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From in-role to extra-role: Beneficiary-specific impact perceptions in workplace pro-environmental spillover

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This study investigates the impact of employee in-role pro-environmental behavior on extra-role pro-environmental behavior in the workplace. Drawing on altruism and prosocial theories, we uncover a linear spillover effect mediated by perceived environmental impact, and a curvilinear spillover effect mediated by perceived organizational impact. A three-wave survey of 311 full-time employees was conducted to test these dual pathways. The findings contribute to the literature on organizational environmental management, behavioral spillover, and prosocial impact.

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Abstract

Research into spillover of pro-environmental behavior (PEB) has surged due to its cost-effective potential to enhance environmental policy and intervention implementation. We extend this work by moving beyond the traditional environmentally-focused mechanism and, instead, recognizing the dual nature of in-role PEBs. Drawing on altruism and prosocial theories, we propose that in-role PEB leads to both perceived environmental impact and perceived organizational impact, each driving different spillover patterns from in-role to extra-role PEB. Specifically, when employees perceive that in-role PEBs help the environment, positive spillover to subsequent extra-role PEB occurs; however, when employees perceive that in-role PEBs help the organization, there will be a curvilinear (U-shape) relationship to subsequent extra-role PEBs. Data from 311 employees, collected via an online survey through Prolific across three waves, support these hypotheses. By uncovering distinct spillover patterns tied to perceived impacts on different beneficiaries, this study emphasizes the importance of perceived prosocial impact and provides new insights into the mechanisms underlying PEB spillover effect beyond environment-relevant factors.

Keywords: Workplace pro-environmental behavior, spillover effect, prosocial impact

Introduction

The growing concerns over global warming and environmental degradation have led organizations to take more responsibility for protecting the natural environment (Aguilera, Aragón-Correa, Marano, & Tashman, 2021; Bhuiyan, Adu, Ullah, & Islam, 2025). Many organizations have included pro-environmental tasks within job roles and adopted various environmental management practices to enhance employees' pro-environmental involvement (Chaudhary, 2020; Peng, Chen, Zou, & Nie, 2021; Ren et al., 2022; Sabbir & Taufique, 2022; Stein, Kühner, Katz, & Zacher, 2025). Companies are also trying to maximize the impact of their interventions (Trianni, Cagno, & Neri, 2017) to not only increase targeted employee pro-environmental behaviors (e.g., in-role pro-environmental behaviors, or in-role PEBs), but to also pull in broader and untargeted pro-environmental efforts (e.g., extra-role PEBs, Dumont, Shen, & Deng, 2017; Khalid, Shahzad, Shafi, & Paille, 2022; Saleem, Zhang, Bashir, & Rafiq, 2025; Thøgersen, 1999). To reap the full benefit, in-role PEBs must positively spill over to extra-role PEBs. Yet spillover research in organizational behavior and private-sphere PEB has suggested that increasing a targeted beneficial behavior (e.g., task performance, conservation behavior) does not always lead to subsequent socially desirable behavior (Nilsson, Bergquist, & Schultz, 2017; Truelove, Carrico, Weber, Raimi, & Vandenbergh, 2014; Webster, Greenbaum, Mawritz, & Reid, 2022; Zhang, Liu, Wang, & Luo, 2025). Therefore, increased engagement in in-role PEB resulting from organizational environmental interventions will not necessarily spill over to extra-role PEB, contrary to the needs of today's organizations. Instead, it is key to understand the mechanisms through which workplace PEB spillover will occur, that is, why and how engaging in in-role PEB leads to subsequent engagement in extra-role PEB (Nilsson et al., 2017).

Despite recent attention given to the important phenomenon of PEB spillover, our current

knowledge is limited predominantly to the private sphere, with workplace-focused research first appearing in 2019 but receiving more substantive attention only since 2024 (Paillé, Raineri, & Boiral, 2019; Guo, Unsworth, Bretter, & Davis, 2024; Zhang, Ren, & Tang, 2024; Zhang et al., 2025; Saleem et al., 2025; Stein et al., 2025; Wang, Jin, Xu, & Khan, 2025; Yang, Tang, & Jia, 2025). Perhaps due to the preponderance of private-sphere spillover studies, the proposed mechanisms across these works are consistently linked to the natural environment and morality, whether though actors' environmental self-identity (e.g., Van Der Werff, Steg, & Keizer, 2014; Zhang et al., 2024), environmental goal commitment (e.g., Guo et al., 2024), environmental habit and self-efficacy (Saleem et al., 2025), person-organization fit (Wang et al., 2025), moral credit and identity (Zhang et al., 2025), or reflective moral attentiveness (Wang et al., 2025). These factors universally arise from the actor's perception that they have (or have not) brought positive change to the environment; implicitly assuming that the employees perceive the environment as the sole beneficiary of their PEB.

Nonetheless, as Guo et al. (2024) suggested, workplace in-role PEB represents not only a means to helping the environment, but also compliance with organizational requirements. Thus, while in-role PEB may be a prosocial behavior in that it promotes and/or protects all of humanity (Klein, Nockur, & Reese, 2022; Zelenski & Desrochers, 2021), it can also be viewed as an impure altruistic behavior, with perceived prosocial impact directed towards benefitting the organization and not just those individuals or groups directly affected by environmental issues (see Bolino & Grant, 2016; Grant & Campbell, 2007). This highlights an important oversight in current research – the lack of attention to identifying and distinguishing between beneficiaries. This oversight is problematic because there will be fundamentally different mindsets between perceiving the environment as the beneficiary and perceiving the organization or the customer as

the beneficiary. We demonstrate that shifting the research lens to beneficiaries can provide new insights and a more detailed accounting of the complex effects of spillover between in-role and extra-role PEBs.

