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RESEARCH ARTICLE

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Blood diamonds? Responses of open-source software developers to the Facebook–Cambridge Analytica scandal

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Abstract

Research Summary: Corporate scandals often create moral struggles for ecosystem stakeholders who collaborate with scandal-tainted firms on mutually beneficial projects. We examine how these stakeholders navigate their relationships with such firms. Drawing on cognitive dissonance theory, we posit that stakeholders typically withdraw from such collaborations after a scandal. However, if stakeholders continue their engagement, they tend to emphasize the importance of collaborative projects and counterintuitively increase their project contribution. Stakeholders' responses depend on their choice space for comparable projects and their social embeddedness in the focal projects. By examining the Facebook–Cambridge Analytica scandal and the contribution of open-source software (OSS) developers to Facebook projects with a difference-in-differences approach, we find supporting evidence for our hypotheses. Our study contributes to the stakeholder management literature with practical implications.

Managerial Summary: Firms are increasingly adopting ecosystem strategies and engaging diverse

stakeholders for value creation. Managers must therefore consider how to maintain stakeholder engagement when adverse events occur. In this study, we examine the reactions of OSS developers to the Facebook–Cambridge Analytica scandal of 2018. We found that after the scandal, OSS developers with more project choices and less social embeddedness in Facebook projects were more likely to disengage from Facebook. Interestingly, however, developers who continued their engagement with Facebook projects tended to rationalize their continued involvement and surprisingly increased their commitment to those projects. This unusual effect suggests that stakeholder retention not only ameliorates the negative effects of scandals but also has positive outcomes, thus warranting the allocation of extra resources from scandal-tainted firms.

KEYWORDS

cognitive dissonance, corporate scandal, open innovation, open source, stakeholder engagement

1 | INTRODUCTION

Firms are increasingly aware of the importance of creating vibrant ecosystems. Therefore, they involve stakeholders in collaborative projects and initiatives for innovation (Jacobides et al., 2018), product development (Stonig et al., 2022), and other value-creation activities (Barney, 2018). While stakeholders derive instrumental rewards or ideological fulfillment from such collaborations, the firms behind these collaborations may fail these stakeholders by being involved in corporate scandals (McDonnell et al., 2021), which often create moral struggles for stakeholders in corporate ecosystems. Understanding how ecosystem stakeholders react to corporate scandals helps firms design their stakeholder engagement strategies and revitalize their ecosystem development.

Existing research on stakeholder management has primarily focused on disengagement as a response to corporate scandals (Jensen, 2006; McDonnell et al., 2021), arguing that stakeholders withdraw from scandal-tainted firms due to value violations or stigmatization concerns. However, recent studies have revealed more nuanced reactions from individual ecosystem stakeholders. As these stakeholders often have instrumental or ideological goals tied to the projects of scandal-tainted firms, their responses to corporate wrongdoings are intricate (Barnett, 2014; Frandsen & Morsing, 2022). We therefore ask two important questions. First, in what situations do ecosystem stakeholders (not) sustain their engagement after a corporate scandal? Second, if they sustain their engagement, how do they deal with the struggle of working with a now tainted firm?

To answer these questions, we adopt a cognitive perspective and draw insights from cognitive dissonance theory (Festinger, 1957). We posit that a corporate scandal is likely to cause cognitive dissonance among stakeholders who contribute to projects led by a tainted firm because their positive views of the projects conflict with their negative perceptions of the firm. To reduce this dissonance, stakeholders tend to disengage from the firm, but this response is contingent on their choice space for comparable and contributable projects and their social embeddedness in the focal projects. If stakeholders continue their engagement (hereafter referred to as "continuing stakeholders"), they are still motivated to alleviate the discomfort of working with a tainted firm. We theorize that continuing stakeholders tend to enhance their evaluation of the focal projects to reduce dissonance, thereby increasing their project contribution. This propensity to increase their contribution becomes stronger if continuing stakeholders have a larger choice space or if they are more socially embedded in the focal projects.

To test our hypotheses, we leveraged the context of open-source software (OSS) projects and examined the reactions of OSS developers to a major corporate scandal—the Facebook–Cambridge Analytica (FB-CA) scandal of 2018. OSS has become a key component of the digital ecosystem of many firms, such as Google, Facebook,[1] Intel, and 3M. These firms have launched OSS projects to develop software, attract talent, and promote complementary products, for which OSS developers have been key stakeholders. To explore OSS developers' reactions to the FB-CA scandal, we collected data from GitHub, the world's largest platform that held over 35 million OSS projects (He et al., 2020). To enhance causal inferences, we adopted a difference-in-differences (DiD) approach with two-stage matching. We first paired OSS projects initiated by Facebook (i.e., treatment projects) with similar projects (i.e., control projects) launched by comparable firms, namely Google, Apple, Amazon, and Twitter (hereafter referred to as "GAAT"). We then matched the OSS developers of the treatment projects with those of the control projects and obtained a sample of 4294 paired developers. Comparing the behavior of these paired developers, we found that developer engagement with Facebook projects decreased by 14.5% after the scandal. Interestingly, developers who continued working with Facebook after the scandal behaved differently: they not only sustained their engagement but even increased their contribution. Consistent with our theoretical framework, developers' choice space for comparable projects and their social embeddedness in the focal projects were important contingencies for both the scandal-induced disengagement and the increased contribution of continuing developers.

Our study contributes several insights to the literature on stakeholder management. First, this literature often assumes reciprocity in the stakeholder–firm relationship (e.g., Freeman et al., 2004; Harrison et al., 2010). Although insightful, this perspective does not explain why many stakeholders ignore corporate wrongdoings (Barnett, 2014) and even support tainted organizations (Frandsen & Morsing, 2022). Our research draws attention to the cognitive microfoundations of stakeholder behavior (Bridoux & Stoelhorst, 2014; Felin et al., 2015) and theorizes cognitive dissonance as a key motivator driving ecosystem stakeholders' reactions to corporate scandals. Notably, we predict and show that continuing stakeholders increase rather than decrease their ecosystem commitment, a finding that challenges the common assumption of negative reciprocity in prior studies (McDonnell & Nurmohamed, 2021).

[1]Facebook (now known as Meta) and Twitter (now known as X) were respectively renamed in 2021 and 2022. Because we examined historical events that preceded the renaming of these firms, we referred to them by their original names in this paper.

Second, existing studies on stakeholder management have often assumed implicitly that a stakeholder's decision to interact with a firm is influenced by a singular or dominant perception of the firm (Jensen, 2006; McDonnell et al., 2021). This assumption overlooks the fact that stakeholder engagement is not abstract but linked to specific elements such as projects and products. Therefore, stakeholders' views of a firm and these elements can differ. We examine this disparity by drawing on cognitive dissonance theory and offer novel theoretical implications for stakeholder management research.

Our study also has practical implications for firms that adopt ecosystem strategies for value creation. Understanding stakeholder behavior is essential for steering corporate ecosystems (Altman et al., 2022), especially when firms face adverse events such as scandals. Although it is widely accepted that managers should retain stakeholders to reduce the negative effects of a scandal, our study suggests that stakeholder retention also brings positive outcomes because continuing stakeholders tend to rationalize their continued engagement and strengthen their commitment to collaborative endeavors. Therefore, it is worth allocating extra resources to retain stakeholders to reap these additional benefits.

2 | THEORY AND HYPOTHESES

2.1 | Cognitive dissonance in engaging with a scandal-tainted firm

In this study, we define ecosystem stakeholders as "actors that contribute to the focal offer's user value proposition" (Kapoor, 2018, p. 2) but "with varying degrees of multilateral, non-generic complementarities that are not fully hierarchically controlled" by ecosystem owners (Jacobides et al., 2018, p. 2264). With firms' increasing adoption of ecosystem strategies for value creation, ecosystem stakeholders become critical for many corporate projects and initiatives (Daymond et al., 2023). As corporate control over these stakeholders is non-hierarchical and often loose, ecosystem engagement must be rewarding for them, either instrumentally or ideologically, to attract their contribution (Daymond et al., 2023).

One major challenge for ecosystem development and management is to maintain stakeholder commitment during adverse events such as corporate scandals, but our understanding of how ecosystem stakeholders react to such adverse events is still limited. Prior studies have generally focused on organizational stakeholders and found that they react negatively to corporate wrongdoings and disengage from irresponsible firms. For example, nonprofit organizations terminated their collaborations with oil companies after the BP oil spill scandal (McDonnell et al., 2021). Client firms disengaged from Arthur Andersen after the Enron audit failure (Jensen, 2006). However, recent research has shown that individuals, as ecosystem stakeholders, do not always punish irresponsible firms. These stakeholders sometimes tolerate (Valor et al., 2022) and even show support to (Zavyalova et al., 2016) tainted organizations. Therefore, scholars have called for a closer examination of individual stakeholders' cognitive processes to better understand their varied reactions to corporate scandals (Barnett, 2014).

Responding to this call, we draw insights from social psychology and develop a framework based on cognitive dissonance theory. Cognitive dissonance refers to a cognitive state that arises from the presence of incongruent beliefs, attitudes, emotions, and behaviors (Festinger, 1957). For example, dissonance occurs when a smoker encounters evidence of the harmful health effects of smoking (Festinger, 1957), when a shareholder witnesses a significant drop in the price of their shares (Chang et al., 2016), or when an employee learns about the unethical

behavior of their employer (Frandsen & Morsing, 2022). Such dissonance generates psychological discomfort, which motivates people to take action or adjust their cognition to reduce this dissonance (Festinger, 1957).

