fee. If investors did not possess a corporate entity as an investment vehicle before SIPA and thus must set up a corporate entity for the sole purpose to invest higher amounts in a single issuer, the investment will be associated with significantly higher transaction costs. Unlike partnerships organized under the German Civil Code or sole proprietorships, corporations trigger, for example, more expensive duties of professional accounting and professional annual reporting. The additional transaction costs should generally discourage investors from going beyond the 10,000 EUR threshold, unless they have used a corporate entity to engage in ECF even before SIPA became binding.

Hypothesis 1a: After SIPA became binding, ECF investors more frequently invest amounts of precisely 1,000 EUR to satisfy their privacy concerns.

Hypothesis 1b: The frequency of investments above 10,000 EUR decreases after SIPA became binding, because setting up a corporate entity is associated with higher transaction costs.

Chervyakov and Rocholl (2019) argue that the single issuer limit of 10,000 EUR for investors who do not invest through a corporate entity protects investors because, to some extent, it forces them to diversify their portfolio, which may offer stronger investor protection than the aggregate limit that restricts the overall investment in the market. While other scholars have also made this argument (Klöhn et al., 2016), it was not the main argument of the German Federal Ministry of Finance responsible for drafting SIPA. In its Monthly Report (BMF, 2017), the Ministry argued that investors had suffered significant losses in the past with investments

[8] We expect that investors who would have invested (slightly) more than 1,000 EUR before SIPA may now be restricted by privacy concerns and will invest precisely 1,000 EUR. There is no particular reason for them to invest less than 1,000 EUR, and therefore investments of precisely 1,000 EUR should become more frequent.

in the gray capital market (e.g., due to the prominent PROKON case). In some cases, the financial losses that occurred were based on the incorrect assumption by the investors that high returns could be achieved without corresponding risk. According to the Ministry, hard paternalistic measures, such as the single issuer limit of 10,000 EUR, would be necessary to protect investors from their own inability to evaluate risk and return correctly. Another argument for investment limits often brought forward in the Anglo-American literature is that limiting investors from investing in privately held companies also protects them from fraud. For example, former SEC chairman, Mary Schapiro, argued that in 1999 the SEC abandoned[9] the possibility for ordinary investors to invest in privately held companies that was made possible only seven years before "in light of investor-protection concerns about fraud."[10]

Nevertheless, having sophisticated investors pledge larger amounts and potentially conduct due diligence in an ECF campaign can also entail positive externalities for ordinary crowd investors. In the domain of crowdlending, Herzenstein et al. (2011) demonstrates that investors can learn from one another. Even if herding can lead to irrational behavior and cause investors to ignore private information (Scharfstein and Stein, 1990), according to Herzenstein et al. (2011), strategic herding in crowdlending is positively related to the performance of a loan after funding. Given the relatively high transaction costs of screening and monitoring an investment relative to the small investment amounts in ECF, investors infer information about the quality of the venture from large investments that stem from angel-like investors and other more sophisticated investors. Hornuf and Schwienbacher (2018) show that in ECF, ordinary investors base their investment decisions on large investments of more than 5,000 EUR or 10,000 EUR by other investors. Investors who make larger investments have a larger stake in the game (Taleb, 2018) and, thus, stronger incentives to analyze the startup more thoroughly. In some cases, they might even directly contact the founders to obtain information about the quality of the venture. The ordinary crowd investor might thus rationally update the perceived quality of the venture from the investment behavior of sophisticated investors.

Therefore, the question arises whether the single issuer limit of 10,000 EUR for investors who do not invest through a corporate entity affects the signaling capacity of sophisticated investors. Because of the transaction costs of setting up a corporate entity, the signal that sophisticated investors send through their investment should become more costly at first glance and, thus, more valuable to ordinary investors. However, this holds only if sophisticated investors

[9] The previous legislation stipulated no single issuer limit whatsoever.
[10] See https://www.wsj.com/articles/SB10001424052748704843404576251160999848924.

continue investing by setting up a *new* corporate entity and do not leave the market. If only the investors who had already used a corporate entity before SIPA stay in the market, the cost of the signal remains the same for them after SIPA and the strength of the signal does not change.[11] Moreover, the strength of the signal of large investments might even decrease, if only the investors who can cheaply send the signal stay in the market, because they already possessed a corporate entity before SIPA. Put differently, if large investments become much less frequent, ordinary investors might infer that it has become too costly for some sophisticated investors to stay in the market and that only those who can send the signal of a large investment at comparatively low cost continue to invest more than 10,000 EUR. If SIPA discourages sophisticated investors from investing more than 10,000 EUR and their signaling strength decreases, the signaling channel of large investments might break down for small investors.

Hypothesis 2: If investments above 10,000 EUR vanish after SIPA became binding and sophisticated investors leave the market, small investors might no longer base their investment decisions on these signals.

One way to differentiate sophisticated from ordinary investors is by analyzing whether crowd investors use a corporate entity when making an investment or by considering larger investment amounts an indication of angle-like investors (Hornuf and Schwienbacher, 2018). Another way to define and identify investors groups is to analyze their investment motives. Using a cluster analysis, Goethner et al. (2020) recently classified three investor types on Companisto: *Casual Investors*, *Crowd Enthusiasts*, and *Sophisticated Investors*. *Casual Investors* constitute the majority of investors, who are motivated by financial returns. *Crowd Enthusiasts* care about pro-social factors and represents another sizable group. *Sophisticated Investors* are a relatively small but experienced group that is very active. We follow Goethner et al.'s approach and use a cluster analysis to classify our investors into these three categories.

Nevertheless, whether it is worthwhile to incur the transaction cost of setting up a corporate entity to exceed the threshold of 10,000 EUR may depend on the specific circumstances of the investment. In line with Kahneman's (1973) notion that attention is a limited cognitive resource,

[11] In our empirical analysis, we find that before SIPA became binding, only nine of 250 large investments were made by corporate entities and the rest by individual investors. After SIPA became binding, there were 23 large investments (naturally by corporate entities), which provides strong evidence that more sophisticated investors such as business angels, who invest larger amounts than regular crowd investors but do not incorporate as a firm, left Companisto after SIPA became binding. After consulting the German company register, we verified that in 86% of the cases, the corporate entities used after SIPA became binding were incorporated before SIPA and were not established because of SIPA, thus creating no additional transaction costs to the ECF investors.

Sims's (2003) theory of rational inattention suggests that if the cost of information acquisition is too high, investors may rationally make decisions based on incomplete information. Legal matters are often complex, and some investors might rely on advice from professional lawyers to help them set up a corporate entity, even if doing so is not cost-efficient for their investment. Furthermore, *Sophisticated Investors* might continue using a corporate entity they already set up before SIPA or avoid the additional transaction costs by simply reducing their investment amounts to precisely 10,000 EUR.

Cumming et al. (2019a) recently showed that in the UK ECF market, professional investors care about the implementation of a threshold for the attribution of voting rights. Moreover, they evidence that professional investors often exactly bid the Class A investment threshold, which attributes voting rights to their investment. In our context, voting rights are the same for all investment amounts in ECF, and differential investments will not be made for that reason (Hornuf et al. 2020a). By contrast, *Sophisticated Investors* should be more likely to leave the market, especially if they did not use a corporate entity to invest in ECF before SIPA. Higher transaction costs should make larger investments less attractive, at least for some of the *Sophisticated Investors*.

Hypothesis 3: A significant share of *Sophisticated Investors* leave the ECF market and/or reduce their investment amounts to 10,000 EUR.