To achieve this objective, this study focuses on two core properties of in-role PEB: its environmental-helping purpose (Mi et al., 2024; Pham, Vo-Thanh, Shahbaz, Huynh, & Usman, 2020; Sabbir & Taufique, 2022) and its alignment with organizational and customer expectations (Norton, Parker, Zacher, & Ashkanasy, 2015; Tian, Zhang, & Li, 2020). This is akin to work on altruism which identifies two broad types of individuals' altruism – pure altruism (i.e., acting merely for the public good) and impure altruism (i.e., combining public benefit with self-interest, such as compulsory altruism; Andreoni, 1990; Land & Rose, 1985). We argue that the environmental aspect of in-role PEB highlights employees' pure altruism, reflecting their concern for the environment (Fawehinmi, Yusliza, Ogbeibu, Tanveer, & Chiappetta Jabbour, 2022; Hubbard, Harbaugh, Srivastava, Degras, and Mayr, 2016). In contrast, the compliance aspect of in-role PEB makes employees' impure altruism salient, under which behavior is driven by external motivators or internalized self-expectation (Graves, Sarkis, & Zhu, 2013; Norton et al., 2015; Tian et al., 2020). Given that altruism is often embedded in beneficial behaviors (Armutcu, Ramadani, Tan, & Appolloni, 2025; Batson, 2012), we integrate prosocial impact theory (Bolino & Grant, 2016; Chen & Zhang, 2023; Gómez, Espejo, Martela, Bastías, Bravo, & Unanue, 2024; Grant, 2007; Lanaj, Johnson, & Wang, 2016; Lanaj et al., 2019) which suggests that prior beneficial behaviors shape perceptions of prosocial impact and subsequent behaviors.

Thus, we argue that in-role PEB fosters two different types of impacts: on the environment, which we term perceived environmental impact, and on the organization and customers, which we term perceived organizational impact. Due to their different altruism roots, we hypothesize

different patterns. We suggest that perceived environmental impact consistently promotes extra-role PEB, in line with private-sphere PEB spillover research. However, we hypothesize that perceived organizational impact initially discourages extra-role PEB by emphasizing employees' compliance with external expectations. As perceived organizational impact grows, we argue that employees derive a sense of value and internal motivation, ultimately fostering extra-role PEBs.

By integrating the altruism framework (Andreoni, 1990; Costa Pinto, Maurer Herter, Rossi, Meucci Nique, & Borges, 2019) with prosocial impact theory (Grant, 2007; Lanaj et al., 2016, 2019), we explore how in-role PEBs shape different impact perceptions and thus, spillover patterns to extra-role PEBs. In doing so, our research contributes to environmental management and organizational behavioral theory in three ways. First, by examining perceived prosocial impact as the proximal consequence of in-role PEB, we shift the focus from actors to beneficiaries. The broader corporate social responsibility literature has begun to consider the role of beneficiaries (e.g., Rupp & Mallory, 2015; Rupp, Aguinis, Siegel, Glavas, & Aguilera, 2024). However, existing spillover research still implicitly assumes that employees recognize only the environment as the beneficiary of their in-role PEBs; as such research has focused on employees' inspection of their identity or commitment as the mechanisms driving spillover (Guo et al., 2024; Zhang et al., 2024). We challenge this assumption by demonstrating that in-role PEB can lead to both perceived environmental *and* organizational impact, and we thus offer new insight into in-role PEB's nature as both pure and impure altruism.

Second, unlike prior workplace PEB spillover research that focuses solely on environment- and morality-relevant mechanisms (Guo et al., 2024; Zhang et al., 2024; Wang et al., 2025), our study further considers the non-environmental and amoral side (i.e., perceived organizational impacts) of employees' reactions to prior PEB performance. This leads to the demonstration of

a novel and complex curvilinear (a U-shape) PEB spillover pattern, in which employees' mindsets are different depending upon the degree of perceived organizational impact. This finding suggests that the spillover effect of in-role PEB varies not only by the nature of mediator and but also by the degree of employees' PEB performance.

Finally, although prosocial behavior has been defined as acts benefiting "coworkers, customers, teams, stakeholders, or the organization as a whole" (Bolino & Grant, 2016, p.4), little attention has been paid to the latter. By correcting this trend, we have uncovered a rare negative effect of prosociality: Most research assumes that perceived prosocial impact uniformly motivates further social desirable behaviors (e.g., Castanheira, 2016; Freeney & Fellenz, 2013; Gómez et al., 2024; Sonnentag & Starzyk, 2015) but by considering organizational and customer expectations we are able to respond to Bolino and Grant's (2016) call to examine the dark side of perceived prosocial impact. The theoretical model is shown in Fig 1.

Insert Fig 1 about Here

Theory and hypotheses

PEB spillover and perceived prosocial impact

The concept of spillover traces back to the "foot-in-the-door" technique, whereby compliance with a small request leads to subsequent compliance with a larger request, even when the second request is different or comes from a different person (Freedman & Fraser, 1966). Consistent with "foot-in-the-door" techniques, Thøgersen (1999) first used the term "spillover effect" to describe the process whereby a specific change in environmental behavior or attitude leads to a broader change in environmental behaviors or attitudes. Since then, a large body of research has focused on the spillover effect of PEBs across time, behavioral type, and context in

the private sphere (Nilsson et al., 2017; Thøgersen & Crompton, 2009; Truelove et al., 2014).

Although some economics research examines the behavioral rebound consequences of the cost-saving aspect of PEB, reflecting the impure altruism of PEB (e.g., Gillingham, Kotchen, Rapson, & Wagner, 2013; Matiaske, Menges, & Spiess, 2012), spillover research has mainly focused on PEB as a means to help the environment, thereby considering only the pure altruism of PEB. Indeed, the vast majority of PEB spillover studies have investigated mechanisms based on identity (e.g., Van Der Werff et al., 2014; engaging in one PEB makes the environmental identity salient leading to further identity-driven behaviors), action-based learning (e.g., Zhang & Wang, 2020; engaging in one PEB teaches the individual how to help the environment leading to further skill-based behaviors), and moral licensing (e.g., Truelove et al., 2021; engaging in one PEB helps the environment leading to resting on one's laurels and future disengagement).

More recently, research has begun to examine spillover across different PEB types in the workplace, however, the focus on the pure altruistic component of PEB has still been maintained. For example, Zhang et al. (2024) suggested that employee in-role PEB was an identity cue that contributes to an employee's formation of an environmental self-identity which then leads to extra-role PEB. Although Guo et al. (2024) recognized the organizationally-driven nature of in-role PEB, their research returned to the mediating effect of environmental goal commitment between in-role and extra-role PEB. Similarly, although Wang et al. (2025) identified employees' in-role PEB as a response to formal organizational environmental requirements, they construed employees' cognitive reactions to their performance as engaging in morally right actions and expressing their green values, which led them to develop strong moral feelings and perceive a high degree of person-organization fit.