Based on cognitive dissonance theory, we posit that a corporate scandal is likely to trigger cognitive dissonance among the ecosystem stakeholders of the implicated firm. On one hand, these stakeholders derive rewards or fulfillment from ecosystem participation. On the other hand, the firm's irresponsible behavior violates the values held by most stakeholders. Their continued collaboration with the tainted firm undermines their self-image as ethical and responsible individuals. This cognitive struggle is well illustrated by the following quote from an OSS developer who has contributed to a Facebook project but has been confronted with Facebook's irresponsible behavior in the FB-CA scandal[2]:

> Like **blood diamonds**, I'm not at all concerned about the suitability of the final product [i.e., OSS projects initiated by Facebook], but rather the process and funding behind its creation.... By embracing Facebook's tools, we're effectively subsidizing those activities [i.e., Facebook's irresponsible behavior], aren't we?

Cognitive dissonance motivates changes in cognition and behavior because it generates psychological discomfort (Festinger, 1957). Given the prominence of corporate scandals and the dissonance they create for ecosystem stakeholders, we anticipate that stakeholders will take action to mitigate this dissonance and develop the following hypotheses.

2.2 | Disengagement and pre-decision contingencies

Previous stakeholder research has shown that a corporate scandal often evokes negative emotions such as anger among stakeholders (Dodson et al., 2023). Although ecosystem stakeholders benefit from collaborating with a tainted firm, we posit that negative emotions tend to dominate their behavior and lead to disengagement, because people's reactions to negative emotions are usually stronger than their reactions to positive ones (Irvin et al., 2022). This type of stakeholder response has been reported in prior research (e.g., Jensen, 2006; McDonnell et al., 2021). Therefore, we propose the following baseline hypothesis:

> **Hypothesis 1.** Stakeholders reduce their participation in an ecosystem project after a scandal involving the project-holding firm.

Cognitive dissonance theory, however, offers nuanced insights into how individuals deal with dissonance. Festinger (1957) has illustrated these insights using a smoker's possible reactions to information indicating that smoking is detrimental for health. To reduce dissonance, the smoker may (1) quit smoking, (2) deny the dissonant information, or (3) continue smoking and reinforce the consonant belief that smoking reduces stress. Therefore, when faced with dissonant information, people may abandon their current behavior or counterintuitively support it through cognitive changes. Psychologists have examined the conditions leading to different dissonance reduction strategies (for a review, see McGrath, 2017). Among the various factors, two conditions are particularly relevant to stakeholder engagement both theoretically and

[2]Quotes from OSS developers were extracted from their Twitter posts and did not represent an exhaustive analysis.

practically: *choice space* (Festinger & Carlsmith, 1959) and *social embeddedness* (Cooper & Stone, 1999). We thus elaborate on these two conditions and examine how they shape stakeholders' responses to a corporate scandal.

When making decisions, people consider the scope of comparable choices that are cognitively relevant to the decisions, which we refer to as their choice space (Schwartz, 2016). For example, a researcher's choice space for the next project comprises research ideas that are similarly promising based on their expertise, interests, and the frontier of their field. Weak ideas are not meaningful options in the researcher's choice space, even if these ideas may have emerged previously. A larger choice space affords increased autonomy and reduces reliance on a specific option. For stakeholders, ceasing their contribution to ecosystem projects is a difficult decision because it involves relinquishing the rewards generated by the projects. If a focal project sponsor is involved in a scandal, stakeholders are likely to consider alternative projects in which they can participate. The larger the stakeholders' choice space, the less dependent they are on the focal project to achieve their goals. Therefore, we propose the following hypothesis:

> **Hypothesis 2.** Stakeholders with a larger choice space for alternative projects are more likely to reduce their participation in the focal ecosystem project after a scandal involving the project-holding firm.

Stakeholders' behavior is also shaped by social embeddedness, and so is their disengagement in the face of dissonant information (Zavyalova et al., 2016). *Social embeddedness* refers to the extent to which an individual is involved in social relationships in a specific field (Granovetter, 1985). Through social interactions, people develop collective identities, establish social bonds, and share goals and emotions (Zhang et al., 2023). As ecosystem stakeholders collaborate to create value, this collaboration is likely to nurture social relationships and foster a sense of community. Thus, stakeholders with a higher degree of social embeddedness in an ecosystem project are more likely to identify with the project and avoid the negative impact of their departure on the community, which creates resistance to disengagement despite the dissonance induced by a scandal. Therefore, we propose the following hypothesis:

> **Hypothesis 3.** Stakeholders with a higher degree of social embeddedness in an ecosystem project are less likely to reduce their participation after a scandal involving the project-holding firm.

2.3 | Continuation and post-decision justification

When resistance to disengagement is strong, some ecosystem stakeholders will maintain their participation even after a corporate scandal (Barnett, 2014). However, the dissonance associated with contributing to the tainted firm persists. How do continuing stakeholders resolve this dissonance? How does their effort to reduce cognitive dissonance lead to observable actions?

Psychological research on cognitive dissonance offers several insights into this issue. After making difficult decisions, people view the chosen alternative as more desirable and the rejected alternative as less desirable (Brehm, 1956). When unpleasant effort is required to achieve an outcome, people who expend that effort will exaggerate the desirability of the outcome (Aronson & Mills, 1959). When confronted with information that threatens one's positive self-concept, such as integrity, people tend to misinterpret the information (Festinger

et al., 1956) and seek opportunities to restore their self-concept through consonant behavior (Steele, 1975). In summary, after a decision to maintain a behavior amid dissonant information, people will suppress their behavior-inconsistent cognition and strengthen their behavior-consistent cognition (Festinger, 1957). These insights guide the development of our following hypotheses.

When stakeholders maintain their engagement with a scandal-tainted firm, their dissonance is likely to persist. To mitigate this dissonance, stakeholders may deny the firm's wrongdoings (Barnett, 2014). However, this approach is ineffective if the firm's misconduct is widely publicized. Alternatively, dissonance can be reduced by adding or boosting consonant elements because the magnitude of dissonance is a function of the relative weight of dissonant versus consonant cognitive elements (Festinger, 1957). Therefore, continuing stakeholders can reduce their cognitive dissonance by overstating the desirability of their continuation decisions.

This approach has been reported by prior studies. For example, Aronson and Mills (1959) found in an experimental setting that people who endured an embarrassing ceremony to join a boring group rated the group more positively than those who experienced a less embarrassing one. Frandsen and Morsing (2022) reported that after a bank's money laundering scandal, staying employees idealized the bank as decent and described themselves as heroes who saved the bank in crisis. These dissonance-induced cognitive changes often lead to observable actions. For example, Zorn et al. (2020) found that after a firm performed poorly, its directors who had appointed the current CEO surprisingly raised the CEO's pay, believing that this person was the best choice to save the firm. Zavyalova et al. (2016) found that after the wrongdoings of reputable universities, alumni increased their donations because they attributed the wrongdoings to situational factors and positively reinterpreted these negative events. Collectively, evidence shows that if people pursue an action despite dissonant information, their effort to reduce their dissonance often results in a more favorable evaluation of the action and its outcomes, leading to increased commitment.

Extending these insights to our context, we expect continuing stakeholders to employ a similar strategy to rationalize their continuation decisions after a scandal. They will emphasize the positive aspects of their continuation and highlight the value of ecosystem projects. This response was observed after the FB-CA scandal. In an online discussion among Facebook's OSS developers, one continuing developer noted the positive aspect of Facebook projects, remarking that "*a world where [a] problematic business can still have positive externalities is a good thing*." Some highlighted the public nature of corporate OSS, arguing that "*at this point, React [a Facebook OSS project] is much more than Facebook's playground and heavily community driven*." These views were echoed by another developer: "*Sure. Facebook may have subverted democracy and ruined the internet but at least they gave us a nice open-source declarative UI framework*." Thus, continuing stakeholders pay particular attention to the positive aspects of their ecosystem projects and reinforce the belief that their contribution is meaningful. As cognition often shapes actions (Festinger, 1957), we posit that the contribution of continuing stakeholders will increase as a result of their enhanced evaluation of the ecosystem projects.

> **Hypothesis 4.** Stakeholders who continue to participate in the ecosystem projects of a scandal-tainted firm increase their subsequent contribution to those projects.

As mentioned previously, choice space and social embeddedness are two important conditions that affect the likelihood of stakeholder disengagement from a tainted firm. We further

propose that these factors are equally important in shaping the post-scandal behavior of continuing stakeholders who tend to reduce their dissonance through increased commitment.

When people make decisions, their cognitive space for comparable choices not only affects the choices they make as hypothesized in Hypothesis 2, but also shapes their level of post-decision dissonance. The reason is that a larger choice space makes people feel more responsible for their decisions (Connolly et al., 1997; Festinger, 1957). For example, after accepting a job among many appealing offers, a new employee is strongly motivated to retrospectively justify this decision, leading to a high level of job commitment (O'Reilly III & Caldwell, 1981). In a famous experiment by Festinger and Carlsmith (1959), participants were paid USD 1 (high-choice condition) or USD 20 (low-choice condition) to lie about boring tasks being enjoyable.[3] Later, the participants were asked to evaluate the same tasks, and those in the high-choice condition expressed greater task enjoyment. This experiment shows that a larger choice space amplifies cognitive dissonance and increases the need for dissonance reduction. This is because a sense of personal responsibility is a necessary condition for dissonance arousal associated with an action, and a small choice space allows people to absolve themselves of such responsibility (Cooper, 2012).