4. Data and methods

4.1. Data

Our data come from two sources: Companisto, the largest German ECF portal for startups, and Greenrocket, an ECF portal based in Austria that focuses on social, ethical, and/or environmental (SEE) campaigns. The Companisto data start with the launch of the portal in June 2012 and end in November 2017. During this time span, Companisto investors made 62,045 investments in 85 distinct campaigns, which amounts to 42.5 million EUR being raised. Data from Greenrocket start in October 2013 and end in June 2018. They consist of 9,956 individual investments in 50 campaigns, for a total investment volume of 10.9 million EUR. From these data, we construct a panel dataset. Our unit of observation is the aggregated investment amounts for a given campaign day, with a particular campaign as the cross-sectional dimension and the day as the time dimension.

The date SIPA became binding, which is July 3, 2015, is the external shock we aim to exploit in our empirical analysis. To analyze how SIPA affected investment behavior, we pursue a mixed-methods approach. We begin by splitting our observations in two periods, depending on whether a campaign was run before or after SIPA became binding. In our regression framework, we focus on the investment-size brackets that SIPA introduced. We test whether investments from each investment-size bracket constitute a signal for subsequent investments, before and after SIPA became binding. Thereafter, we complement the investment-level analysis with a categorization of individual investors into investor types according to their investment decisions before and after SIPA using an explorative cluster analysis. Finally, we use insights into investor types in an analysis of investment amounts before and after SIPA, to identify the effect of SIPA on the behavior of different investor types.

4.2. Variables

4.2.1. Dependent variable

To investigate Hypothesis 2, we consider the amount of capital raised during an ECF campaign on a given day as the dependent variable in our empirical analysis.

4.2.2. Explanatory variables

To investigate whether investors base their investment decisions on investments of a certain size by others, we categorize the investments in our sample according to the thresholds introduced by SIPA: *Small investments* (≤1,000 EUR), *Medium investments* (>1,000 EUR–≤10,000 EUR), and *Large investments* (>10,000 EUR). *Small investments* constitute the reference category in our analysis, which is excluded from the estimations. Because, unlike professional traders, crowd investors may not permanently monitor the market, we consider time lags of one week for the explanatory variables. The variables *Medium investments (7-day lag)* and *Large investments (7-day lag)* thus capture the number of medium and large investments during the previous seven days. The dummy variable *PostSIPA* indicates whether the investment occurred before or after July 3, 2015, the date SIPA became binding.

4.2.3. Control variables

We also consider several control variables known to affect funding dynamics from previous research (Hornuf and Neuenkirch, 2017; Hornuf and Schwienbacher, 2018; Vismara, 2018a,

2018b). Hornuf and Schwienbacher (2018) find that investments tend to be more frequent at the beginning of a campaign and follow an L-shaped pattern. Thus, we construct campaign phase dummies for investments during the first and second weeks of a campaign (*First week*, *Second week*). To test whether herding influences investors' propensity to invest, we include the variable *Herding (7-day lag)*, which captures the sum of investments in a campaign during the last seven days. Furthermore, ECF campaigns are only successful if a certain minimum funding goal is reached. Setting the funding goal very low indicates that the founders fear that they will not be able to collect enough capital during the funding period. A low funding goal can then be considered a signal of little confidence. By contrast, setting a high funding goal indicates that the founder team is confident about its ECF prospects. We therefore consider the variable *Funding goal*, which we expect to have a positive impact on investments amounts each day. Furthermore, the funding dynamics might change when the funding goal is surpassed. Reaching the funding goal might provide evidence to potential investors that a critical mass of investors believes in the startup. We therefore construct the dummy variable *Post-Funded*, which takes the value of 1 when the funding goal has been reached and 0 otherwise. As additional control variables, we specify the number of granted patents (*Number of patents*) and the size of the founder team (*Number of founders*).

Finally, given that we might not have controlled for all relevant explanatory variables, we also consider a range of fixed effects. First, we include industry fixed effects because they help us remove any time-invariant heterogeneity from certain industries and business models. Second, we include the variable *Year*, helps us remove heterogeneity over time, such as general market dynamics.

4.3. Empirical methods

4.3.1. Panel model

We estimate the following baseline equation

$$y_{it} = \alpha + \beta_1 \cdot \mathbf{Investments}_{i,lag7} + \beta_2 \cdot PostSIPA_t + \beta_3 \cdot \mathbf{Controls}_{it} + \upsilon_i + \varepsilon_{it},$$

where the dependent variable y_{it} is the amount raised in project i on campaign day t, $\mathbf{Investments}_{i,lag7}$ is a vector of two variables respectively measuring the number of medium and large investments during the course of one week, $\mathbf{Controls}_{it}$ is a vector that entails the

control variables outlined previously, v_i is the random project-specific effect,[12] and ε_{it} is the residual.

4.3.2. Cluster analysis

A cluster analysis is a multivariate technique that sorts different objects into groups by maximizing within-group similarities and between-group differences. The identification of clusters is thus led by data and not by a particular theory. Our approach follows that of Goethner et al. (2020), who employ a cluster analysis to identify investor types for Companisto over the 2012–2014 period. We use a two-stage clustering procedure, employing a hierarchical clustering as a prior step to determine the appropriate number of clusters for subsequent non-hierarchical clustering (Ketchen & Shook, 1996). Research shows that this approach leads to superior clustering solutions and increases the validity of the final clusters obtained (Milligan, 1980; Punj & Stewart, 1983). For both stages of the clustering procedure, we calculate distance matrices using the Euclidean distance measure.

In the first stage, we conduct pre-clustering with the single linkage method to eliminate potential outliers (Jiang et al., 2001). The main procedure is performed using Ward's minimum-variance method. This hierarchical method treats every object as a separate cluster at the beginning of the algorithm. The clusters are then successively joined together into groups until only a single cluster remains. The objective of Ward's method is to join two clusters at each step so that the variance for the joined cluster is minimized and the variance between clusters is maximized. Ward's method is superior to alternative approaches and forms very homogeneous clusters (Milligan & Cooper, 1985; Punj & Stewart, 1983). In the second stage of the clustering procedure, we performed a non-hierarchical *k*-means clustering. With *k*-means clustering, objects are iteratively classified by their distance to some initial starting points of dimension *k*. While some *k*-means methods use randomly selected starting points, we employ the centroids of the initial cluster solution of Ward's method for this purpose (Ketchen & Shook, 1996).

[12] Because some of our explanatory variables are time-invariant, we cannot estimate a fixed effects model.

5. Results

5.1. Descriptive statistics

Our dataset consists of 62,045 investments from 86 campaigns run on Companisto and 9,956 investments from 50 campaigns run on Greenrocket. Table 1 provides summary statistics at the campaign level for Companisto (Panel A) and for Greenrocket (Panel B). The median campaign at Companisto attracted 630 investors and received 265,023 EUR in overall investments, which are more than the median campaign at Greenrocket, which attracted 160 investors and 169,125 EUR. Table 1 also distinguishes between campaigns before and after SIPA became binding. At Companisto, campaigns had longer funding periods on average, and fewer comments were posted by investors after SIPA became binding ($p < 0.05$). The longer funding periods are most likely due to ECF fatigue, resulting from little repayments during the first years of this new market segment and the emergence of attractive alternatives, such as real estate crowdfunding (Hornuf et al. 2018). All other variables did not significantly change when comparing campaigns before and after SIPA became binding ($p > 0.05$). At Greenrocket, campaigns were less successful on average after SIPA became binding, which might be due to founders defining significantly higher funding goals. Except for the number of founders, which increased by more than one founder ($p < 0.05$), the other variables did not significantly change when comparing campaigns before and after SIPA became binding ($p > 0.05$).

--INSERT TABLE 1 HERE--

Table 2 presents summary statistics at the individual investment level. At Companisto, the median investment is 150 EUR, and the average investment is 686 EUR. Overall, 89.7% of the investments are *Small investments*—smaller than or equal to 1,000 EUR. *Medium investments* make up 9.8%, and only 0.4% of all investments are *Large investments*. Almost a quarter of all investments is accompanied by a comment at Companisto. On average, the mean investment is made one month after the campaign start, with the median investment made after 20 days, which indicates that investments frequently occur early on in the campaign. Greenrocket investments tend to be larger with an average of 1,091 EUR and a median of 500 EUR. Especially *Medium investments* are more common at Greenrocket, most likely due to the 150 EUR minimum investment at Greenrocket.[13]

[13] Most campaigns on Companisto defined a minimum investment of 5 EUR.