Extant research therefore assumes that workplace PEB spillover is indistinguishable from

private PEB spillover, however, workplace PEB, and especially in-role PEB, contrasts with private PEB because it also comprises impure altruism. Specifically, employees may engage in PEBs solely due to organizational benefits or requirements (Ones & Dilchert, 2012); indeed, many employees may not have environmental goals or even environmental awareness (Lamm, Tosti-Kharas, & Williams, 2013; Unsworth, Dmitrieva, & Adriasola, 2013; Ramus & Killmer, 2007). Thus, the construal of the performance of in-role PEB may be substantively differently to the performance of private PEB as the perceived beneficiary is different. To capture and differentiate the unique mechanism driving impure in-role PEB spillover, this research therefore shifts the attention away from the actors and towards the perceived impact of the behavior. In-role PEB is a behavior designed to help others – whether those 'others' are the environment or the organization – and thus is a prosocial behavior (Klein et al., 2022), therefore we argue that prosocial impact theory is an appropriate theoretical framework to examine how one prosocial behavior affects future prosocial behaviors via perceived impact (Grant, 2007; Lanaj et al., 2016, 2019).

Perceived prosocial impact was initially proposed by Grant (2007) to capture individuals' subjective sense that their actions have made a meaningful difference in others' lives. Research on perceived prosocial impact has primarily focused on two sets of employee-beneficial behaviors: voluntary work behaviors, such as helping (Clair et al., 2016; Sonnentag & Grant, 2012) and OCBs (Gómez et al., 2024); and in-role work behaviors such as work engagement (Lanaj, Foulk, & Erez, 2019) and public or customer service behavior (Bashir, Wright, & Hassan, 2023; Castanheira, 2016; Freeney & Fellenz, 2013). These behaviors are aimed at benefiting humans or entities constituted of humans.

In-role PEBs also benefit humans or groups constituted of humans. For example, in-role

PEBs can help organizations and customers meet their goals, express environmental values, reduce financial costs, and promote healthier lifestyles (Luu, 2018; Olekanma, Rodrigo, Adu, & Gahir, 2024; Pellegrini, Rizzi, & Frey, 2018). Yang et al. (2025) suggests that workplace PEB can be considered as a type of prosocial behavior that generates value for individuals, groups, organizations, and society. This shared characteristic highlights the potential to examine how in-role PEBs act as prosocial behaviors (Chou, 2014; Dumont et al., 2017), leading to perceived impact and, in turn, influence employees' engagement in subsequent extra-role PEBs.

Nonetheless, in-role PEB differs from previously examined prosocial behaviors because it has two distinct beneficiaries: (1) the environment and (2) organizations and customers. To reflect these distinctions, we introduce *perceived environmental impact* (the awareness of one's positive impact on the environment) and *perceived organizational impact* (the awareness of one's positive impact on their organizations and customers). The environment is the explicit beneficiary of in-role PEB because in-role PEB is designed for the purpose of moving toward environmental sustainability (Boiral, 2009; Ones & Dilchert, 2012). As this demonstrates concern for a direct beneficiary, it is rooted in pure altruism, thereby achieving self-transcendence. At the same time, however, organizations and customers may also be benefitting from the prosocial PEB, particularly when there are external expectations and organizational prescriptions (Norton et al., 2015; Sabbir & Taufique, 2022). This shifts the employees' focus from environmental or societal benefits to organizational or customers' expectations, rooting the behavior in impure altruism. We argue below that a focus on the pure altruistic, environmental beneficiaries will result in the traditional positive behavioral outcomes found previously, but that the impure altruistic, organizational beneficiaries will result in a more complex dynamic, tied to striving for social approval, that will lead to a more complex pattern of spillover effects.

In-role PEBs and perceived prosocial impact

Research on prosocial impact suggests that employees' beneficial work activities enhance their feelings of prosocial impact. For example, leaders' daily work engagement fosters a sense of prosocial impact on subordinates (Lanaj et al., 2019), employees' OCBs directed at individuals increase their perception of prosocial impact (Gómez et al., 2024) and employees' organizationally focused OCBs similarly enhance perceived prosocial impact (Kelemen, Matthews, Henry, Zhang, & Bradley, 2023). Theoretically, perceived prosocial impact theory (Grant, 2007) suggests two paths for promoting employee's perceived prosocial impact: providing employees with opportunities to affect the lives of beneficiaries; and helping them become aware of their impact on and attachment to the beneficiaries. For example, organizational socio-moral climate tends to provide employees with multiple opportunities to engage in behaviors that benefit others, thereby promoting their perceptions of prosocial impact (Schümann, Stein, Tanner, Baur, & Bamberg, 2021). Contacting or receiving gratitude from beneficiaries enables employees to recognize that they have made a difference in others' lives and thus increases their perception of prosocial impact (Grant, 2008, 2012; Lee et al., 2019).

Although in-role PEB differs from traditionally-studied prosocial behaviors in that it affects very large groups of people (i.e., humanity and whole organizations) rather than individuals or teams, we argue that engaging in it can still follow these two paths and thereby can affect employees' perception of prosocial impact. Specifically, when employees demonstrate high performance of in-role PEB, they are engaging in these behaviors frequently and extensively and, thus, have more opportunities to make a difference in the environment and address the demands and expectations of the organization and consumers. They thereby accumulate more benefits for the environment and the organization. Second, frequent engagement in in-role PEB

provides consistent cues that employees are actively contributing to the well-being of the environment and the organization and consumers. These employees are more likely to receive positive feedback from others regarding the meaningful differences they have made for these beneficiaries, perhaps via colleague or family comments, performance management, or stakeholder feedback. Therefore, employees with higher in-role PEB performance are likely to be more confident in recognizing their positive impacts on the environment (i.e., environmental impact) and the organization and its customers (i.e., organizational impact).

Accordingly, we propose that:

Hypothesis 1: Employees' engagement in in-role PEBs is positively related to their perceived environmental impact.

Hypothesis 2: Employees' engagement in in-role PEBs is positively related to their perceived organizational impact.

Perceived prosocial impact and employee extra-role PEB

The perceived prosocial impact theory considers perceived prosocial impact as an allocentric (i.e., other-focused) psychological state that emphasizes the thoughts, feelings, preferences, and welfare of beneficiaries, as well as a subjective experience of work meaningfulness derive from its connection to the welfare of beneficiaries (Grant, 2007, 2008). This is directly applicable to perceived environmental impact because this perception arises from behaviors driven by pure altruism, whereby employees focus purely on the welfare of the environment.