In our context, we similarly posit that continuing stakeholders with a larger choice space have a higher level of cognitive dissonance because they feel more responsible for their continuation decisions. They are more motivated to rationalize their decisions to stay with a tainted firm despite having many other choices. In contrast, stakeholders with a smaller choice space can easily attribute their continuation decisions to situational constraints. Having few comparable choices is consonant with their continuation behavior and therefore mitigates their dissonance. In summary, having a larger pre-decision choice space generates a greater post-decision need for continuing stakeholders to justify their decisions, leading to a greater dissonance-driven increase in their project commitment. Therefore, we propose the following hypothesis:

> **Hypothesis 5.** The increased contribution of continuing stakeholders is greater if they have a larger choice space for alternative projects.

Social embeddedness also shapes how people react to dissonance. While Hypothesis 3 considers its moderating effect on stakeholder disengagement, we further theorize its facilitating effect on continuing stakeholders' behavioral changes. In their classic work on cognitive dissonance, Festinger et al. (1956) examined a group of people who believed in a prophecy of a doomsday flood. The researchers observed that when the flood did not occur, isolated members abandoned their beliefs, but those embedded in the group maintained and even strengthened their faith by developing the consonant cognition that their faith saved the world from destruction. This moderating effect of social embeddedness was also reported by Zavyalova et al. (2016). In their study of university wrongdoings, they found that alumni donors, who were more socially embedded than non-alumni donors, were more likely to echo the positive reinterpretation of their universities' wrongdoings and increase their subsequent donations.

Therefore, we expect social embeddedness to facilitate continuing stakeholders to rationalize their decisions and increase their commitment. Socially embedded stakeholders are more likely than others to identify with the focal ecosystem, which will lead them to pay disproportionate attention to positive narratives about that ecosystem (Zavyalova et al., 2016). More

[3]The purchasing power of USD 20 in 1959 was equivalent to that of USD 216 in 2024. The participants who received USD 20 had a smaller choice space because they faced a greater pecuniary constraint on whether or not to lie.

importantly, these stakeholders are more likely to engage in collective sense-making after a negative shock by collaboratively developing justification arguments and reinforcing their positive beliefs about the community and the ecosystem (Festinger et al., 1956). Therefore, social embeddedness is not only a situational factor, but also creates an enabling social environment that facilitates the commitment of continuing stakeholders. We thus propose the following hypothesis:

> **Hypothesis 6.** The increased contribution of continuing stakeholders is greater if they are more socially embedded in the ecosystem project.

3 | RESEARCH CONTEXT AND METHODS

We have tested our hypotheses in the context of corporate OSS, which has become increasingly important in the software development ecosystem. OSS refers to software with public source codes. Since its inception, the OSS movement has produced many high-quality software packages, such as Linux and Android. With its growing popularity, firms have recognized its value and begun to use it for software development (Spaeth et al., 2015). For example, Microsoft, which once called OSS a "*cancer*," now embraces it, stating that "*we are all in on open source*." In OSS, developers who contribute their knowledge to corporate projects are pivotal stakeholders with whom firms are eager to engage.

This context fits our study well for several reasons. First, although OSS developers are vital to project success, corporate control over these stakeholders is loose and informal, which matches our definition of ecosystem stakeholders. Second, OSS developers leave digital records of their activities, allowing us to systematically examine stakeholder engagement that is difficult to observe in other contexts. Lastly, many comparable corporate OSS projects, such as Google's TensorFlow and Facebook's PyTorch, enable us to construct treatment and control groups for a DiD analysis of developers' responses to a corporate scandal.

To test our hypotheses, we exploited a profound event—the FB-CA scandal—that involved Facebook, an active sponsor of corporate OSS. In March 2018, a whistleblower from Cambridge Analytica revealed that Facebook had allowed the misuse of 87 million users' private data (The Guardian, 2018, March 17). This scandal quickly made headlines, sparked public outrage, and propelled the *#deletefacebook* movement on social media. Public fury led to a US Senate hearing in April 2018. In July 2019, Facebook was fined USD 5 billion for privacy violations, the largest penalty ever imposed for data mismanagement (Federal Trade Commission, 2019, July 24). Although this scandal had little impact on Facebook's financial performance due to the irreplaceability of Facebook among users (CNBC, 2018, July 6), it eroded trust in the firm's commitment to data privacy and transparency, generating discontent within the OSS community. Many developers joined the *#deletefacebook* movement, and key OSS associations publicly condemned Facebook (Free Software Foundation, 2019, January 18). Consistent with our theory, the FB-CA scandal triggered cognitive dissonance among developers, as illustrated by the following quotes[4]:

[4]These quotes were taken from Twitter threads in which OSS developers discussed whether to continue with Facebook projects.

> Should our discomfort with Facebook/Cambridge Analytica also extend to React, Flow, and other open-source tools that are indirect products of Facebook's tracking and monetization of our personal data?
> Does anyone else feel guilty about how much you like some of Facebook's open-source tools, when Facebook is otherwise such a moral wasteland of a company?

3.1 | Data and sample

We collected corporate OSS data from GitHub, the largest OSS platform for independent and corporate projects. Facebook hosted 776 OSS projects on GitHub, ranging from machine learning and virtual machines to Android libraries and user interface tools. These projects were managed by Facebook employees. Our sample started with 568 Facebook projects initiated before the FB-CA scandal. We excluded 102 projects with fewer than 10 code commits or 50 watchers[5] to focus on those with a meaningful impact. Employees and voluntary developers both contributed to these corporate projects. As we studied ecosystem stakeholders, we excluded employee contributions. We identified 7240 voluntary developers and extracted their engagement records during our sample period from January 2016 to May 2019. We then focused on 3490 developers who were active before the FB-CA scandal with at least five project contribution records.[6]

We used the DiD approach to compare the impact of the FB-CA scandal on treatment and control groups to enhance causal inferences. We used two-stage Coarsened Exact Matching to construct a control group of similar developers engaged with non-Facebook projects (Wang & Zheng, 2022). In the first stage, we matched Facebook projects with projects held by GAAT that were comparable to Facebook but not involved in the scandal. The matching was based on several criteria. First, the paired projects had a similar number of watchers in February 2018.[7] Second, we categorized programming languages into procedural, scripting, functional, and other languages based on their paradigms (Ray et al., 2014) and paired projects with the same paradigm.[8] Third, the paired projects had similar development momentum before the scandal, as proxied by their number of new code commits in the first quarter of 2018. As a result, we successfully matched 267 Facebook projects with 267 comparable GAAT projects.

In the second stage, we constructed the treatment and control groups by pairing developers. Each pair of treatment and control developers came from the projects paired in the previous stage. We applied additional matching criteria to ensure comparability at the developer level. First, the paired developers had similar pre-scandal OSS experience, as proxied by the total number of code commits up to February 2018. Second, they had comparable status, as measured by their number of followers in February 2018. Third, they had similar pre-scandal

[5]"Watchers" is a GitHub term for project subscribers who follow a project and receive notifications about its development.

[6]Contribution records included code commits, pull requests, and issue reports, defined in the "dependent variables" section. We used five as the cutoff because 96.7% of all contribution records came from developers who contributed five or more instances.

[7]We used sample quartiles to create four bins for each of the following variables: project watchers, project new code commits, developer cumulative code commits, developer followers, and developer contribution records before the scandal. We paired projects and developers within the same bin for each variable.

[8]Language types capture programming paradigms and purposes. For example, procedural languages are often used for low-level programming such as system development while scripting languages are designed for smaller tasks such as web development.

TABLE 1 Results of *t*-tests on the raw and matched samples.

Panel A. Raw sample	Mean Facebook	GAAT	Difference	SE	*p*-value
Pre-scandal project watchers (ln)	8.80	7.64	1.16	0.01	.000
Pre-scandal project accumulated commits (ln)	7.65	7.19	0.46	0.01	.000
Pre-scandal developer followers (ln)	2.02	1.51	0.51	0.01	.000
Pre-scandal developer commits	1.00	1.08	−0.08	0.03	.003
Pre-scandal developer pull requests	0.21	0.28	−0.07	0.01	.000
Pre-scandal developer issue reports	0.15	0.21	−0.06	0.01	.000
Pre-scandal developer comments	1.14	1.43	−0.29	0.03	.000
Total number of projects	381	892			
Total number of developers	3490	6443			
Panel B. Matched sample	**Mean Facebook**	**GAAT**	**Difference**	**SE**	***p*-value**
Pre-scandal project watchers (ln)	8.70	8.69	0.01	0.01	.373
Pre-scandal project accumulated commits (ln)	7.66	7.68	−0.02	0.02	.281
Pre-scandal developer followers (ln)	1.96	1.92	0.04	0.03	.098
Pre-scandal developer commits	0.73	0.72	0.01	0.03	.876
Pre-scandal developer pull requests	0.21	0.21	0.00	0.01	.942
Pre-scandal developer issue reports	0.19	0.19	0.00	0.01	.638
Pre-scandal developer comments	1.06	1.13	−0.07	0.04	.038
Total number of projects	258	258			
Total number of developers	2147	2147			

contribution momentum, as captured by their total contribution records to the focal projects in the first quarter of 2018.

After matching, we obtained 4294 paired developers engaged in Facebook and GAAT projects, yielding 135,708 developer-month observations. Table 1 shows the key statistics for the treatment and control groups before and after matching. Our matching effectively improved the balance between the treatment and control groups.