Hypothesis 1 states that after SIPA became binding, investors should more frequently invest amounts of precisely 1,000 EUR than before SIPA became binding. At the investment level, the introduction of SIPA splits the Companisto data into 33,410 observations before and 28,635 after the law became binding. A chi-square test confirms that distributions of investment amounts are different before and after SIPA became binding ($p < 0.01$). More important, investments of exactly 1,000 EUR make up 6.1% of all investments before SIPA took effect and 10.4% afterward, a significant increase of 70.5% ($p < 0.01$), which we consider strong evidence for our Hypothesis 1. Hypothesis 1 also states that the frequency of investments above 10,000 EUR should decrease. *Large investments* indeed become much less frequent (from 0.8% (corresponding to 250 investments) before to 0.1% (corresponding to 23 investments) after SIPA, $p < 0.01$), while *Medium investments* become more common (from 7.7% before to 12.3% after SIPA, $p < 0.01$), and *Small investments* drop from 92% before to 88% ($p < 0.01$) after SIPA became binding.[14] The fact that investments of exactly 1,000 EUR become much more frequent results from a drop of small investments (see Table 2). Small investors thus have either increased their investment amounts after SIPA but frequently did not exceed 1,000 EUR, or some small investors left the market and those investors who joined after SIPA more frequently invested exactly 1,000 EUR. In either case, self-reporting requirements have discouraged investors from making investments slightly above the 1,000 EUR threshold.

Though unlikely, the finding that investors on Companisto invest precisely 1,000 EUR more often might be due to changing investor preferences. We therefore test whether investments of precisely 1,000 EUR increase in our control group as well. Splitting the data for Greenrocket at the date when SIPA became binding results in 3,184 observations in the period before and 6,772 after. The average investment amount increases from 951 EUR before to 1,157 EUR after SIPA became binding. The distributions of investment categories also differ before and after SIPA became binding ($p < 0.01$). *Medium investments* become more frequent (from 17.8% to 22.7%), *Large investments* increase from 0 to 19, and the share of *Small investments* falls (from 82.2% to 77.1%). At Greenrocket, 1,000 EUR is a prominent investment amount as well. However, there is no significant difference when comparing investments of precisely 1,000 EUR before and after SIPA became binding (from 16.5% to 18.1%, $p > 0.05$).

[14] However, the fraction of investments below 1,000 EUR also decreases, from 85.4% before to 77.2% after SIPA became binding ($p < 0.01$).

--INSERT TABLE 2 HERE--

As a robustness check, Fig. 1 depicts the shift in the distribution of investment amounts. It shows histograms of the invested amount before and after SIPA became binding.[15] While before SIPA more than half of all investments had amounts of 100 EUR or less, after SIPA this number drops to 43%. Instead, the spike at an invested amount of 1,000 EUR increases. The frequency of investments between 100 EUR and 1,000 EUR remains unchanged.

--INSERT FIGURE 1 HERE--

Our descriptive analysis is in line with Hypothesis 1 and shows that the introduction of SIPA affected the investment amounts at Companisto in two ways. First, we find a noticeable increase of investments of precisely 1,000 EUR, which constitutes the maximum investment without having to provide additional information about income/wealth to portals. Second, the extent of *Large investments* fell sharply. By contrast, for our control group from Greenrocket investments of precisely 1,000 EUR did not significantly increase, while medium and large investments became more frequent. In the next section, we build on these insights and use a regression framework to test whether *Large investments* had a signaling capacity before SIPA became binding and disappeared thereafter.

5.2. Funding dynamics

To test Hypothesis 2 about whether investments above 10,000 EUR constitute a valuable signal to investors, we estimate our baseline panel data regression as outlined in Section 4.3.1. Table 3 presents the results separately for Companisto and our control group Greenrocket. We are particularly interested in the coefficient of *Large investments*, which captures whether investments of more than 10,000 EUR have a signaling value and trigger additional investments by other investors. In columns 2 and 4, we add the variable *PostSIPA* as well as the respective interactions with our explanatory variables and *Herding*. Finally, column 5 presents results for a DID model in which we combine the Companisto and Greenrocket data.

--INSERT TABLE 3 HERE--

The results of the Companisto baseline regression in column 1 indicate a significant effect of

[15] For illustration purposes, we drop investments of more than 3,000 EUR.

Large investments on subsequent funding ($p < 0.01$). We estimate an increase for the amount raised on a given day by 1,620 EUR due to one additional investment of more than 10,000 EUR during the previous seven days. The estimated effect because of previous *Medium investment* is only 66 EUR ($p < 0.01$). The coefficient of *First week* is positive and highly significant, which is in line with an L-shaped investments pattern. The control variables *Herding*, *Funding target*, and *Post-funded* are significant ($p < 0.05$) predictors of the amount raised; the *Number of patents* and *Number of founders* are not.

In column 2 in Table 3, we test whether the signaling value of *Large investments* disappears after SIPA became binding. The coefficient of *Large investments* remains positive and significant, while the interaction term of *Large investments* with *PostSIPA* is negative and significant. In other words, the signaling value of *Large investments* decreased after SIPA became binding. Testing the joint effect of *Large investments* and *PostSIPA* × *Large investments* using a Wald test, we find that the signaling value of *Large investments* disappears completely after SIPA became binding ($p = 0.80$), which we consider strong evidence for Hypothesis 2. The coefficient for *Medium investments* is positive but not significantly different from zero, neither before ($p = 0.18$) nor after SIPA became binding (Wald test, $p = 0.06$), which implies that *Medium investments* are no substitute for the signaling value of *Large investments.*

For our Greenrocket control group, the results from the baseline regression in column 3 in Table 3 indicate that, unlike on Companisto, *Medium investments* ($p < 0.05$) instead of *Large investments* have a signaling value, which is, however, economically small, with additional investments of only 23 EUR. We confirm the L-shaped distribution of investments, finding significantly higher funding amounts during the first and second week, which is in line with the investment pattern at Companisto. Including the *PostSIPA* dummy in column 4 reveals that *Medium investments* are positively correlated with funding after but not before SIPA became binding (Wald test, $p < 0.05$). Note that estimating the interaction of *PostSIPA* × *Large investments* is not possible, because on Greenrocket, no investment above 10,000 EUR was made before SIPA became binding.

These results are also reflected in the DID model in column 5 in Table 3, which pools the Companisto and Greenrocket data. At Companisto, before SIPA *Large investments* are correlated with more subsequent funding ($p < 0.01$), while *Medium investments* are not ($p = 0.31$). After SIPA became binding, *Large investments* and subsequent funding are again no

longer correlated ($p = 0.87$),[16] while *Medium investments* are ($p < 0.01$). At Greenrocket, *Large investments* again are not correlated with subsequent funding, while there is a positive correlation of *Medium investments* with subsequent investment after SIPA ($p < 0.01$) and a negative one before SIPA became binding ($p < 0.05$). We find no indication of a general time trend, neither at Companisto nor at Greenrocket, given that the *Year* variable is non-significant in all specifications.

Our findings remain robust to three different regression models specifying placebo *PostSIPA* dummies for July 3 in the years 2013, 2014 and 2016 respectively.[17] We find that in 2013 and 2014 *Large investments* are still correlated with more subsequent funding even after July 3 of the respective year, while in 2016 this is no longer the case. We consider this as additional evidence that a structural break occurred in the year 2015, the year SIPA became binding.

In summary, our regression results indicate a positive effect of *Large investments* on subsequent funding for Companisto before but not after SIPA became binding. At Greenrocket, we find a positive correlation between *Medium investments* on subsequent funding after but not before SIPA became binding and no effect for *Large investments*. Thus, we conclude that SIPA had a substantial impact on the signaling value of *Large investments* in Germany.