As perceived prosocial impact theory suggests, recognizing the positive impacts of ones' actions on beneficiaries increases employees' motivation to make a prosocial difference and therefore, drive greater effort and consistency in subsequent prosocial behaviors. This is because

perceiving a high prosocial impact boosts employees' subjective well-being and satisfies their needs for relatedness and competence (Sonnentag & Starzyk, 2015). It also works as a source of work meaningfulness that reduces employees' rumination about the cost of prosocial action and shifts their focus to the benefits experienced by the beneficiaries (Grant, 2012; Lanaj et al., 2016; Meng, Lin, Du, Zhang, & Lu, 2023). Furthermore, perceived prosocial impact makes employees feel closer to and emotionally attached to the beneficiaries because they might interpret their contribution as reflecting their valuing of the beneficiaries (Grant, Dutton, & Rosso, 2008). Finally, awareness that one can improve others' welfare strengthens employees' judgment of their behavioral instrumentality (i.e., effective performance will benefit others) and expectancy (i.e., the belief that effort can transform into performance; Grant, 2008; Hamm, Ropp, Witwer, & Scott, 2024). All these positive affective and cognitive states will motivate employees to be more sensitive to the needs of potential beneficiaries (Papachristopoulos, Gradito Dubord, Jauvin, Forest, & Coulombe, 2023) and to dedicate additional time and energy for the prosocial activities (Bashir et al., 2023; Gómez et al., 2024; Schümann et al., 2021). Indeed, research has suggested that perceived prosocial impact in the workplace can promote employees' proactive and beneficial work behaviors, such as helping leaders (Ni et al., 2022), engaging in OCBs toward individuals and organizations (Gómez et al., 2024), and increasing work engagement (Cheng, Zhang, He, & Yao, 2024).

Since the nature of environmental impact perception aligns with the prosocial impact perception, employees who experience an increase in perceived environmental impact from previous in-role PEB engagement are likely to become more motivated to make a positive difference to the environment. This motivation stems from the increased psychological well-being, work meaningfulness, environmental commitment, and green goal expectancy noted

above, all of which have been shown to positively predict employees' extra-role PEB (Bissing-Olson, Iyer, Fielding, & Zacher, 2013; Guo et al., 2024; Gusmerotti, Todaro, Tosi, & Testa, 2023; Yuan et al., 2024). As a result, as perceptions of environmental impact increase, it is more likely that employees will go beyond their job duties and engage in extra-role PEBs in the future. Accordingly, we propose:

Hypothesis 3a: Perceived environmental impact has a positive relationship with employees' subsequent extra-role PEBs.

Hypothesis 3b: Perceived environmental impact mediates the positive relationship between employee previous in-role PEB and subsequent extra-role PEB.

The consequences of perceived organizational impact are more complex. Although in-role PEB is a prosocial behavior, perceived organizational impact originates from employees' helping, and thus conforming to the expectations of, the organization and customers. In such cases, employees are not proactive, nor purely altruistic contributors, but are reactive participants fulfilling externally imposed standards (Norton et al., 2015; Yang, Law, & Tang, 2024). In other words, the environmental goal is not internalized, and in-role PEBs are performed under pressure or with a sense of obligation (Pelletier, Tuson, Green-Demers, Noels, & Beaton, 1998; Tian et al., 2020). As a result, perceived organizational impact fails to function as a personal resource fostering eudaimonic well-being or encouraging further altruistic behaviors (Lin, Savani, & Ilies, 2019; Martela & Ryan, 2016; Sonnentag & Grant, 2012). Instead, by helping the organization (Bolino & Grant, 2016) it reflects alignment with external demands (Weinstein & Ryan, 2010), which can lead to collateral outcomes such as emotional exhaustion (Fernet, Austin, & Vallerand, 2012), aversion to externally imposed environmental goals (van Hooff & van Hooft, 2017), and a narrowed behavioral focus on prescribed actions (Deci, Olafsen, & Ryan, 2017).

This argument is supported by research on pro-environmental performance pressure, which shows that such pressure reduces employees' broader concern, but focuses their attention on self-relevant information and consequence lowers PEB performance (Yang et al., 2024). Furthermore, when employees hold a stress-is-debilitating mindset, performance pressure can trigger maladaptive emotional coping strategies that further diminish PEB (Yang, Law, & Tang, 2025). Evidence from controlled motivation research echoes this pattern: when employees perceive algorithmic HR systems as tools of managerial control, they prioritize metricized tasks and neglect non-metricized ones (Edwards, Zubielevitch, Okimoto, Parker, & Anseel, 2024). Similarly, socially responsible HRM fails to promote employee moral voice when it fosters controlled motivation, as such motivation is less conducive to proactive behavior and more associated with antisocial outcomes (Zhao, Chen, & Liu, 2023). Thus, as employees begin to engage in in-role PEBs, and as they move from perceiving no organizational impact to seeing some impact, they increasingly view it as dictated by external pressures; diminishing their willingness to engage in behaviors beyond organizational scrutiny, namely extra-role PEB.

Yet, once organizational impact reaches a certain level, employees are more likely to feel they are valuable and useful (Castanheira, 2016; Ni, Song, Zheng, Zhu, Zhang, & Xu, 2022) because moderate-to-high degrees of perceived organizational impact are often validated by positive outcomes of their actions, such as favorable performance feedback and customer satisfaction (Roberts, Cumberland, & Ellinger, 2025). Research also suggests that perceiving oneself as able to influence work outcomes enhances employees' self-evaluation, such as self-esteem (De Cremer, Van Knippenberg, Van Knippenberg, Mullenders, & Stinglhamber, 2005). This can result in environmental goals being personally significant and promoting internalization because goal internalization occurs when one's competence need is satisfied, and because a form

of internalized motivation for goal pursuit involves pursuing the goal for the purpose to boost one's self-evaluation (see e.g., Ryan, Deci, Vansteenkiste, & Soenens, 2021; van Beek, Taris, & Schaufeli, 2011). Thus, employees with moderate-to-high degree of perceived prosocial impact will view PEBs not solely as externally required but as partially driven by their free will (Ng, Cheung, Lit, Wan, & Choy, 2024). Accordingly, we argue that once perceived organizational impact reaches a critical threshold, it functions as a self-regulatory force through goal internalization and thus, enhances engagement in PEBs, including those beyond job prescriptions (Trépanier, Peterson, Gagné, Fernet, Levesque-Côté, & Howard, 2023; Stoeber, Davis, & Townley, 2013; Yu & Frenkel, 2013). In other words, we hypothesize that perceived organizational impact positively influences employees' subsequent extra-role PEBs once it surpasses a threshold. Accordingly, the relationship between perceived organizational impact and extra-role PEB should follow a curvilinear trajectory: initially negative due to the dominance of external regulation but becoming positive due to internalization processes and internal regulation. Accordingly, we propose:

Hypothesis 4a: Perceived organizational impact has a U-shaped relationship with employee subsequent extra-role PEB.