3.2 | Dependent variables

We followed previous OSS research to measure the engagement activities of OSS developers (Lindberg et al., 2016).

Commits. Code commits were the most important contribution to a project. They were approved changes to the codebase that improved project performance. This variable was measured as the monthly number of commits made by a developer to a focal project.

Pull requests. Pull requests were proposed code revisions. If accepted by project leaders, pull requests became commits. They were analogous to journal submissions in academia. This

variable was measured as the monthly number of pull requests made by a developer to a focal project.

Issue reports. Issue reports were requests for bug fixes or new functions. They were important for stimulating new ideas and code revisions. This variable was measured as the monthly number of issues reported by a developer in a focal project.

Comments. Comments were discussions about commits, pull requests, and issue reports. They represented social interactions among developers related to code development. This variable was measured as the monthly number of comments made by a developer in a focal project.

Total activities. This variable captured the overall engagement of a developer in a project. We measured it as the total monthly number of *commits*, *pull requests*, *issue reports*, and *comments*.

3.3 | Independent and moderating variables

Facebook. This variable was an indicator of the treatment group. It took the value of one for developers in Facebook projects and zero for developers in GAAT projects.

Post scandal. The FB-CA scandal was publicly exposed by a whistleblower on March 18, 2018. We coded *post scandal* as one for months after March 2018 and zero otherwise.

Choice space. This variable captured a developer's choice set for alternative projects. A project was an alternative if the developer had shown interest and ability to contribute to it, which we inferred from the developer's past contribution records. However, projects of the same firm were not valid alternatives because switching between these projects could not alleviate the dissonance associated with the firm. Thus, *choice space* was proxied by the number of projects held by other firms with at least five contribution records from the focal developer in the last 12 months.

Social embeddedness. This variable captured the extent to which a developer was socially embedded in a project's community. We constructed *social embeddedness* in two steps based on the social interactions of the focal developer with other project members in the community. First, we proxied social interactions using the number of comments made by the developer in the focal project. Second, we divided this project-level measure by the total number of comments made by the developer across all GitHub projects. This ratio captured the degree of social embeddedness in the focal project, taking into account all social activities of the developer on GitHub.

3.4 | Control variables

All estimation models included matched developer-pair and project fixed effects to account for time-invariant paired developers and project heterogeneity, respectively. We also included month fixed effects to isolate the time trend in the behavior of OSS developers. In addition, we controlled for developer-, project-, and firm-level factors that affected the engagement intention of developers.

At the developer level, we controlled for a developer's social status using the number of *developer followers* in a month. We controlled for the number of projects watched by a developer (i.e., *developer interested projects*) to account for the scope of their OSS interests. A developer's motivations to contribute were often shaped by social recognition and personal hobbies

(Shah, 2006). We also added a developer's total *contribution to other projects* in the focal month to control for the effects of other unobservable factors, such as time availability, on engagement intensity.

At the project level, we controlled for a project's impact using the number of *project watchers*. Impactful projects were generally more attractive to developers because these projects offered more social rewards to contributors (von Krogh et al., 2012). We used the number of *project leaders*, who were usually employees of a holding firm, as a proxy for the level of attention devoted to the focal project by the holding firm. Project progress was also important to developers because it determined the types of contribution developers could make (Shah, 2006). We used *project accumulated commits* up to the previous month to control for its effect. In addition, OSS participation may be driven by one's effort to address issues raised by other members (Foss et al., 2016). To account for the effect of issue backlogs, we added the variable *opening issues per committer*, measured by the number of unsolved issues divided by the number of active committers in a month.

At the firm level, the overall participation of a firm in the OSS movement can affect its reputation among developers (Spaeth et al., 2015). Therefore, we controlled for this effect using the number of *OSS projects* sponsored by the focal firm. We also added the total *employee contribution* of a firm to all OSS projects to capture the firm's attitude toward OSS.

Lastly, to account for the skewness of the count variables (e.g., *developer followers*), we log transformed these variables by taking the natural logarithm of the raw number plus one.

3.5 | Estimation

We conducted DiD analyses to study the responses of OSS developers to the FB-CA scandal. In particular, we examined developer engagement in Facebook projects (i.e., the treatment group) before and after the scandal, compared with that in GAAT projects (i.e., the control group). We used fixed-effects ordinary least squares regression models to estimate the coefficients. We clustered all standard errors at the matched developer-pair level.

4 | RESULTS

Table 2 reports the summary statistics and correlation coefficients of all the variables.

Figure 1 depicts the raw data of developer engagement. It shows similar behavioral patterns of developers in Facebook and GAAT projects before the scandal, confirming the effectiveness of our matching. After the dashed event line, discrepancies emerge between the treatment and control groups. The overall activities of Facebook projects decline as a result of developer disengagement.[9] However, there is a notable increase in the contribution of continuing developers in Facebook projects compared with those in GAAT projects. Although this abnormal increase diminishes after two quarters, it is sufficiently remarkable given the overall trend of disengagement observed in the left graph of Figure 1.

Table 3 shows the regression results for Hypothesis 1. In the regression, the time-invariant *Facebook* dummy is absorbed by project fixed effects, and the *post scandal* dummy is absorbed

[9]We would like to express our special thanks to an anonymous reviewer for his or her persistent suggestions regarding tense usage and within-paragraph tense consistency.

TABLE 2 Summary statistics and correlation coefficients.

Variable	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. Commits	0.67	4.23										
2. Pull requests	0.18	1.10	0.40									
3. Issue reports	0.15	0.66	0.17	0.35								
4. Comments	0.96	5.18	0.32	0.56	0.41							
5. Total activities	1.96	8.75	0.75	0.69	0.46	0.86						
6. Reference to sponsor	0.14	3.00	0.04	0.09	0.03	0.09	0.09					
7. Developer followers (ln)	1.93	1.59	−0.07	0.00	0.02	−0.01	−0.04	0.00				
8. Developer interested projects (ln)	3.20	2.00	−0.08	−0.01	0.02	−0.01	−0.05	0.00	0.49			
9. Contribution to other projects (ln)	1.86	1.79	0.09	0.15	0.12	0.11	0.14	0.03	0.24	0.27		
10. Project watchers (ln)	8.91	1.99	−0.05	−0.02	−0.01	−0.01	−0.03	−0.01	0.08	0.16	−0.07	
11. Project leaders (ln)	4.48	1.32	−0.05	−0.01	0.01	0.00	−0.03	0.00	0.07	0.12	−0.04	0.84
12. Project accumulated commits (ln)	7.91	1.91	−0.01	−0.02	0.01	−0.01	−0.01	0.00	0.02	0.07	−0.07	0.78
13. Opening issues per committer	74.02	127.50	−0.03	−0.01	−0.03	−0.02	−0.03	−0.01	0.01	0.03	−0.03	0.12
14. Firm OSS projects (ln)	6.98	0.87	0.00	0.00	0.00	0.00	0.00	−0.02	−0.02	−0.02	−0.03	0.14
15. Firm employee contribution (ln)	11.09	0.76	0.00	0.01	0.03	0.02	0.01	−0.01	0.01	−0.03	0.02	0.16
16. Facebook	0.50	0.50	0.00	−0.01	−0.01	−0.01	−0.01	0.01	0.03	0.08	0.02	0.00
17. Post scandal	0.36	0.48	−0.02	−0.03	−0.09	−0.03	−0.04	−0.01	−0.01	0.08	−0.12	0.15
18. Choice space	3.85	8.51	0.05	0.09	0.08	0.06	0.08	0.02	0.19	0.23	0.48	−0.02
19. Social embeddedness	0.11	0.18	0.10	0.09	0.03	0.17	0.16	0.02	−0.24	−0.29	−0.28	0.01

Variable	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
12. Project accumulated commits (ln)	0.87							
13. Opening issues per committer	0.14	0.14						
14. Firm OSS projects (ln)	0.08	0.19	0.19					
15. Firm employee contribution (ln)	0.11	0.19	0.11	0.84				

TABLE 2 (Continued)

Variable	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
16. Facebook	0.01	−0.06	−0.19	−0.79	−0.69			
17. Post scandal	0.09	0.17	0.16	0.18	−0.08	0.00		
18. Choice space	−0.01	−0.01	−0.01	−0.02	−0.02	0.03	−0.06	
19. Social embeddedness	−0.01	0.05	0.01	0.03	−0.02	−0.02	0.07	−0.15

Note: $N = 135{,}708$.

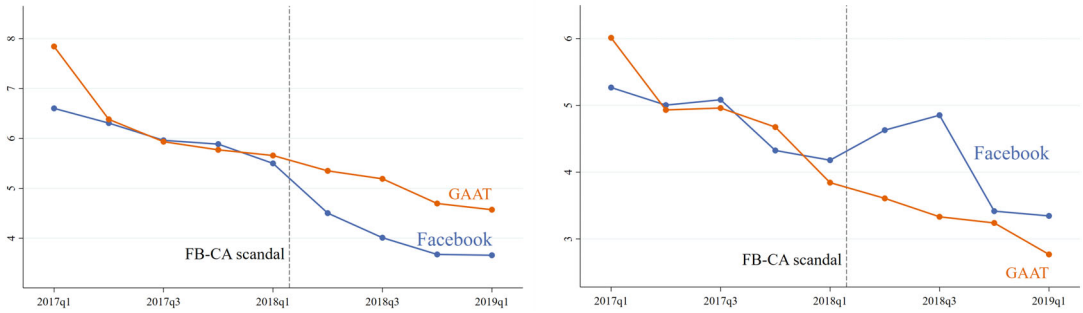

FIGURE 1 Trends in raw engagement data.

by month fixed effects. Table 3 reports the results before and after adding the control variables. Consistent with prior studies on corporate scandals (e.g., McDonnell et al., 2021), OSS developers as stakeholders tend to disengage from Facebook after the FB-CA scandal. The coefficients of *Facebook* × *post scandal* are negative for all activity types (e.g., *commits*: $\beta = -0.109$, $p = .000$). The economic magnitude of these coefficients is also considerable. Compared with *total activities* for GAAT projects, *total activities* for Facebook projects have decreased by 14.5% after the scandal.