5.3. Cluster analysis

In a next step, we investigate whether investors can be classified as *Casual Investors*, *Crowd Enthusiasts*, and *Sophisticated Investors* in line with Goethner et al. (2020). Similar to them, we apply a two-stage clustering procedure combining Ward's minimum-variance method with non-hierarchical *k*-means clustering and use the following input variables to identify distinct investor types: *#Projects*, or the number of projects in a crowd investor's portfolio; *Average Investment*, or the average investment amount of a crowd investor; *Prior Investors*, or the average number of prior investors who invested earlier in the focal project; *Comments*, or the average number of comments an investor posted; and *Innovativeness*, or the average innovativeness of an investor's portfolio according to information taken from the project pages

[16] *Large investments* (7-day lag) × *PostSIPA* × *Companisto* cannot be identified, because (1) there are no large investments on Greenrocket before SIPA and (2) the triple interaction collapses to the interaction *Large investments* (7-day lag) × *PostSIPA*. Because *Large investments* (7-day lag) × *PostSIPA* × *Companisto* and *Large investments* (7-day lag) × *PostSIPA* are identical and suffer from perfect multicollinearity, we cannot identify *Large investments* (7-day lag) × *PostSIPA* × *Companisto*.

[17] These results are available upon request.

on Companisto.[18] To investigate whether SIPA affects our crowd investor categorization, we split our data into two samples; the first contains all investments made before SIPA became binding and the second consists of investments of the investors who joined the platform after SIPA became binding. Input variables for the cluster analyses are generated for each sample separately.

In Table 4, we report the two samples' final cluster solutions derived from the *k*-means clustering procedure and provide descriptive statistics for the input variables included in the cluster analysis for each of the identified clusters. From the pre-clustering procedure (Jiang et al., 2001), we identified 102 investors as outliers (56 in the pre-SIPA sample and 46 in the post-SIPA sample) and subsequently excluded them from the analyses. We also dropped investments for a real estate campaign ("Weissenhaus") from the cluster analysis because the campaign attracted uncharacteristically high investments.

For the pre-SIPA sample, the three crowd investor clusters and their distinct characteristics are similar to those in Goethner et al. (2020), which is why we adopt their terminology. *Casual Investors* comprise 60.0% of the pre-SIPA sample. They invest rather small amounts in less innovative projects. Moreover, the small average number of prior investors suggests *Casual Investors'* comparatively low sense for community when making their investments. This group of crowd investors seem to primarily pursue financial interests, adopting a relatively risk-averse investment strategy of diversification. *Crowd Enthusiasts* make up 35.1% in the pre-SIPA sample. They are characterized by the highest level of average innovativeness of their project portfolio and by the highest number of prior investors per project. *Crowd Enthusiasts* are influenced by a strong sense of community. Finally, *Sophisticated Investors* (4.9%) make by far the highest average investments, which are more than ten times larger than those of *Casual Investors* and *Crowd Enthusiasts*.

--INSERT TABLE 4 HERE--

For the sample of post-SIPA investors, our cluster analysis results in three distinct investor types as well. In line with Goethner et al. (2020), the largest cluster (51.7%) is again characterized by the fewest prior investors, lowest average portfolio innovativeness, and lowest

[18] We consider a project innovative if (1) intellectual property protection, such as patents or trademarks, has been applied for, (2) the project pursues a significant R&D strategy, (3) the project serves a market with no direct competitors, or (4) the project is the only supplier of the service or product on the market.

investment amount. The second cluster (37.2%) again features the highest level of innovativeness and most previous investors; this investor type invests in the most projects. Investors from the third cluster (11.1%) pledge the highest average investment amounts. Overall, the identified investor types who joined Companisto after SIPA became binding are not identical but very similar in type to those identified before SIPA became binding.

While our identification of investor types is comparable to results Goethner et al. (2020) obtain, it might be argued that the clusters we define are not valid representations of these groups. We therefore provide additional evidence for the robustness of our categorization for *Sophisticated Investors*. According to the definition, sophisticated investors are more likely to become members of the so-called Companisto Business Club (CBC). We thus collected information about the Companisto ranking of investors at the time of their investments.[19] Accordingly, we can identify the most active investors (those with a ranking), including investors who are most likely CBC members (the 10% of investors with the highest ranking). By analyzing the overlap between the Companisto ranking data and our investor categorization, we found that the share of investors who obtained a ranking is equally large for the three clusters (i.e., 9.3% of the *Casual Investors*, 9.9% of the *Sophisticated Investors*, and 10.8% of the *Crowd Enthusiasts*). Moreover, *Sophisticated Investors* are indeed over-represented among the top 10% of ranked investors; 45.2% of the *Sophisticated Investors* with a Companisto ranking also obtained the highest rank. For *Casual Investors* and *Crowd Enthusiasts*, this share is only 6.9% and 10.5%, respectively.

Moreover, it might be argued that *Casual Investors* or *Crowd Enthusiasts* actually constitute a different group that was previously identified in the literature—namely, family and friends. We follow Agrawal et al.'s (2015) approach and identify family and friends if (1) they invest in the focal startup before investing in any other startup, (2) their investment in the focal startup is their largest investment, and (3) they invest in no more than three other startups. We find that family and friends are equally distributed among all our investor types (i.e., 65.5% of the *Casual Investors*, 65.6% of the *Crowd Enthusiasts*, and 61.5% of the *Sophisticated Investors*). Therefore, we conclude that we did not wrongly classify one of our three investor types, because

[19] Companisto ranks investors by the number of investments made, the invested amount, and the completeness of their profile, among other factors. Investors with the highest ranking can become members of the CBC. Note that we could not directly collect information on membership in the CBC, because collecting such data *ex post* is not possible; we thus took the indirect route through investor ratings.

family and friend investors are represented among all three.

--INSERT TABLE 5 HERE--

Table 5 also shows the final cluster solutions for Greenrocket using the same input variables. We find a similar pattern of results to that in the Companisto data. For both the pre- and post-SIPA samples, the *k*-means clustering procedure suggests three different crowdinvestor types. However, the three crowdinvestor types cannot be distinguished from one another as clearly as in the Companisto data.

5.4. Analysis of investor types before and after SIPA

To test Hypothesis 3, we next investigate whether the different investor types that we identified in the cluster analysis have adjusted their investment behavior after SIPA became binding. Our pre-SIPA cluster analysis identified 5,350 *Casual Investors*, 3,133 *Crowd Enthusiasts*, and 440 *Sophisticated Investors*. These investors made 16,821, 9,259, and 1,306 investments before and 6,568, 2,109, and 905 investments after SIPA became binding, respectively. Our cluster analysis of investors who joined Companisto after SIPA resulted in 1,039 *Casual Investors*, 747 *Crowd Enthusiasts*, and 224 *Sophisticated Investors*, who invested 1,988, 3,348, and 428 times, respectively. We run ordinary least squares (OLS) panel regressions on the investor level with the invested amount as the dependent variable. The cross-sectional dimension of the panel refers to investors, while the time dimension is the number of investments made by the respective investor. Thus, our regression specification controls for time-constant investor-specific effects such as investor gender. The explanatory variables are dummy variables for the three investor types we identified in the cluster analysis (i.e., *Casual Investors*, *Crowd Enthusiasts*, and *Sophisticated Investors*) for the period before SIPA and those categorized after SIPA, as well as a *PostSIPA* dummy. Investments for which no investor type could be identified constitute the reference group. This setup allows us to compare the extent to which the behavior of different investor type not only changes over time (before and after SIPA) but also differs across investment type.[20]

[20] Our analysis does not intend to make causal claims about the relationship between investor type and the invested amount; the investor type is a causal result of the cluster analysis, which uses the investment amount as input. Rather, the goal is a comparison of investor type behavior before and after SIPA.