Hypothesis 4b: Perceived organizational impact mediates the U-shaped relationship between employee previous in-role and subsequent extra-role PEBs.

Methods

Participants, design and procedure

Data for this study were obtained from the survey platform Prolific, which has been shown to provide the highest data quality among commonly used survey platforms such as Amazon Mechanical Turk, CloudResearch, and Prolific (Peer, Rothschild, Gordon, Evernden, & Damer,

2022). In each wave, participants received a small payment equivalent to approximately £9 per hour for their time. To decrease the likelihood of common method variance (CMV) and to capture the behavioral spillover trajectory, data were collected in three waves. In the first wave, 555 working adults completed the survey, which measured their performance of in-role PEBs. One week later, we invited 491 participants who responded appropriately to the attention checks to take the wave 2 survey. Of these, 454 participants completed the wave 2 questionnaire, which measured their perceptions of environmental and organizational impacts. Fourteen of these participants failed the attention check and thus, were not invited to the wave 3 survey in the third week. In the wave 3 survey, participants were asked to rate their frequency of conducting extra-role PEBs and provide their demographic information, including education background, work tenure, and industry. Since the age and gender information could be directly obtained from Prolific once employees complete the survey, we did not include these questions in the survey. This study was reviewed and approved by the research ethics committee of the first author's institution.

A total of 402 employees completed the third survey, and we matched their data across the three waves using their unique Prolific IDs. By comparing the matched samples with the original response samples, we obtained an overall response rate of 72.43%. 26 participants who either failed an additional attention check in wave 1 or wave 3, or both, were excluded from the analysis. In addition, we excluded 47 participants who didn't have in-role pro-environmental tasks in their job, 15 participants who completed the survey in an unreasonably short time, and three participants who had missing values in control variables (two didn't report their working tenure and one's age and gender information could not be obtained from Prolific). The final sample size was 311, with 51.13% of the sample being females and 74.59% having a bachelor's

degree or above. The average age of these participants was 33 years (SD = 9.96) and the average working tenure was 5 years (SD = 5.41). They were from various industries, including information technology (15.43%), healthcare (10.93%), education and training (10.29%), retail (7.40%), electricity and automation (6.11%), manufacturing (5.79%), and others (44.05%).

Measures

All measures employed a 5-point response scale ranging from 1 (strongly disagree/seldom) to 5 (strongly agree/always).

In-role PEBs. We measured employees' performance of in-role PEB in the first week by adapting the 4-item task performance scale of Van Dyne and LePine (1998). An example of this scale was "I fulfill the green responsibilities in my job description". The Cronbach α for this scale was 0.85.

Perceived environmental and organizational impacts. In the second week, to measure employees' perception of their impact on the environment as well as the organization and customer, we adopted the 3-item scale of Grant and Campbell (2007). The items for *perceived environmental impact* were: "I was very conscious of the positive impact that my work had on the environment", "I was very aware of the ways in which my work was benefiting the environment", and "I felt that I could have a positive impact on the environment" (α = 0.89). The items for *perceived organizational impact* were: "I was very conscious of the positive impact that my work had on my organization and consumers", "I was very aware of the ways in which my work was benefiting my organization and consumers", and "I felt that I could have a positive impact on my organization and consumers through my work" (α = 0.84). The Confirmatory Factor Analysis (CFA) indicated that the two-factor model of perceived environmental impact and perceived organizational impact ($\chi^2(8)$ = 59.74, CFI = 0.96, SRMR = 0.03) was significantly

superior to the one-factor model that combines the two factors ($\chi^2(9)$ = 175.28, CFI = 0.86, SRMR = 0.07; $\Delta\chi^2(1)$ = 115.54, $p < 0.001$). Thus, it is reasonable to treat perceived environmental impact and perceived organizational impact as separate constructs.

Subsequent extra-role PEB. We measured employee extra-role PEB in the third week using the three-item proactive PEB scale of Bissing-Olson et al. (2013). An example was: "I took chances to get actively involved in environmental protection at work" (α = 0.88).

Control variables. Given that individuals' age, gender, educational background, and work tenure has been found to influence their environmental attitude and behavior (Katz, Rauvola, Rudolph, & Zacher, 2022; Meyer, 2015; Xia & Li, 2023; Wiernik, Ones, & Dilchert, 2013), we controlled for employees' age (in years), gender (0-male, 1-female), educational background (1-less than high school degree, 2-high school graduate, 3-some college but no degree, 4-associate degree in college (2-year), 5-bachelor's degree (4-year), 6-master's degree, 7-doctoral degree, and 8-professional degree), and work tenure (in years) to exclude their potential impact. We also conducted robustness tests without the control variables included.

Results

The descriptive statistics, correlations, and scale reliabilities are presented in Table 1. As shown, in-role PEB was positively related to both environmental (r = 0.32, $p < 0.001$) and organizational impact perceptions (r = 0.27, $p < 0.001$). In addition, perceived environmental impact and organizational impact were both positively related to extra-role PEBs (r = 0.65 and 0.48 respectively, ps < 0.001).

Insert Table 1 about Here

Although we used procedural means to minimize CMV, we also conducted Harman's one-

factor test to check that they worked, using an unrotated exploratory factor analysis (Podsakoff et al., 2003). The analysis showed that the first factor accounted for 48.02% of the cumulative variance, which is below the 50% threshold (Podsakoff et al., 2003), indicating that a single factor did not dominate the variance (Dang-Van, Wang, Vo-Thanh, Jiang, & Nguyen, 2023). Thus, CMV is unlikely to be influencing the validity of the dataset or results. To ensure the convergent and discriminant validity of the core constructs, we conducted CFAs using Mplus 7.4 (Muthén & Muthén, 2017). The four-factor model (in-role PEB, perceived environmental impact, perceived organizational impact, and extra-role PEB) yielded a satisfactory model fit to the data (χ^2 = 132.59, df = 59, RMSEA = 0.06, CFI = 0.97, SRMR = 0.03). All indicators loaded on their respective constructs, with standardized factor loadings higher than 0.50 ($p < 0.001$). Thus, the convergent validity was adequate. To assess the discriminant validity, we conducted a CFA model comparison between the theoretical four-factor model and alternative models (six three-factor models, four two-factor models, and a single-factor model). Results showed that the alternative models yielded significantly worse model fit ($\Delta\chi^2 \geq 121.56$, $\Delta df \geq 3$, $p < 0.001$; for details, please see Table 2), indicating adequate discriminant validity.