Table 4 displays results regarding the heterogeneity of disengagement among developers. The results in Columns 1 to 5 support Hypothesis 2. The negative coefficients of the three-way interaction *Facebook* × *post scandal* × *choice space* (e.g., *total activities*: $\beta = -0.004$, $p = .042$) show that the post-scandal disengagement of Facebook developers is more pronounced if these developers have a large choice space for comparable projects. The results in Columns 6–10 generally support Hypothesis 3. Developers who are less socially embedded are more likely to disengage after the scandal (e.g., *total activities*: $\beta = 0.258$, $p = .031$).

Next, we examine continuing developers who have stayed with Facebook after the FB-CA scandal. We hypothesize that persistent dissonance would motivate continuing developers to reinforce the belief that their contribution is meaningful and thus increase their commitment. Table 5 presents our analysis results, showing strong support for Hypothesis 4 (e.g., *total activities*: $\beta = 0.054$, $p = .012$). The overall engagement level of developers who have continued to work on Facebook projects increases by 5.4%, resonating with the pattern in Figure 1. As our models controlled for *opening issues per committer*, this increase cannot be attributed to the task backlog.

Table 6 reports the moderating effects of *choice space* and *social embeddedness* on the behavior of continuing developers. In line with Hypothesis 5, the results in Columns 1–5 suggest that continuing developers' choice space further motivates them to increase their commitment (e.g., *total activities*: $\beta = 0.008$, $p = .002$). Interestingly, when *choice space* is zero, continuing developers do not exhibit additional commitment. This finding is consistent with previous studies showing that choice space is a necessary condition for dissonance arousal (Cooper, 2012; Festinger, 1957). Columns 6–10 show the estimation results for Hypothesis 6, supporting the moderating role of *social embeddedness* (e.g., *total activities*: $\beta = 0.406$, $p = .021$). Continuing developers who are more socially embedded increase their contribution more than those who are less socially embedded. Notably, they increase their contribution only when *social embeddedness* is greater than zero, indicating that social interactions and support are necessary to strengthen their decision-consonant beliefs. Overall, the above results support the use of our

TABLE 3 Regression results for developer engagement in corporate OSS projects.

Variable	(1) Commits (ln)	(2) Commits (ln)	(3) Pull request (ln)	(4) Pull request (ln)	(5) Issue reports (ln)	(6) Issue reports (ln)	(7) Comments (ln)	(8) Comments (ln)	(9) Total act. (ln)	(10) Total act. (ln)
Facebook × post scandal	−0.109	−0.098	−0.049	−0.042	−0.046	−0.046	−0.076	−0.060	−0.169	−0.145
	(0.010)	(0.010)	(0.006)	(0.006)	(0.006)	(0.006)	(0.012)	(0.012)	(0.016)	(0.016)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Developer followers (ln)		−0.022		−0.005		0.005		−0.009		−0.018
		(0.010)		(0.004)		(0.005)		(0.010)		(0.015)
		[0.021]		[0.304]		[0.329]		[0.379]		[0.223]
Developer interested projects (ln)		−0.000		0.000		0.007		0.010		0.011
		(0.004)		(0.002)		(0.002)		(0.004)		(0.006)
		[0.903]		[0.932]		[0.000]		[0.030]		[0.062]
Contribution to other projects (ln)		0.038		0.040		0.019		0.069		0.097
		(0.003)		(0.002)		(0.001)		(0.003)		(0.004)
		[0.000]		[0.000]		[0.000]		[0.000]		[0.000]
Project watchers (ln)		0.027		0.028		0.016		0.062		0.076
		(0.007)		(0.004)		(0.003)		(0.008)		(0.011)
		[0.000]		[0.000]		[0.000]		[0.000]		[0.000]
Project leaders (ln)		0.081		0.035		0.018		0.069		0.136
		(0.013)		(0.008)		(0.007)		(0.018)		(0.022)
		[0.000]		[0.000]		[0.016]		[0.000]		[0.000]

TABLE 3 (Continued)

Variable	(1) Commits (ln)	(2) Commits (ln)	(3) Pull request (ln)	(4) Pull request (ln)	(5) Issue reports (ln)	(6) Issue reports (ln)	(7) Comments (ln)	(8) Comments (ln)	(9) Total act. (ln)	(10) Total act. (ln)
Project accumulated commits (ln)		−0.054		−0.035		−0.016		−0.068		−0.103
		(0.007)		(0.004)		(0.003)		(0.009)		(0.011)
		[0.000]		[0.000]		[0.000]		[0.000]		[0.000]
Opening issues per committer (hundred)		−0.008		−0.010		−0.002		−0.013		−0.017
		(0.002)		(0.002)		(0.001)		(0.003)		(0.004)
		[0.000]		[0.000]		[0.097]		[0.000]		[0.000]
Firm OSS projects (ln)		0.199		0.050		0.012		0.144		0.247
		(0.071)		(0.039)		(0.031)		(0.072)		(0.100)
		[0.005]		[0.205]		[0.690]		[0.045]		[0.013]
Firm employee contribution (ln)		0.006		0.021		−0.025		0.033		0.035
		(0.039)		(0.024)		(0.022)		(0.053)		(0.065)
		[0.879]		[0.381]		[0.260]		[0.535]		[0.592]
Choice space		0.003		0.002		0.002		0.006		0.009
		(0.001)		(0.000)		(0.000)		(0.001)		(0.001)
		[0.000]		[0.000]		[0.000]		[0.000]		[0.000]
Social embeddedness		0.322		0.165		0.069		0.668		0.756
		(0.044)		(0.021)		(0.016)		(0.050)		(0.060)
		[0.000]		[0.000]		[0.000]		[0.000]		[0.000]
Developer-pair FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

TABLE 3 (Continued)

Variable	(1) Commits (ln)	(2) Commits (ln)	(3) Pull request (ln)	(4) Pull request (ln)	(5) Issue reports (ln)	(6) Issue reports (ln)	(7) Comments (ln)	(8) Comments (ln)	(9) Total act. (ln)	(10) Total act. (ln)
Project and month FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	135,708	135,708	135,708	135,708	135,708	135,708	135,708	135,708	135,708	135,708
R^2	0.359	0.377	0.228	0.265	0.174	0.189	0.258	0.301	0.297	0.343

Note: The indicators *Facebook* and *Post scandal* are absorbed by fixed effects. Standard errors in parentheses are clustered at the developer-pair level. *p*-values are reported in brackets.

TABLE 4 Moderating effects of choice space and social embeddedness on developer engagement.

Variable	(1) Commits (ln)	(2) Pull request (ln)	(3) Issue reports (ln)	(4) Comments (ln)	(5) Total act. (ln)	(6) Commits (ln)	(7) Pull request (ln)	(8) Issue reports (ln)	(9) Comments (ln)	(10) Total act. (ln)
Choice space	0.003	0.000	0.001	0.002	0.004	0.002	0.001	0.001	0.002	0.004
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
	[0.000]	[0.190]	[0.049]	[0.006]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Social embeddedness	0.321	0.166	0.070	0.672	0.758	0.347	0.198	0.150	0.882	0.963
	(0.044)	(0.021)	(0.016)	(0.050)	(0.060)	(0.059)	(0.031)	(0.025)	(0.071)	(0.082)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Facebook × post scandal	−0.088	−0.034	−0.041	−0.057	−0.171	−0.110	−0.059	−0.071	−0.077	−0.225
	(0.011)	(0.006)	(0.006)	(0.012)	(0.016)	(0.013)	(0.008)	(0.007)	(0.014)	(0.019)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Facebook × choice space	−0.001	0.001	0.000	0.000	−0.000					
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)					
	[0.164]	[0.040]	[0.655]	[0.708]	[0.781]					
Post scandal × choice space	0.000	0.001	0.000	0.001	0.000					
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)					
	[0.908]	[0.135]	[0.398]	[0.168]	[0.858]					
Facebook × post scandal × choice space	−0.003	−0.002	−0.001	−0.001	−0.004					
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)					
	[0.071]	[0.006]	[0.039]	[0.225]	[0.042]					
Facebook × social embeddedness						0.207	0.037	−0.151	−0.061	0.044
						(0.086)	(0.044)	(0.033)	(0.093)	(0.113)
						[0.016]	[0.390]	[0.000]	[0.511]	[0.694]

TABLE 4 (Continued)

Variable	(1) Commits (ln)	(2) Pull request (ln)	(3) Issue reports (ln)	(4) Comments (ln)	(5) Total act. (ln)	(6) Commits (ln)	(7) Pull request (ln)	(8) Issue reports (ln)	(9) Comments (ln)	(10) Total act. (ln)
Post scandal × social embeddedness						−0.405	−0.208	−0.120	−0.571	−0.793
						(0.058)	(0.032)	(0.026)	(0.066)	(0.082)
						[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Facebook × Post scandal × Social embeddedness						0.061	0.121	0.201	0.080	0.258
						(0.087)	(0.044)	(0.034)	(0.094)	(0.120)
						[0.480]	[0.006]	[0.000]	[0.400]	[0.031]
Control variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Developer-pair FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Project and month FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	135,708	135,708	135,708	135,708	135,708	135,708	135,708	135,708	135,708	135,708
R^2	0.378	0.264	0.188	0.298	0.342	0.382	0.266	0.189	0.303	0.346

Note: Standard errors in parentheses are clustered at the developer-pair level. *p*-values are reported in brackets.