--INSERT TABLE 6 HERE--

Table 6 reports the results of the regressions. Our first specification in column 1 begins with the three investor types we identified before and after SIPA became binding and the *PostSIPA* dummy. In column 2, we add interactions for the investor types before SIPA became binding with *PostSIPA.* In column 3, we report variance inflation factors, all of which are less than 4, indicating that multicollinearity is not a serious concern. The coefficient for *Sophisticated Investors* is positive and significant ($p < 0.01$), while the coefficients for *Crowd Enthusiasts* and *Casual Investors* are both negative and significant ($p < 0.01$). On average, *Sophisticated Investors* have invested around 3,000 EUR more than the reference category, while *Crowd Enthusiasts* and *Casual Investors* have invested 179 EUR and 311 EUR less before SIPA, respectively. We find a similar pattern for *Casual Investors*, *Crowd Enthusiasts*, and *Sophisticated Investors* we identified after SIPA became binding.

In a next step, we investigate whether investors who were classified as *Casual Investors*, *Crowd Enthusiasts*, and *Sophisticated Investors* before SIPA changed their investment behavior after the law became binding (Table 6, column 1). The *PostSIPA* dummy is as such not significant. The interaction of *PostSIPA* with *Sophisticated Investors* is significantly negative ($p < 0.01$), while the interactions with *Crowd Enthusiasts* and *Casual Investors* are positive ($p < 0.01$). This indicates that *Sophisticated Investors* reduced their investment after the SIPA became binding, which is in line with our findings in Section 5.1. and supports Hypothesis 3. Finally, the coefficients for *Sophisticated Investors after SIPA*, *Crowd Enthusiasts after SIPA*, and *Casual Investors after SIPA* remain largely unaffected by the inclusion of the interaction terms.

To test Hypothesis 3, whether SIPA led to changes of the invested amount by different investor types, we need to jointly test the effect of our explanatory variables and the PostSIPA dummy using Wald tests. We find a tendency to increase investments for our initial *Crowd Enthusiasts* (by 242 EUR) and *Casual Investors* (by 166 EUR) after SIPA became binding (both $p < 0.01$). However, *Sophisticated Investors* tend to decrease their investments by 1,795 EUR after the SIPA became binding ($p < 0.01$). Furthermore, all investor types who joined the platform after SIPA invested significantly more (Wald tests, $p < 0.05$) than their pre-SIPA counterparts did before the SIPA became binding (*Casual Investors* 194 EUR, *Crowd Enthusiasts* 73 EUR, *Sophisticated Investors* 939 EUR). Finally, post-SIPA investments are not significantly different in the case of *Casual Investors* categorized before versus after SIPA (Wald test, $p >$

0.10) or in the case of *Crowd Enthusiasts* ($p > 0.19$), but they are for *Sophisticated Investors* (-2,888 EUR, $p < 0.01$), which is further evidence for Hypothesis 3. Furthermore, we find that *Crowd Enthusiasts* and *Casual Investors* categorized before SIPA tend to increase their investments after SIPA became binding. Taking the negative post-SIPA coefficient into account, for all investor types Wald tests show that investors who joined the market after SIPA invested significantly more ($p < 0.05$) than their pre-SIPA counterparts. Wald tests also show that post-SIPA investments are not significantly different for *Casual Investors* categorized before versus after SIPA ($p > 0.10$) and likewise for *Crowd Enthusiasts* ($p > 0.19$).

In summary, the cluster analysis shows that the introduction of SIPA induced *Crowd Enthusiasts* and *Casual Investors*, whom we consider small investors, to increase investment amounts and likewise for both those who already joined Companisto before SIPA became binding and those who joined afterward. Moreover, SIPA led *Sophisticated investors* to substantially reduce their investments or to leave the portal altogether. To fill this gap, a new generation of *Sophisticated investors* has entered the market.

6. Discussion and future research

An alternative explanation for our findings could be that the legal changes not only triggered changes in investor behavior but also affected issuers and platforms. While we cannot completely rule out this explanation from an empirical perspective, in this section we provide several arguments for why behavioral responses of issuers and platforms operators seem highly implausible.

First, it could be argued that regulators imposed extra scrutiny on platforms, and platform operators consequently changed their behavior after SIPA. ECF platforms may, for example, be extra cautious about avoiding scandals. Cumming et al. (2019b) find that in ECF, due diligence is related to legislation requirement, platform size, and type or complexity of crowdfunding campaigns. In our setting, ECF platforms are legally not required to conduct due diligence or to carry out background checks. This is because they are *Internet portals* that help broker investments, but they do not advise clients on financial products in any form. Consequently, ECF platforms are only subject to trade regulation pursuant to §34c paragraph 1 no. 2 and §34f of the German Trade Regulation Act. ECF platforms are not required, for example, to obtain a banking license under the German Banking Act because they typically

make use of the exemption of §2 paragraph 6 no. 8 lit. e). Likewise, the German Capital Investment Regulation does not cover typical ECF models. These essential regulations did not change because of SIPA. Moreover, the type and size of the platforms have not changed significantly after SIPA, indicating that behavioral responses by issuers and platform operators are highly unlikely.

An alternative platform-related explanation for our findings could be that sophisticated investors have realized that other platforms and matching mechanisms are more appropriate. They also could have found the platform fees high and the platform governance mechanisms weak. While investors might always come to these conclusions, to explain our findings, sophisticated investors would need to change their perception about platform fees precisely at the time SIPA became binding while all other investor groups did not. While that might be the case, it seems unlikely that sophisticated investors have been accepting portal fees and, at some point, jointly changed their evaluation of platform fees while other investors did not.

Second, it could be argued that our treatment and control groups are not perfect, in that we did not randomly attribute investors to them and the control group was not entirely unaffected given the changes in the Austrian Alternative Financing Law at the time SIPA became binding. We do not claim to have found a perfect natural experiment but believe that Austria constitutes a valuable benchmark. This is because the Austrian legislator did not implement regulatory measures in the opposite direction of the German legislator; policy measures have been similar but have a weaker intensity in Austria. For example, Austria did not establish a hard cap, but flexibly limits investments of sophisticated investors depending on their assets and income. Thus, it might be argued that our empirical analysis captures the differential regulatory effect between the two countries. Precisely for that reason our coefficients constitute conservative measures or lower bounds, which would become larger if we had a perfect control group at hand that was not affected at all by any regulatory measures.

To rule out the possibility that structural differences between Companisto and Greenrocket invalidate comparing these two platforms and attributing differences to SIPA, we investigate differences in the characteristics of projects on both platforms. Table 7 shows that projects are quite similar in their funding goal, the duration of the campaigns, and the number of granted patents but differ in terms of industry sectors of the campaigns and the size of the founder teams. Indeed, these differences are not surprising and most likely due to Greenrocket's SEE

orientation. Moreover, for the project characteristics that differ (i.e., industry dummies and founder team size), we find that the differences between the two platforms persist over time, indicating common trends (i.e., project characteristics before and after SIPA do not significantly differ; see Table 7, columns 4 and 9). Overall, this provides additional evidence that we can largely rule out structural differences between Companisto and Greenrocket as alternative drivers of the change in investment behavior that we observe after SIPA became binding.

--INSERT TABLE 7 HERE--

Third, the majority of investors are German and do not invest from abroad. Hornuf et al. (2020b) report that less than 10% of the investments from Companisto and Innovestment come from abroad. However, to use the exemptions from the Investment Act, platforms and issuers must ensure that investors adhere to the regulations implemented through SIPA. In other words, it does not matter whether investors invest their money via an LLC based in London with the aim to circumvent the 10,000 EUR threshold. Likewise, foreign investors need to disclose their income and wealth when they invest more than 1,000 EUR, which indicates that foreign investors are not the source of our findings. To further test the robustness of our results, we extended our descriptive analysis to Seedmatch,[21] the second-largest German ECF platform. We obtained 17,277 observations between August 2011 and December 2017 from 109 campaigns. The analysis of the invested amount is in line with our findings from Companisto. Before SIPA, 62.9% of the investments were below 1,000 EUR, 14.8% at exactly 1,000 EUR, and 22.3% were above 1,000 EUR. After SIPA, investments below 1,000 EUR dropped to 53.9% ($p < 0.01$), investments of exactly 1,000 EUR increased to 24.1% ($p < 0.01$), and investments above 1,000 EUR remained unchanged ($p = 0.74$).