Insert Table 2 about Here

Path analysis and the bootstrapping approach with 1000 iterations were used in Mplus 7.4 to test the hypotheses. To mitigate multicollinearity from squaring perceived organization impact, we mean-centered it. Results for hypotheses testing are shown in Table 3. Hypothesis 1 proposed that the performance of in-role PEBs was positively related to employee's perceived environmental impact. As shown in Table 3, the relationship between in-role PEB and perceived environmental impact was positive and significant ($\beta = 0.42$, $p < 0.001$), supporting hypothesis

1. Hypothesis 2 proposed a positive relationship between the performance of in-role PEB and employee's perceived organizational impact. According to the results in Table 3, in-role PEB was positively and significantly related to perceived organizational impact ($\beta = 0.27$, $p < 0.001$). Thus, hypothesis 2 was supported.

Insert Table 3 about Here

Hypothesis 3a and 3b suggested that employees' perception of environmental impact was positively related to their future extra-role PEBs and that it would mediate the relationship between in-role PEB and extra-role PEB. Results in Table 3 suggested that there was a positive and significant relationship between perceived environmental impact and extra-role PEB ($\beta = 0.66$, $p < 0.001$), supporting hypothesis 3a. Similarly, the results of bootstrapping suggested that perceived environmental impact significantly mediated the positive relationship between in-role PEB and extra-role PEB ($\beta = 0.28$, 95% CI = [0.18, 0.43]). Thus, hypothesis 3b was supported.

Hypothesis 4a predicted a U-shaped relationship between employees' perception of organizational impact and their future extra-role PEB. Following the recommended procedure of Lind and Mehlum (2010) and Haans, Pieters, and He (2016) for identifying the curvilinear relationship, we first examined whether the quadratic term of perceived organizational impact was positively and significantly related to extra-role PEB. According to the results shown in Table 3, the relationship between squared perceived organizational impact and extra-role PEB was positive and significant ($\beta = 0.15$, $p < 0.01$), meeting the standard for a curvilinear relationship. Second, we examined whether the slopes of the relationship between perceived organizational impact and extra-role PEB were sufficiently steep at both ends of the organizational impact perception range (i.e., -2.77 - 1.23). The t-test suggested that when the

value of perceived organizational impact was 1, the slope of the relationship was significantly negative (β = - 0.67, p < 0.01); when the value of perceived organizational impact was 5, the slope of the relationship was significantly positive (β = 0.49, p < 0.01). Third, we examined whether the turning point of the relationship between organizational impact perception and extra-role PEB was located well within the range of organizational impact perception. Results suggested that turning point was -0.47, and the 95% CI was located within the -2.77 - 1.23 range of organizational impact perception (95% CI = [-1.55, 0.26]).

We further plotted the predicted values of extra-role PEBs for the range of perceived organizational impact with all other variables being at their mean, following the recommendation of Jourdan and Kivleniece (2017; Fig 2) and the Johnson–Neyman diagram of the effect of perceived organizational impact on employees' extra-role PEB (Fig 3). As shown in Fig 2, the relationship between perceived organizational impact and extra-role PEB followed a U-shape. Further, Fig 3 suggested that the effect size of perceived organizational impact on extra-role PEB gradually increased from negative to positive as perceived organizational impact increased. In addition, when centered perceived organizational impact is smaller than -1.69, or larger than 0.16, the 95% CI of the effect size excluded zero, indicating that perceived organizational impact was negatively and significantly related to extra-role PEB when it was smaller than 2.08, and was positively and significantly related to extra-role PEB when it was larger than 3.93. Taken together, hypothesis 4a was supported.

Insert Fig 2 & Fig 3 about Here

Hypothesis 4b predicted an indirect U-shaped relationship between in-role PEB and extra-role PEB via employees' organizational impact. The results of the bootstrapping approach

suggested that the mediation effect of quadratic organizational impact perception on the relationship between in-role and extra-role PEB was positive and significant (β = 0.04, 95% CI = [0.01, 0.08]). Following the recommendation of Lin, Law and Zhou (2017), we detected the curvilinear effect sizes when perceived organizational impact were at low and high values (2 SD below and above the mean). Results suggested that the indirect effect was significantly negative when perceived organizational impact was low (β = -0.09, 95% CI = [-0.23, -0.003]), while significantly positive when perceived organizational impact was high (β = 0.16, 95% CI = [0.05, 0.33]). Thus, hypothesis 4b was supported. The results hold without control variables included.

Discussion

Research attention on behavioral spillover, especially PEB spillover, has been increasing in recent years because, comparing to other drivers such as leaders' initiated green behavior (Baldassari et al., 2023; Jiang et al., 2022; Shao, Jiang, Yang, & Zhang, 2023), it provides a costless way to promote the efficiency of policies and interventions aimed at promoting individuals' PEBs (Thøgersen, 1999). In alignment with this trend, recent studies have introduced the spillover effect into the workplace, focusing on the employees' self-perceptions as the mediator linking previous in-role PEBs and their subsequent extra-role PEBs (e.g., Guo et al., 2024; Zhang et al., 2024). We add to this stream of research by moving beyond a pure altruistic (i.e., environmental or moral) mechanism and acknowledging the dual nature of in-role PEBs. In doing so, we have shifted the lens to the beneficiaries of the behaviors and investigated how the spillover effect of in-role to extra-role PEB occurs via perceived environmental and organizational impacts. Using a temporally lagged study of 311 employees across three time points, we found that the spillover patterns of in-role PEBs on extra-role PEBs varied with perceived impact on different beneficiaries. Through perceived environmental impact, in-role

PEB had a positive linear effect on extra-role PEB. However, through perceived organizational impact, the spillover effect followed a U-shaped pattern: initially, in-role PEB had a negative spillover effect on extra-role PEB. As perceived organizational impacts increased, the negative spillover weakened and eventually became an increasingly strong positive spillover. Our research thus advances the development of the promising workplace PEB spillover research.