TABLE 5 Regression results for the engagement of continuing developers.

Variable	(1) Commits (ln)	(2) Commits (ln)	(3) Pull request (ln)	(4) Pull request (ln)	(5) Issue reports (ln)	(6) Issue reports (ln)	(7) Comments (ln)	(8) Comments (ln)	(9) Total act. (ln)	(10) Total act. (ln)
Facebook × post scandal	0.035	0.032	−0.003	0.010	0.020	0.023	0.037	0.054	0.041	0.054
	(0.014)	(0.014)	(0.007)	(0.007)	(0.005)	(0.005)	(0.016)	(0.016)	(0.021)	(0.021)
	[0.010]	[0.025]	[0.649]	[0.189]	[0.000]	[0.000]	[0.023]	[0.001]	[0.054]	[0.012]
Developer followers (ln)		0.006		0.005		0.006		0.009		0.015
		(0.008)		(0.004)		(0.007)		(0.012)		(0.015)
		[0.453]		[0.209]		[0.386]		[0.467]		[0.313]
Developer interested projects (ln)		−0.006		−0.000		0.007		0.010		0.007
		(0.004)		(0.002)		(0.003)		(0.005)		(0.006)
		[0.124]		[0.852]		[0.011]		[0.045]		[0.248]
Contribution to other projects (ln)		0.038		0.039		0.021		0.067		0.096
		(0.003)		(0.002)		(0.001)		(0.003)		(0.004)
		[0.000]		[0.000]		[0.000]		[0.000]		[0.000]
Project watchers (ln)		0.017		0.025		0.019		0.059		0.065
		(0.009)		(0.005)		(0.004)		(0.011)		(0.014)
		[0.061]		[0.000]		[0.000]		[0.000]		[0.000]
Project leaders (ln)		0.078		0.029		0.018		0.071		0.135
		(0.017)		(0.010)		(0.008)		(0.022)		(0.028)
		[0.000]		[0.003]		[0.022]		[0.001]		[0.000]

TABLE 5 (Continued)

Variable	(1) Commits (ln)	(2) Commits (ln)	(3) Pull request (ln)	(4) Pull request (ln)	(5) Issue reports (ln)	(6) Issue reports (ln)	(7) Comments (ln)	(8) Comments (ln)	(9) Total act. (ln)	(10) Total act. (ln)
Project accumulated commits (ln)		−0.053		−0.026		−0.018		−0.067		−0.101
		(0.009)		(0.005)		(0.004)		(0.011)		(0.014)
		[0.000]		[0.000]		[0.000]		[0.000]		[0.000]
Opening issues per committer (hundred)		−0.007		−0.008		−0.003		−0.016		−0.020
		(0.002)		(0.002)		(0.001)		(0.004)		(0.005)
		[0.002]		[0.000]		[0.010]		[0.000]		[0.000]
Firm OSS projects (ln)		0.026		0.036		−0.041		0.072		0.022
		(0.080)		(0.036)		(0.024)		(0.083)		(0.114)
		[0.748]		[0.327]		[0.087]		[0.386]		[0.849]
Firm employee contribution (ln)		−0.076		0.058		0.003		0.048		−0.018
		(0.050)		(0.028)		(0.027)		(0.066)		(0.081)
		[0.131]		[0.036]		[0.909]		[0.466]		[0.823]
Choice space		0.003		0.002		0.002		0.006		0.010
		(0.001)		(0.000)		(0.000)		(0.001)		(0.001)
		[0.000]		[0.000]		[0.000]		[0.000]		[0.000]
Social embeddedness		0.400		0.243		0.082		0.819		0.925
		(0.061)		(0.032)		(0.026)		(0.075)		(0.088)
		[0.000]		[0.000]		[0.002]		[0.000]		[0.000]
Developer-pair FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

TABLE 5 (Continued)

Variable	(1) Commits (ln)	(2) Commits (ln)	(3) Pull request (ln)	(4) Pull request (ln)	(5) Issue reports (ln)	(6) Issue reports (ln)	(7) Comments (ln)	(8) Comments (ln)	(9) Total act. (ln)	(10) Total act. (ln)
Project and month FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	61,714	61,714	61,714	61,714	61,714	61,714	61,714	61,714	61,714	61,714
R^2	0.364	0.381	0.258	0.294	0.219	0.235	0.272	0.313	0.297	0.342

Note: The indicators *Facebook* and *Post scandal* are absorbed by fixed effects. Standard errors in parentheses are clustered at the developer-pair level. *p*-values are reported in brackets.

TABLE 6 Moderating effects of choice space and social embeddedness on the engagement of continuing developers.

Variable	(1) Commits (ln)	(2) Pull request (ln)	(3) Issue reports (ln)	(4) Comments (ln)	(5) Total act. (ln)	(6) Commits (ln)	(7) Pull request (ln)	(8) Issue reports (ln)	(9) Comments (ln)	(10) Total act. (ln)
Choice space	0.003	0.002	0.003	0.005	0.010	0.005	0.002	0.001	0.005	0.010
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
	[0.004]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Social embeddedness	0.407	0.244	0.081	0.818	0.934	0.638	0.253	0.190	1.220	1.432
	(0.061)	(0.032)	(0.028)	(0.075)	(0.087)	(0.096)	(0.054)	(0.046)	(0.124)	(0.135)
	[0.000]	[0.000]	[0.007]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Facebook × post scandal	−0.001	0.012	0.010	−0.008	−0.004	0.001	0.002	0.001	−0.010	0.006
	(0.016)	(0.007)	(0.005)	(0.017)	(0.024)	(0.019)	(0.009)	(0.006)	(0.020)	(0.027)
	[0.968]	[0.076]	[0.077]	[0.629]	[0.871]	[0.972]	[0.834]	[0.827]	[0.625]	[0.824]
Facebook × choice space	0.001	−0.000	−0.002	−0.001	−0.002					
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)					
	[0.272]	[0.801]	[0.000]	[0.355]	[0.198]					
Post scandal × choice space	0.003	−0.002	−0.002	0.001	−0.001					
	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)					
	[0.110]	[0.017]	[0.000]	[0.575]	[0.808]					
Facebook × post scandal × choice space	0.003	0.001	0.002	0.004	0.008					
	(0.002)	(0.001)	(0.001)	(0.002)	(0.003)					
	[0.062]	[0.284]	[0.013]	[0.025]	[0.002]					
Facebook × social embeddedness						−0.032	0.056	−0.185	−0.310	−0.289
						(0.119)	(0.074)	(0.051)	(0.148)	(0.156)

TABLE 6 (Continued)

Variable	(1) Commits (ln)	(2) Pull request (ln)	(3) Issue reports (ln)	(4) Comments (ln)	(5) Total act. (ln)	(6) Commits (ln)	(7) Pull request (ln)	(8) Issue reports (ln)	(9) Comments (ln)	(10) Total act. (ln)
						[0.788]	[0.446]	[0.000]	[0.036]	[0.065]
Post scandal × social embeddedness						−0.745	−0.141	−0.122	−0.865	−1.214
						(0.095)	(0.053)	(0.036)	(0.111)	(0.127)
						[0.000]	[0.008]	[0.001]	[0.000]	[0.000]
Facebook × post scandal × social embeddedness						0.256	0.082	0.151	0.300	0.406
						(0.134)	(0.067)	(0.041)	(0.141)	(0.176)
						[0.057]	[0.220]	[0.000]	[0.034]	[0.021]
Control variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Developer-pair FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Project and month FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	61,714	61,714	61,714	61,714	61,714	61,714	61,714	61,714	61,714	61,714
R^2	0.385	0.295	0.163	0.315	0.336	0.390	0.295	0.163	0.321	0.342

Note: Standard errors in parentheses are clustered at the developer-pair level. *p*-values are reported in brackets.

dissonance-based framework to understand the reactions of ecosystem stakeholders to corporate scandals.

4.1 | Robustness checks

To further strengthen the rigor of our analyses, we have conducted a series of robustness tests. First, one may argue that the FB-CA scandal has been anticipated and our variable *post scandal* does not capture the correct window of the scandal's impact. To address this concern, we have perused related news articles and social media posts. Although rumors of the data breach appeared in 2016, they were neither confirmed nor circulated. We have also conducted a placebo test using the rumor date as the pseudo-event date. Panel (A) of Table 7 reports the test results and shows that this pseudo-event has no meaningful effects. In addition, we have found evidence of exogeneity from insider reviews on Glassdoor. Before the scandal, Facebook was consistently ranked among the top five best places to work. However, it suddenly fell to seventh place after the scandal. This decline implies that even insiders have changed their views on Facebook by that time. Overall, it is unlikely that the scandal had been anticipated before its public exposure.