Another question emerging from our observation that SIPA affects investment amounts is whether there are also economic effects for the ECF market as such. To provide an answer, we run two types of analyses. First, we investigate whether SIPA affects the duration of an ECF campaign and, second, whether the new law changes the amount of capital that can be raised per day during a campaign.[22] With respect to the duration of a campaign, our descriptive project level analysis in Table 1 indicates that Companisto campaigns take longer after SIPA than

[21] The data do not allow for a multivariate analysis, because Seedmatch ruled out investments above 10,000 EUR before SIPA became binding, which renders a DID analysis impossible.

[22] The results are available on request from the authors.

before the law became binding. However, an OLS regression with the same controls from our main analysis does not confirm this result. In addition, we test the effect on the capital raised per day. Again, our results do not indicate any difference in the capital raised on a given day before and after SIPA. This is an important finding, given that industry representatives sometimes claim that their funding capacity has been restricted because of policy measures such as SIPA. Taken together, we do not find evidence of a market-wide effect of SIPA on the ECF market as such. We provide first evidence that the disappearance of the original *Sophisticated Investors* is substituted by a new generation of *Sophisticated Investors* who have entered the market after SIPA to fill the gap. Future research might investigate whether the original *Sophisticated Investors* now use a different investment channel (e.g., directly invest in the venture, thereby surpassing ECF platforms) or whether they left the market altogether and also where the new *Sophisticated Investors* come from and why they now enter the market.

7. Conclusions

In this article, we investigate the consequences of SIPA on investment decisions in ECF. SIPA became binding on July 3, 2015, with the goal to protect investors engaging in the new asset class of ECF. In particular, investors pledging more than 1,000 EUR must self-report their income and wealth. Investing more than 10,000 EUR in ECF became possible only through a corporate entity. Similar regulation has been passed around the world.

We find that large investments became generally less frequent, which provides first evidence that more sophisticated investors have left the market. By contrast, medium investments have become more frequent, especially those of precisely 1,000 EUR. We consider this strong evidence that the self-reporting requirement discourages investors from making investments slightly above this threshold. Moreover, the disappearance of large investments affects firms' propensity to tap the ECF market not only directly but also indirectly by removing an important signaling channel for small investors (Hornuf and Schwienbacher, 2018). In our empirical analysis, we find that large investments during a campaign have a positive signaling effect on subsequent funding before SIPA became binding. The signaling value of large investments no longer exists after SIPA became binding, which is due to the reduction of sophisticated investors investing larger amounts. We find that medium investments are to some extent now being employed as a new signaling channel, which might, however, not provide the same signal

quality as large investments by sophisticated investors. Consequently, unsophisticated investors might need more protection through regulation.

Our analysis of investor types before and after SIPA became binding reveals that they stay rather similar before and after the legislative change. In line with Goethner et al. (2020), investors at Companisto and Greenrocket can be classified in three groups even after SIPA became binding: *Casual Investors*, *Crowd Enthusiasts*, and *Sophisticated Investors*. However, we find that the investor behavior of the respective types has changed. *Casual Investors* categorized before SIPA became binding tended to invest more, while the original *Sophisticated Investors* left the market after SIPA became binding, with those who continue investing pledging smaller amounts. After SIPA became binding, a new generation of *Sophisticated Investors* has entered the market to fill this gap.

Our results yield some first insights into regulatory initiatives that have been enacted in many jurisdictions, not only in Germany. Many jurisdictions have limited the amount that an investor may invest in the same issuer on the ECF markets. Such legislation may in some cases have a negative impact on the investment decisions of small investors, because they do not base their investment decisions solely on the campaign characteristics of the respective issuer and their portfolio needs but also on the question whether or not to disclose information about their personal wealth and income. Moreover, given that investors in ECF often have to rely on simple and easily observable information signals (Block et al. 2018b), limiting investment amounts of natural persons might be counterproductive for investor protection. If small investors have efficiently followed the larger investments by professional investors and these investors have now disappeared, small investors now lack an important source of information when making an investment. These findings might also have important implications for the regulation of traditional capital markets, which often follow cycles of more stringent and more relaxed investor protection measures. Relating investor limits to investor privacy and prohibiting sophisticated investors from investing large amounts may well have unintended effects on ordinary investors.

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Table 1

Summary statistics at the campaign level.

This table shows summary statistics at the campaign level, separated by ECF portal (Panel A Companisto, Panel B Greenrocket). The dummy variable *Funded* (1=Yes) indicates whether the campaign was successful (i.e., whether the funding goal was achieved). The variable *Funding Goal* gives the minimum amount of money (in EUR) below which the campaign is unsuccessful and, thus, no securities are issued. *Duration* gives the time length in days of the campaign. *Number of Backers* is the total number of crowd investors who pledged money during the campaign. The variable *Total Amount Pledged* gives the amount of money (in EUR) pledged during the duration of the campaign. *Comments* indicate the total number of comments to a campaign. *Number of Patents* indicates the number of granted patents. *Number of Founders* is the size of the founder team. The last column provides test statistics for the pre-/post-SIPA comparison (ranksum or chi-square tests depending on the variable type).

Panel A: Companisto (n=86 campaigns)

Variable	Mean	Median	Std. Dev.	Min.	Max.	Pre-SIPA mean	Post-SIPA mean	Test statistics
Funded (1=Yes)	.91	1	.29	0	1	.95	.85	0.11
Funding goal (€)	183,802.10	100,000	276,219.10	41,290	2,150,000	191,626	175,000	0.69
Duration (days)	90.31	93	41.06	8	256	83.02	98.50	0.01
Number of backers	721.45	630	408.35	144	2,154	742.44	698.41	0.73
Total amount pledged (€)	495,092.90	265,023	869,532.40	31,080	7,500,000	502,058	487,449	0.06
Comments	181.93	125	219.95	0	1,679	266.4	89.2	0.01
Number of patents	0.69	0	2.56	0	18	0.77	0.61	0.21
Number of founders	4.01	4	1.88	1	8	3.87	4.17	0.46

Panel B: Greenrocket (n=50 campaigns)

Variable	Mean	Median	Std. Dev.	Min.	Max.	Pre-SIPA mean	Post-SIPA mean	Test statistics
Funded (1=Yes)	.74	1	.44	0	1	.94	.65	0.03
Funding goal (€)	182,126.60	75,000	179,584.70	25,000	800,000	120,997	210,781	0.01
Duration (days)	93.94	88	88.11	4	616	120.88	81.26	0.99
Number of backers	199.12	160	149.37	12	831	199	199.18	0.68
Total amount pledged (€)	217,213.30	169,125	172,649.30	6,000	902,450	189,266	230,365	0.23
Comments	24.34	21.5	24.37	1	135	28.31	22.47	0.52
Number of patents	0.64	0	1.22	0	5	0.68	0.62	0.98
Number of founders	2.72	2	2.03	1	13	1.81	3.15	0.02

Table 2
Summary statistics at the investment level.

This table shows summary statistics at the investment level, separated by ECF portal (Panel A Companisto, Panel B Greenrocket). The last column provides test statistics for the pre-/post-SIPA comparison (ranksum or tests depending on the variable type).