Theoretical implications

Our research offers multiple theoretical contributions to the environmental management literature. First, we extend the theoretical perspective on PEB in the workplace by considering both its pure and impure altruistic elements. This dual nature of workplace PEB is substantively different to private-sphere PEB, thus demonstrating the necessity of examining workplace PEB independently. More specifically, existing research has provided meaningful insights to understand how and why spillover occurs when the PEB is done for pure altruistic reasons, including cognitive/identity consistence maintenance, self-regulation in goal pursuit, and action-based learning (Guo et al. 2024; Saleem et al., 2025; Wang et al., 2025; Zhang et al., 2023). By framing in-role PEBs as cues for environmental self-identity, means to achieve the goal of helping the environment, and environmental value expression, these studies implicitly assume that employees are focused only on the benefit of their actions towards the environment. However, in the workplace, employees may not (only) perceive environmental impact from their in-role PEBs but instead, may view PEBs from a perspective of impure altruism. For example, a procurement employee might consistently purchase from a local sustainable supplier, not because of the contribution to carbon reduction, but because they know doing so aligns with the customer's expectations. Thus, a unique characteristic that differentiates in-role PEB from extra-role PEB and private-sphere PEB is its alignment with organizational and customer

requirements. By turning the lens to employees' perception on who the beneficiary is, we offer new insights into in-role PEB and its spillover effects.

Second, through demonstrating both a linear and a curvilinear spillover pattern through perceived environmental impact and perceived organizational impact, respectively, we are able to capture the complexity of workplace PEB spillover. Existing research on the spillover effect of in-role PEB has mainly focused on linear relationships, whether they be positive (e.g., Saleem et al., 2025; Wang et al., 2025; Zhang et al., 2024), negative (e.g., Zhang et al., 2025) or conditional (Guo et al., 2024). In these studies, employee in-role PEB uniformly increases or uniformly decreases extra-role PEB. We contribute to this line of research by demonstrating that the effects of in-role PEB on extra-role PEB are more complex and do not always operate linearly. We argue that in-role PEB influences extra-role PEB in different ways not only because of how employees construe their behavior, but also because of their degree of performance. These differential mediating effects suggest the necessity of moving beyond not only environmental- or moral-related factors but also beyond a purely linear pattern. By revealing differential spillover mechanisms, we extend prior knowledge and shed new light on this previously overlooked but promising research field.

Third, we move beyond the traditional thinking that suggests that prosocial behaviors, such as in-role PEB, will always have positive effects. Existing prosociality research conceptualizes perceived prosocial impact as a meaningful state connecting actors with the beneficiaries and serving as a psychological resource (Chen & Zhang, 2023; Gómez et al., 2024; Sonnentag et al., 2015). We extend this conceptualization by showing that a form of perceived prosocial impact—perceived organizational impact (Grant, 2007)—does not always have a positive effect. Indeed, perceived organizational impact exhibits a conditional dark side: it initially decreases employees'

extra-role PEB and only shifts to a positive influence after reaching a certain point. Our finding addresses Bolino and Grant's (2016) call to explore the potential negative consequence of perceived prosocial impact.

Practical implications

Our research also provides practical implications for managers in their environmental management. First, our findings caution managers against assuming a linear relationship between employees previous in-role PEB and subsequent extra-role PEB. Specifically, we show that when employees perceive low-to-moderate organizational impact from their performance of in-role PEB, this perception might undermine their motivation to go beyond their formal duties. In contrast, when employees see their actions as making a meaningful difference to the environment, extra-role PEBs are more likely to occur, regardless of the level of perceived impact. Thus, when there is likely to be only low to moderate levels of perceived impact, we suggest that managers foster environmental impact perception rather than organizational impact perception. That is, organizations and line managers should de-emphasize the duty- or performance-driven framing of in-role PEB (e.g., "because it's part of your job", "do this to build our green reputation" or "to save organizational costs"). Instead, they should emphasize the environmental-helping aspect, for example, by highlighting how employees' actions can reduce waste, conserve energy, or protect natural resources. To achieve this, line managers and HR teams need to review existing message around in-role PEB tasks, reinforcing language that focuses environmental impact, and redesigning performance communication to include tangible environmental outcomes. Practical strategies may include hosting workshops, nature-based activities, or environmental storytelling campaigns to raise employees' awareness of their broader ecological contributions (Perron, Côté, & Duffy, 2006; Tang et al., 2018). Importantly, to

avoid the risk of perceived hypocrisy, organizations should balance this messaging with consistent role-modelling of genuine environmental commitment, such as managers' own extra-role PEB (Baldassari et al., 2023; Jiang et al., 2022; Shao et al., 2023).

On the other hand, because of the curvilinear spillover effect, if perceived organizational impact is likely to be moderate to high, then this can be carefully maintained to create synergy and prevent rebound effects. HR and line managers can strengthen perceived organizational impact in two main ways. First, they can enhance employees' objective environmental performance through communication of the organization's pro-environmental norms (Li, Abdalla, Mohammad, Khassawneh, & Parveen, 2023; Sabbir & Taufique, 2022), providing environmental training (Pham et al., 2020), and demonstrating environmental-specific leadership (Robertson & Barling, 2017; Yang, Shao, & Jiang, 2023). Second, managers can amplify employees' low-to-moderate subjective perceptions of organizational impact to moderate-to-high levels by sharing authentic feedback from stakeholders, such as consumer appraisal, public recognition, or internal impact stories (Lee, Bradburn, Johnson, Lin, & Chang, 2019; Ni et al., 2022). However, managers should be cautious not to overemphasize organizational control (e.g., rules, surveillance, or compliance), as this may lead employees to perceive the organization as overly directive and indifferent to their welfare. Instead, communication and feedback are suggested to be presented in a positive and autonomy-supportive tone to reinforce employees' self-worth and intrinsic motivation while remaining grounded in actual outcomes.