Second, reputation concerns may be an alternative explanation for our findings. However, this explanation cannot account for the increased commitment of continuing developers and its contingencies (e.g., *choice space*). Nevertheless, to further mitigate this concern, we have conducted robustness tests with a subsample of anonymous developers on GitHub. Their anonymity indicates that they care little about their reputation and status on GitHub. Therefore, their responses are unlikely to be driven by reputation concerns. The results are shown in Panel (B) of Table 7 and remain consistent with our main results, suggesting that reputation concerns cannot adequately explain our findings.

Third, another potential explanation is that developers' behavior has been driven by their career concerns. Facebook may have become a less attractive employer after the scandal, and some developers may have perceived less instrumental value in their engagement. However, this career-based explanation cannot explain the increased commitment of continuing developers. In addition, Facebook's operational and financial performance recovered quickly after the scandal (CNBC, 2018, July 6), suggesting that career opportunities at Facebook were unlikely to have declined. Nevertheless, we have conducted a robustness check to further tease out this alternative explanation. In this test, our sample only includes developers working in the top 20 Internet firms, who are less reliant on OSS for labor market signaling and thus less driven by career concerns to make OSS contributions. The results are reported in Panel (C) of Table 7. The responses of these developers are qualitatively similar to those reported in our main analyses.

Fourth, we have rerun our analyses using alternative methods and samples. Panel (D) of Table 7 reports results using negative binomial models to estimate count variables for engagement activities. Panel (E) presents our analyses of project-spanning developers who have contributed to Facebook and GAAT projects simultaneously. The results show their behavioral changes in the treatment versus control projects after the scandal. Panel (F) reports our robustness tests using an alternative measure of *social embeddedness*, which is the natural logarithm of the number of cumulative comments made by a developer in the focal project. The results of the above tests are generally consistent with our main findings.

TABLE 7 Robustness tests.

	Panel A. Placebo test		Panel B. Anonymous developers		Panel C. Developers in top Internet firms	
	(1)	(2)	(3)	(4)	(5)	(6)
Variable	**Total act. (ln)**	**Total act. (ln) of cont. dev.**	**Total act. (ln)**	**Total act. (ln) of cont. dev**	**Total act. (ln)**	**Total act. (ln) of cont. dev**
Facebook × pseudo-event	0.009	0.007				
	(0.023)	(0.044)				
	[0.697]	[0.873]				
Facebook × post scandal			−0.109	0.050	−0.174	0.252
			(0.028)	(0.029)	(0.085)	(0.132)
			[0.000]	[0.085]	[0.042]	[0.056]
Control variables	YES	YES	YES	YES	YES	YES
Developer-pair FEs	YES	YES	YES	YES	YES	YES
Project and month FEs	YES	YES	YES	YES	YES	YES
Observations	86,842	22,326	43,985	18,703	7532	2570
R^2	0.313	0.467	0.440	0.464	0.119	0.141

	Panel D. Negative binomial models		Panel E. Project-spanning developers		Panel F. Alternative social embed. measurement	
	(7)	(8)	(9)	(10)	(11)	(12)
Variable	**Total act.**	**Total act. of cont. dev.**	**Total act. (ln)**	**Total act. (ln) of cont. dev**	**Total act. (ln)**	**Total act. (ln) of cont. dev**
Facebook × post scandal	−1.052	0.240	−0.063	0.391	−0.186	−0.044
	(0.078)	(0.079)	(0.034)	(0.146)	(0.032)	(0.043)
	[0.000]	[0.002]	[0.064]	[0.010]	[0.000]	[0.301]
Social embeddedness					0.141	0.162
					(0.009)	(0.012)
					[0.000]	[0.000]

TABLE 7 (Continued)

Variable	Panel D. Negative binomial models		Panel E. Project-spanning developers		Panel F. Alternative social embed. measurement	
	(7)	(8)	(9)	(10)	(11)	(12)
	Total act.	Total act. of cont. dev.	Total act. (ln)	Total act. (ln) of cont. dev	Total act. (ln)	Total act. (ln) of cont. dev
Facebook × social embeddedness					−0.005	−0.025
					(0.012)	(0.014)
					[0.661]	[0.079]
Post scandal × social embeddedness					−0.082	−0.106
					(0.011)	(0.014)
					[0.000]	[0.000]
Facebook × post scandal × social embeddedness					0.016	0.034
					(0.011)	(0.019)
					[0.146]	[0.068]
Control variables	YES	YES	YES	YES	YES	YES
Developer-pair FEs	YES	YES			YES	YES
Developer FEs			YES	YES		
Project and month FEs	YES	YES	YES	YES	YES	YES
Observations	135,708	61,714	10,427	2992	135,708	61,714
Log-likelihood	−160,673	−78,164				
R^2			0.352	0.522	0.351	0.338

Note: Standard errors in parentheses are clustered at the developer-pair level. Standard errors for Panel E are clustered at the developer level because these tests compare the activities of the same developers across treatment and control projects. *p*-values are reported in brackets.

5 | SUPPLEMENTARY ANALYSES

To enrich our insights, we have performed supplementary analyses. First, we examine the dynamic effects of the FB-CA scandal. Panel (A) of Table 8 shows a quarter-by-quarter analysis of developer engagement. Column 1 echoes our finding in Table 3 that developers generally disengaged from Facebook after the scandal, but this trend diminished after 1 year. These findings resonate with Mena et al. (2016), who have posited that stakeholders tend to forget a firm's

TABLE 8 Supplementary analyses.

Panel A. Quarter-by-quarter analysis		
	(1)	**(2)**
Variable	**Total act. (ln)**	**Total act. (ln) of cont. dev**
Facebook × 2016q2	0.024	−0.020
	(0.030)	(0.044)
	[0.437]	[0.656]
Facebook × 2016q3	0.065	0.047
	(0.034)	(0.049)
	[0.057]	[0.332]
Facebook × 2016q4	0.085	0.107
	(0.037)	(0.050)
	[0.021]	[0.031]
Facebook × 2017q1	0.007	0.036
	(0.040)	(0.052)
	[0.855]	[0.486]
Facebook × 2017q2	0.071	0.015
	(0.042)	(0.054)
	[0.091]	[0.786]
Facebook × 2017q3	0.020	0.003
	(0.042)	(0.054)
	[0.637]	[0.961]
Facebook × 2017q4	0.015	0.036
	(0.042)	(0.056)
	[0.722]	[0.518]
Facebook × 2018q1	0.017	0.039
	(0.044)	(0.058)
	[0.700]	[0.498]
FB–CA scandal		
Facebook × 2018q2	−0.164	0.127
	(0.045)	(0.058)
	[0.000]	[0.028]

TABLE 8 (Continued)

Panel A. Quarter-by-quarter analysis		
	(1)	(2)
Variable	Total act. (ln)	Total act. (ln) of cont. dev
Facebook × 2018q3	−0.151	0.120
	(0.046)	(0.060)
	[0.001]	[0.045]
Facebook × 2018q4	−0.156	0.104
	(0.046)	(0.060)
	[0.001]	[0.085]
Facebook × 2019q1	−0.120	0.083
	(0.046)	(0.059)
	[0.002]	[0.159]
Control variables	YES	YES
Developer-pair FEs	YES	YES
Project FEs	YES	YES
Month FEs	YES	YES
Observations	135,708	61,714
R^2	0.343	0.343
Panel B. Reference to the sponsoring firm		
	(1)	(2)
Variable	Refer. to sponsor	Refer. to sponsor
Facebook × post scandal	−0.030	−0.057
	(0.057)	(0.075)
	[0.599]	[0.445]
Control variables		YES
Developer-pair FEs	YES	YES
Project FEs	YES	YES
Month FEs	YES	YES
Observations	61,714	61,714
R^2	0.063	0.064
Panel C. Contribution to other projects		
	(1)	(2)
Variable	Total act. (ln)	Total act. (ln) of cont. dev
Facebook × post scandal	0.073	0.050
	(0.028)	(0.037)
	[0.009]	[0.177]
Developer-pair FEs	YES	YES

TABLE 8 (Continued)

Panel C. Contribution to other projects		
	(1)	(2)
Variable	Total act. (ln)	Total act. (ln) of cont. dev
Project FEs	YES	YES
Month FEs	YES	YES
Observations	135,708	61,714
R^2	0.519	0.500

Note: Standard errors in parentheses are clustered at the developer-pair level. *p*-values are reported in brackets.

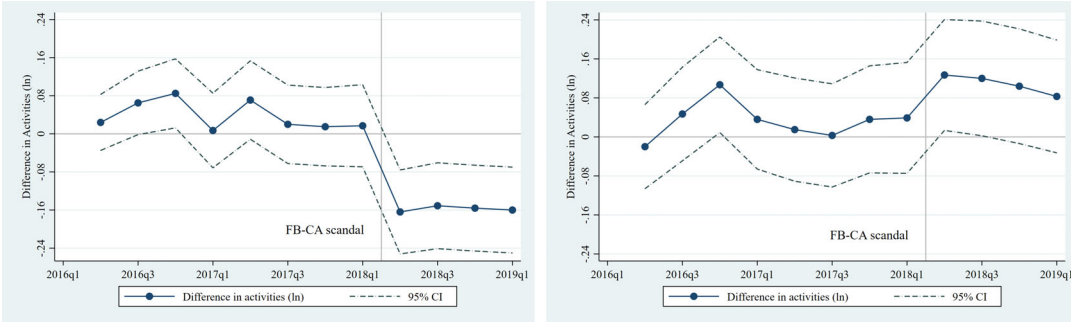

FIGURE 2 Estimated differences between the treatment and control groups.

wrongdoings over time. For continuing developers, Column 2 shows an increase in their engagement immediately after the scandal, which then subsided after two quarters. This reversal suggests that the dissonance-based motivation is temporary and tends to fade once the developers successfully reduce their dissonance. Figure 2 illustrates these findings.