Panel A: Companisto (n=62,045 investments)

Variable	Mean	Median	Std. Dev.	Min.	Max.	Pre-SIPA mean	Post-SIPA mean	Test statistics
Amount (€)	686.24	150	3,771	5	500,000	676.22	697.94	0.47
Post-funded (D)	0.459	0	0.498	0	1	0.332	0.608	0.01
Investments of 1,000 EUR (D)	0.081	0	0.273	0	1	0.061	0.104	0.01
Small investments (D)	0.897	1	0.304	0	1	0.915	0.877	0.01
Medium investments (D)	0.098	0	0.298	0	1	0.077	0.123	0.01
Large investments (D)	0.004	0	0.066	0	1	0.008	0.001	0.01
Comment (D)	0.252	0	0.434	0	1	0.359	0.128	0.01
Day of campaign	37.16	20	43.80	0	810	30.33	45.00	0.01
No. obs.	62,045					33,410	28,64	

Panel B: Greenrocket (n=9,956 investments)

Variable	Mean	Median	Std. Dev.	Min.	Max.	Pre-SIPA mean	Post-SIPA mean	Test statistics
Amount (€)	1,090.87	500	2,276	40	150,000	951.08	1,156.59	0.01
Post-funded (D)	0.379	0	0.485	0	1	0.449	0.346	0.01
Investments of 1,000 EUR (D)	0.176	0	0.381	0	1	0.165	0.181	0.06
Small investments (D)	0.787	1	0.410	0	1	0.822	0.770	0.01
Medium investments (D)	0.211	0	0.408	0	1	0.178	0.227	0.01
Large investments (D)	0.002	0	0.044	0	1	0	0.003	0.01
Comment (D)	0.122	0	0.328	0	1	0.142	0.113	0.01
Day of campaign	43.86	14	81.38	0	616	86.91	23.62	0.01
No. obs.	9,956					3,184	6,772	

Table 3
Regressions on investment dynamics.

This table shows results of panel regression specifications with the aggregated investment amounts for a given campaign day as the dependent variable. The first column shows results of a baseline regression, and the second column distinguishes between the time before and after SIPA became binding. The last column presents results for a DID specification based on a pooled sample of Companisto and Greenrocket campaigns. There are 8,544 campaign-day observations for Companisto and 4,191 for Greenrocket. Standard errors are in parentheses. Significance levels (for coefficient being different from 1): * < 10%, ** < 5%, *** < 1%.

	Companisto		Greenrocket		All
	1: Baseline	2: Post-SIPA	3: Baseline	4: Post-SIPA	5: Post-SIPA
Medium investments (7 day lag)	66.42***	37.79	22.61**	-33.42***	-36.43***
	(21.79)	(28.14)	(9.59)	(8.18)	(7.74)
Large investments (7 day lag)	1,620.19***	1,798.38***	-352.59	-268.76	1,414.41
	(204.72)	(113.04)	(369.79)	(438.84)	(938.76)
First week	2,314.96***	2,507.89***	2,067.26***	2,064.88***	2,084.36***
	(629.66)	(595.79)	(259.00)	(249.11)	(251.48)
Second week	-203.20	-149.73	693.59***	661.68***	677.62***
	(264.39)	(249.91)	(170.07)	(156.80)	(156.85)
Herding (7 day lag)	-0.04**	-0.04***	0.02	0.06***	0.07***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Funding target (in 1,000 EUR)	5.02**	5.09**	3.04***	3.20***	3.15***
	(1.99)	(2.023)	(0.61)	(0.68)	(0.73)
Post funded	4,606.40***	4,598.66***	1,222.43***	1,199.45***	1,205.39***
	(1,262.82)	(1,262.22)	(194.85)	(186.07)	(190.91)
Number of patents	-43.32	-37.65	84.91	75.81	-48.45
	(31.14)	(34.88)	(64.76)	(64.92)	(45.31)
Number of founders	-89.95	-77.70	-53.02	-52.59	-60.87
	(65.47)	(67.03)	(36.09)	(34.56)	(41.46)
Year	-162.28*	-135.05	-38.39	-109.46	-80.33
	(83.43)	(107.46)	(58.94)	(93.76)	(107.84)
PosSIPA		-416.11		336.30	380.91
		(371.25)		(218.97)	(246.53)
PostSIPA × Medium investments (7 day lag)		17.79		64.56***	66.72***
		(44.69)		(10.76)	(10.49)
PostSIPA × Large investments (7 day lag)		-1,580.80*		-	-1,577.37*
		(860.12)		-	(815.83)
PostSIPA × Herding (7 day lag)		0.05***		-0.05***	-0.06***
		(0.01)		(0.02)	(0.02)

Companisto					440,635.81
					(562,638.33)
Companisto × Medium investments (7 day lag)					59.22**
					(26.24)
Companisto × Large investments (7 day lag)					314.78
					(931.65)
Companisto × First week					1,231.65
					(1,156.70)
Companisto × Second week					-503.36**
					(256.57)
Companisto × Herding (7 day lag)					-0.12***
					(0.02)
Companisto × Funding target (in 1,000 EUR)					3.61**
					(1.83)
Companisto × Post funded					6,030.28**
					(2,838.42)
Companisto × PostSIPA					1,349.13
					(1,296.39)
Companisto × Year					-219.28
					(279.68)
PostSIPA × Companisto × Medium investments (7 day lag)					-16.64
					(36.11)
PostSIPA × Companisto × Large investments (7 day lag)					-
					-
PostSIPA × Companisto × First week					-1,413.29
					(1,171.09)
PostSIPA × Companisto × Second week					-321.53
					(377.19)
PostSIPA × Companisto × Herding (7 day lag)					0.11***
					(0.02)
PostSIPA × Companisto × Funding target (in 1,000 EUR)					-5.65***
					(1.80)
PostSIPA × Companisto × Post funded					-4,355.43
					(2,897.36)
Constant	326,754.90*	271,943.29	77,389.28	220,384.94	161,807.44
	(168,024.52)	(216,270.84)	(118,740.68)	(188,803.71)	(217,175.28)
Industry dummies	yes	yes	yes	yes	yes
Observations	8,544	8,544	4,191	4,191	12,735

Table 4

Characteristics of the three clusters according to investment behavior at Companisto.

This table shows the final cluster solutions based on individual investment behavior at Companisto, separated by the date of the introduction of SIPA (Panel A before SIPA, Panel B after SIPA). *#Projects* is the number of projects in a crowd investor's portfolio. *Average Investment* is the average investment amount of a crowd investor. *Prior investors* indicate the average number of prior investors per project in the investor's portfolio. *Comments* are the average number of comments an investor posted. *Innovativeness* measures the average innovativeness of an investor's portfolio.

Panel A: Sample 1 (all investments made before introduction of SIPA)

	Mean values (SD)							
Clustering variables	Cluster 1 (n = 5,350)		Cluster 2 (n = 3,133)		Cluster 3 (n = 440)		ANOVA F-value[a]	Post-hoc mean difference test (Duncan)[b]
#Projects	2.79	(3.77)	2.29	(2.36)	2.37	(2.53)	24.28***	1 > 2, 3
Average investment	201.59	(271.86)	322.57	(380.44)	3,353.05	(1,472.48)	10073.01***	3 > 1, 2; 2 > 1
Prior investors	665.27	(187.58)	1,414.52	(282.21)	1,035.42	(423.74)	9610.06***	3 > 1; 2 > 1, 3
Comments	0.34	(0.43)	0.32	(0.42)	0.31	(0.42)	2.28	
Innovativeness	25.86	(35.95)	56.82	(42.16)	46.59	(43.01)	647.61***	3 > 1; 2 > 1, 3
Population (%)	59.96		35.11		4.93			
Cluster label	*Casual Investors*		*Crowd Enthusiasts*		*Sophisticated Investors*			

Panel B: Sample 2 (investments of investors who joined after SIPA)

	Mean values (SD)							
Clustering variables	Cluster 1 (n = 1,039)		Cluster 2 (n = 747)		Cluster 3 (n = 224)		ANOVA F-value[a]	Post-hoc mean difference test (Duncan)[b]
#Projects	2.31	(2.36)	3.04	(2.64)	1.69	(1.31)	36.04***	1 > 3, 2 > 1, 3
Average investment	400.30	(420.55)	412.31	(438.41)	3,449.98	(1,532.17)	2177.14***	3 > 1, 2
Prior investors	165.85	(127.07)	1,014.64	(291.09)	432.84	(428.86)	2609.47***	3 > 1; 2 > 1, 3
Comments	0.14	(0.30)	0.10	(0.25)	0.09	(0.25)	4.44*	1 > 2, 3
Innovativeness	52.22	(42.03)	67.42	(33.18)	54.30	(44.50)	33.70***	2 > 1, 3
Population (%)	51.69		37.16		11.14			
Cluster label	*Casual Investors*		*Crowd Enthusiasts*		*Sophisticated Investors*			

Note. [a] ***$p < 0.001$, *$p < 0.05$. [b] $p < 0.05$.