Second, we expect that cognitive dissonance among continuing developers would lead to other behavioral changes. Specifically, these developers are expected to dissociate their activities from Facebook by mentioning Facebook less in their post-scandal comments, which allows them to cognitively distance themselves from Facebook's misconduct. We have tested this conjecture by investigating the percentage of comments mentioning Facebook. Panel (B) of Table 8 shows the results. The results did not support our prediction. One explanation is that developers' comments are primarily technical feedback and do not embody their attitudes toward project-holding firms.

Lastly, we examine whether the FB-CA scandal has affected the contribution of Facebook developers to other OSS projects. If developers' choice space increases their likelihood of disengagement by allowing them to switch to alternatives, they would increase their contribution to other projects after the scandal. Panel (C) of Table 8 reports our analysis results. Column 1 shows supporting evidence for this prediction. Next, we examine continuing developers. Although they have continued with Facebook, their reinforced beliefs about the positive impact of OSS may have spilled over and led to increased contribution to other OSS projects. However,

the results in Column 2 do not support this spillover effect, suggesting that developers' dissonance-induced commitment is project-specific.

6 | DISCUSSION

Do stakeholders keep contributing to a corporate ecosystem after a corporate scandal? This question has become more crucial than ever before. On one hand, firms are increasingly adopting ecosystem strategies for value creation (Barney, 2018; Stonig et al., 2022). For example, Boeing engages university scientists for innovation via collaborative research and lab sponsorships.[10] Volkswagen builds its climate-tech ecosystem by supporting visionary entrepreneurs.[11] For many tech firms, such as Apple and Microsoft, engaging stakeholders in their ecosystems has become a vital source of competitive advantage. On the other hand, however, the prevalence of social media facilitates the rapid spread of information about corporate wrongdoings among stakeholders. Consequently, ecosystem stakeholders often struggle with the dissonance between their support for a firm's ecosystem and their stance on its ethical misconduct (Barnett, 2014).

In this study, we have examined how ecosystem stakeholders navigate this situation by developing a dissonance-based framework and analyzing the reactions of OSS developers to the FB-CA scandal. We have found that, on average, developers reduce their engagement with Facebook projects by 14.5% following the scandal. Interestingly, those developers who continue to engage in Facebook projects after the scandal increase their commitment because they tend to overstate the positive aspects of these projects to alleviate their cognitive dissonance. We have also found that the increase in commitment is greater for continuing developers with a larger choice space and a higher level of social embeddedness in the project community. Overall, we have provided a novel and comprehensive framework for understanding how ecosystem stakeholders react to the dilemma of collaborating with scandal-tainted firms.

6.1 | Theoretical and practical implications

By introducing a cognitive lens to examine stakeholder reactions to corporate scandals, our study has extended the current understanding of the stakeholder–firm relationship (Barney, 2018). Extant research in this literature has primarily focused on reciprocity when examining stakeholders' reactions to firm activities (Freeman et al., 2004; Harrison et al., 2010). Firms are rewarded when they fulfill their stakeholders' needs and punished when they fail to do so. Therefore, prior studies have taken stakeholder disengagement as a natural response to corporate wrongdoings (e.g., Jensen, 2006; McDonnell et al., 2021), offering limited insights into why many stakeholders stay with scandal-tainted firms and how these stakeholders behave in the shadow of corporate scandals.

Our study has contributed a new framework for examining the stakeholder–firm relationship. From a stakeholder perspective, a business corporation is often multifaceted: it can benefit

[10]See Boeing's 2023 *Community Impact Portfolio* report, available at https://www.boeing.com/content/dam/boeing/boeingdotcom/principles/community-engagement/pdf/2023-global-engagement-portfolio.pdf.

[11]See Volkswagen's 2023 *Associate Climate Review* report, available at https://www.volkswagen-group.com/en/publications/corporate/association-climate-review-2023-1810.

and fail stakeholders at the same time through different activities (Lange et al., 2022; Mayes, 2019). In this complex situation, stakeholders' decision-making is unlikely to be driven solely by reciprocity. They need to reconcile dissonant cognitive elements for effective action, which is not captured by the reciprocal model of stakeholder behavior. We have addressed this gap by drawing insights from cognitive dissonance theory. While this theory has been adopted by strategy scholars (e.g., Hodgkinson & Healey, 2011), we have drilled down more deeply into the classic psychology literature (e.g., Aronson & Mills, 1959; Festinger et al., 1956) to develop a series of novel hypotheses that advance our understanding of stakeholder behavior. Importantly, our framework predicts the behavioral changes of stakeholders who stay with tainted firms, a topic that is critical for stakeholder management but underexplored in the literature.

Another important implication of our study is the distinction between the reputation of corporate projects and the overall reputation of a firm. While prior research has recognized that corporate reputation is multidimensional (Bundy et al., 2021), we show that reputation is also multilevel in the eyes of stakeholders. This is because stakeholders do not interact with a firm in its entirety but with specific projects or products (Gibson, 2022; Lange et al., 2022). Stakeholders' evaluations of these elements do not always align with their evaluation of the firm as a whole. This cross-level difference in reputation creates cognitive dissonance for stakeholders. Our study directly tackles the consequences of such dissonance by studying the stakeholders who work with a tainted firm. Our framework is also valuable for guiding research on cross-level reputation disparities in other contexts (Mayes, 2019; Valor et al., 2022).

More broadly, our study has added to the scholarly effort to understand the microfoundations of stakeholder behavior (Bridoux & Stoelhorst, 2014; Felin et al., 2015). Echoing the insights into human decision-making from neuroscience and psychology (Lieberman & Eisenberger, 2009; Loewenstein et al., 2008), this literature has recognized the complex psychological mechanisms in stakeholder behavior. For example, scholars have examined the role of psychological states in how managers respond to changes in the external environment (Hodgkinson & Healey, 2011), how employees cope with scandals of their employers (Frandsen & Morsing, 2022), and how corporate misconduct spreads among the public (Han et al., 2024). We have enriched this literature by elaborating on cognitive dissonance as an important driver of stakeholder behavior in their responses to corporate scandals.

Finally, our findings have offered practical implications for scandal management (Bundy et al., 2021; Zavyalova et al., 2012). Although it is widely accepted that managers should communicate with stakeholders after a scandal (e.g., Han et al., 2024), our study suggests more nuanced strategies. To cultivate an ecosystem that is resilient to negative shocks, managers should facilitate social interactions among ecosystem stakeholders to strengthen their social embeddedness. During a scandal, managers should devote additional attention and resources to retaining stakeholders with more alternative choices and fewer social interactions, because they are more likely than others to disengage. Importantly, our findings suggest greater effort in stakeholder retention, as stakeholders who remain in the ecosystem tend to rationalize their continued involvement and increase their commitment. Our advice is particularly pertinent for engaging online stakeholders, such as OSS developers, who are more volatile than traditional stakeholders, such as suppliers and employees (Barnett et al., 2020).

6.2 | Limitations and future research directions

This study has certain limitations that call for further research. First, ecosystem stakeholders engage with firms under loose corporate control (Altman et al., 2022; Kapoor, 2018). While they

are more likely than other stakeholders to experience dissonance during corporate scandals, some stakeholders such as employees and consumers may also perceive dissonance if they identify with scandal-tainted firms and preserve sufficient autonomy (Frandsen & Morsing, 2022; Valor et al., 2022). However, readers should be cautious in generalizing our findings to stakeholders such as regulators because they are typically not involved in firms' value-creation activities. Future research can explore how the behavioral patterns of these stakeholders vary from our predictions depending on the level of their engagement and corporate control.

Second, we have tested our theory in the context of corporate OSS because this context presents several advantages for empirical research, such as data transparency. However, our framework can be extended to examine a broader spectrum of ecosystems (Altman et al., 2022; Daymond et al., 2023). For example, many firms, such as Tesla, have initiated open innovation ecosystems in which some of their patents are freely licensed for technological development. Future studies can examine how our framework predicts and explains the behavior of stakeholders, such as scientists and inventors, in the innovation ecosystem of these firms.

Third, individuals' decision-making can be driven by their emotions (Lieberman & Eisenberger, 2009; Powell et al., 2011), especially when they face salient events such as corporate scandals (Han et al., 2024). While we have observed the emotional responses of some OSS developers to the FB-CA scandal in their online discussions (e.g., "*Facebook is ... such a moral wasteland of a company*"), we have limited access to a comprehensive dataset on OSS developers' emotions, impeding our direct investigation of the impact of emotions on their behavior. When granular data on stakeholder emotions become available, scholars can investigate how emotions dynamically affect stakeholder responses to scandals with further nuances.

7 | CONCLUSION

Firms have become increasingly multifaceted in the eyes of their stakeholders, especially in an era where firms often go beyond traditional boundaries to engage with ecosystem stakeholders. How stakeholders navigate their complex relationships with firms, particularly after negative events, is an important question for ecosystem development and stakeholder management. We develop a dissonance-based framework to examine the varied responses of ecosystem stakeholders to corporate scandals. Exploiting the FB-CA scandal as a shock to OSS developers, we have found that stakeholders' reactions are mainly driven by their effort to reduce their cognitive dissonance, either by disengaging or by strengthening their commitment. Our study underscores the importance of focusing on the cognitive foundations of stakeholder behavior in future research.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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