Table 5
Characteristics of the three clusters according to investment behavior at Greenrocket.

This table shows the final cluster solutions based on individual investment behavior at Greenrocket, separated by the date of the introduction of SIPA (Panel A before SIPA, Panel B after SIPA). *#Projects* are the number of projects in a crowd investor's portfolio. *Average Investment* is the average investment amount of a crowd investor. *Prior investors* indicate the average number of prior investors per project in the investor's portfolio. *Comments* are the average number of comments an investor posted. *Innovativeness* measures the average innovativeness of an investor's portfolio.

Panel A: Sample 1 (all investments made before introduction of SIPA)

	Mean values (SD)							
Clustering variables	Cluster 1 (n = 951)		Cluster 2 (n = 350)		Cluster 3 (n = 58)		ANOVA F-value[a]	Post-hoc mean difference test (Duncan)[b]
#Projects	2.23	(2.63)	2.12	(2.36)	2.16	(2.31)	0.79	
Average investment	440.34	(209.02)	1,521.94	(593.88)	4,561.21	(607.63)	4067.64***	3 > 1, 2; 2 > 1
Prior investors	398.50	(256.47)	290.60	(187.29)	359.20	(239.59)	25.94***	1, 3 > 2
Comments	0.17	(0.34)	0.16	(0.38)	0.17	(0.35)	0.07	
Innovativeness	55.39	(43.73)	71.32	(38.91)	61.62	(42.61)	18.04***	2 > 1
Population (%)	69.98		25.75		4.27			
Cluster label	*Casual Investors*		*Crowd Enthusiasts*		*Sophisticated Investors*			

Panel B: Sample 2 (investments of those investors who joined after SIPA)

	Mean values (SD)							
Clustering variables	Cluster 1 (n = 1,691)		Cluster 2 (n = 978)		Cluster 3 (n = 362)		ANOVA F-value[a]	Post-hoc mean difference test (Duncan)[b]
#Projects	2.37	(2.76)	1.92	(2.09)	1.61	(1.76)	19.85***	1 > 2, 3; 2 > 3
Average investment	423.24	(163.63)	1,304.76	(408.89)	3,666.49	(1,022.66)	8265.18***	3 > 1, 2; 2 > 1
Prior investors	340.78	(235.73)	335.85	(212.83)	323.07	(214.74)	0.94	
Comments	0.13	(0.31)	0.14	(0.33)	0.20	(0.38)	6.30**	3 > 1, 2
Innovativeness	45.46	(41.75)	43.37	(43.56)	49.39	(45.76)	2.65	
Population (%)	55.79		32.27		11.94			
Cluster label	*Casual Investors*		*Crowd Enthusiasts*		*Sophisticated Investors*			

Note. [a] ***$p < 0.001$, **$p < 0.01$. [b] $p < 0.05$.

Table 6

Regressions on the invested amount at Companisto.

This table shows results of OLS panel regressions with the invested amount as the dependent variable. The first column shows results of a specification without interaction terms, while the second column includes them. The last column provides variance inflation factors for the regressors. There are 60,362 observations. Standard errors are in parentheses. Significance levels (for coefficient being different from 1): * < 10%, ** < 5%, *** < 1%.

	1: Baseline		2: With Interactions		3: Variance Inflation Factor
Sophisticated Investor	2,983.54***	(149.97)	3,409.64***	(152.44)	2.04
Crowd Enthusiast	-178.57***	(30.54)	-217.37***	(37.28)	2.66
Casual Investor	-311.82***	(28.95)	-368.71***	(36.40)	3.50
Post SIPA	-36.27	(28.32)	-76.86*	(40.30)	3.92
Sophisticated Investor after SIPA	4,414.11***	(372.21)	4,425.53***	(374.68)	1.02
Crowd Enthusiast after SIPA	-83.25***	(29.56)	-66.99**	(31.42)	1.18
Casual Investor after SIPA	-113.47***	(28.27)	-98.00***	(30.18)	1.11
Sophisticated Investor x Post SIPA			-1,872.32***	(215.58)	1.93
Crowd Enthusiast x Post SIPA			243.26***	(81.11)	1.73
Casual Investor x Post SIPA			318.61***	(47.57)	2.77
Constant	558.74***	(29.89)	584.21***	(36.07)	-
Observations	60,362		60,362		60,362
R^2	0.14		0.16		

Table 7

Mean differences in project characteristics between Companisto and Greenrocket.

The first and second columns report mean values and shares. The third column provides mean difference test statistics (t-tests or chi-square tests depending on the variable type). Columns 1–3 compare project characteristics between Companisto and Greenrocket. For significantly different project characteristics, columns 4–6 and 7–9 further report mean difference tests for Companisto and Greenrocket separately, comparing mean values before and after SIPA. ***p < .01 indicate significantly different means.

	Total Sample			Only Companisto			Only Greenrocket		
	1: Companisto	2: Greenrocket	3: Mean differences	4: Pre-SIPA	5: Post-SIPA	6: Mean differences	7: Pre-SIPA	8: Post-SIPA	9: Mean differences
Funding goal	183,802.10	182,126.60	1,675.50	191,626.22	175,214.68	16,411.54	120,996.67	210,781.25	-89,784.58*
Duration	90.31	93.94	-3.63	83.02	98.50	-15.48**	120.88	81.26	39.61*
Number of patents	0.69	0.64	0.06	0.77	0.61	0.16	0.68	0.62	0.06
Number of founders	4.01	2.72	1.29***	3.87	4.17	-0.30	2.61	3.15	-0.54
Industry									
Arts, entertainment, and recreation	0.03	0.00	0.03	0.07	0.00	0.07	0.00	0.00	0.00
Financial and insurance services	0.07	0.00	0.07	0.07	0.07	0.00	0.00	0.00	0.00
Health and social services	0.04	0.04	0.00	0.02	0.07	-0.05	0.00	0.06	-0.06
Professional, scientific, and technical services	0.10	0.16	-0.06	0.09	0.12	-0.03	0.31	0.09	0.22**
Real estate	0.01	0.00	0.01	0.02	0.00	0.02	0.00	0.00	0.00
Energy supply	0.01	0.26	-0.25***	0.00	0.02	-0.02	0.19	0.29	-0.10
Hospitality and catering services	0.01	0.14	-0.13***	0.00	0.02	-0.02	0.13	0.15	-0.02
ICT	0.26	0.08	0.18***	0.31	0.22	0.09	0.06	0.09	-0.03
Manufacturing sector	0.07	0.32	-0.25***	0.11	0.02	0.09	0.31	0.32	-0.01
Trade, maintenance, and repair of motor vehicles	0.37	0.00	0.37***	0.31	0.47	-0.16	0.00	0.00	0.00
Number of observations	86	50		45	41		16	34	

Fig. 1. Distribution of invested amount by portal before/after SIPA became binding (top Companisto, bottom Greenrocket).