Limitations and future research

Our research has several limitations. First, while we identified two distinct spillover patterns via different pathways, we did not examine the conditions under which each operates. Exploring these boundary conditions would enhance our understanding of spillover effects from a prosocial

perspective and help practitioners identify contexts that foster these patterns. According to social information processing theory, the environment in which individuals are embedded provides various types of information that shape how they construe their prior in-role PEB (Salancik & Pfeffer, 1978). For example, a strong organizational environmental orientation or environmental-specific leadership may make the environment-helping aspect of in-role PEB more salient. These cues may strengthen the link between in-role PEB and perceived environmental impact, while weakening its association with perceived organizational impact. We encourage future studies to refine the spillover field by focusing on these boundary conditions. Second, although we demonstrated the dual aspects of in-role PEB aligning with pure and impure altruism, we did not directly measure these aspects or their mediating roles. This limitation is understandable in a survey-based study, where testing complex mediation effects could introduce methodological biases, and we have captured the more important and proximal mechanism of differentiated impact. Nonetheless, future research could operationalize these distinct aspects of in-role PEBs and further investigate pure and impure altruism as mediators. Third, as a survey-based study, our research cannot establish the causality of the spillover effect via perceived impacts. Although a prior study has verified the causal relationship between in-role and extra-role PEB (Guo et al., 2024), and we temporally separated measures (using the in-role PEB a week ago to predict the next weeks' impact perception and the extra-role PEB two weeks later), we encourage future research to introduce an experimental design for a more robust causal verification.

Conclusion

In conclusion, this study identifies and explains two distinct spillover patterns from employee in-role PEB to extra-role PEB, mediated by different perceptions of prosocial impact. Through perceived environmental impact, in-role PEB positively spills over to extra-role PEB,

but through perceived organizational impact, in-role PEB exhibits a curvilinear spillover effect, initially negative but turning positive as in-role PEB and subsequent perceived organizational impact increase. Our findings caution organizations that increasing employees' in-role PEB will not automatically boost their subsequent extra-role PEB, particularly when in-role PEB is at a low-to-moderate level. Line managers and HR teams should assess whether employees perceive environmental impact or organizational impact from their performance of in-role PEB. When employees' in-role PEB is at a low-to-moderate level, managers should avoid emphasizing organizational impact, as this may dampen extra-role engagement. At moderate-to-high levels of impact, perceptions of both organizational and environmental impact will foster more consistent extra-role PEB. By shifting the focus from actors to beneficiaries, incorporating both environmental and non-environmental mediators, and examining the dark side of prosocial impact, this research adds to both the workplace spillover literature and the prosocial literature.

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Table 1

Descriptive statistics and correlations among study variables

Variable	M	SD	1	2	3	4	5	6	7	8
1. Age	33.14	9.96	na[a]							
2. Gender	0.51	0.50	-0.07	na						
3. Education background	4.77	1.37	0.06	0.13*	na					
4. Tenure	5.12	5.41	0.60***	-0.09†	0.03	na				
5. In-role PEB	4.26	0.68	-0.03	0.09†	-0.01	-0.07	(0.85)			
6. Perceived environmental impact	3.53	0.91	-0.06	0.05	0.002	-0.06	0.32***	(0.89)		
7. Perceived organizational impact	3.77	0.79	0.07	0.11†	-0.07	0.08	0.27***	0.69***	(0.84)	
8. Extra-role PEB	3.12	1.06	-0.13	0.22***	0.04	-0.04	0.33***	0.65***	0.48***	(0.88)

Note: n = 311 employees. Table entries represent reliabilities of the scales. [a]na = not applicable. † p<0.1 * p< .05 ** p< .01 ***

Table 2
Fit statistics from measurement model comparison

Models	*χ2(df)*	RMSEA	CFI	SRMR	*Δχ2*	*Δdf*
Four-factor model	132.59(59)	0.06	0.97	0.03		
Three-factor model 1[a]	545.89(62)	0.16	0.80	0.11	413.30	3***
Three-factor model 2[b]	606.91(62)	0.17	0.78	0.13	474.32	3***
Three-factor model 3[c]	528.50(62)	0.16	0.81	0.10	395.91	3***
Three-factor model 4[d]	254.15(62)	0.10	0.92	0.05	121.56	3***
Three-factor model 5[e]	359.43(62)	0.12	0.88	0.06	226.84	3***
Three-factor model 6[f]	439.20(62)	0.14	0.85	0.07	306.61	3***
Two-factor model 1[g]	668.27(64)	0.17	0.76	0.12	535.68	5***
Two-factor model 2[h]	752.67(64)	0.19	0.72	0.12	620.08	5***
Two-factor model 3[i]	816.57(64)	0.19	0.70	0.12	683.98	5***
Two-factor model 4[j]	495.71(64)	0.15	0.83	0.07	363.12	5***
Single-factor model	893.06(65)	0.20	0.66	0.12	760.47	6***

Note: All models are compared to the full measurement model.

[a] In-role PEB and perceived environmental impact combined into a single factor

[b] In-role PEB and perceived organizational impact combined into a single factor

[c] In-role PEB and extra-role PEB combined into a single factor

[d] Perceived environmental impact and perceived organizational impact into a single factor

[e] Perceived environmental impact and extra-role PEB into a single factor

[f] Perceived organizational impact and extra-role PEB into a single factor

[g] In-role PEB, perceived environmental impact, and perceived organizational impact combined into a single factor

[h] In-role PEB, perceived environmental impact, and extra-role PEB combined into a single factor

[i] In-role PEB, perceived organizational impact, and extra-role PEB combined into a single factor

[j] Perceived environmental impact, perceived organizational impact and extra-role PEB combined into a single factor

*** $p < 0.001$

Table 3
Unstandardized path modeling results

Variable	Perceived environmental impact	Perceived organizational impact	Extra-role PEB
Intercept	1.82 (0.39)***	-1.56 (0.31)***	0.00 (0.39)
Age	0.00 (0.01)	0.00 (0.01)	-0.02 (0.01)**
Gender	0.02 (0.10)	0.18 (0.08)*	0.33 (0.09)***
Education background	0.01 (0.04)	-0.05 (0.03)†	0.02 (0.03)
Tenure	0.00 (0.01)	0.01 (0.01)	0.02 (0.01)†
In-role PEB	0.42 (0.07)***	0.27 (0.06)***	0.19 (0.07)**
Perceived environmental impact			0.66 (0.07)***
Perceived organizational impact			0.14 (0.08)†
Perceived organizational impact ^{2}			0.15 (0.04)**

Note: N = 311 employees. Table entries represent unstandardized coefficients with standard errors in parentheses.
† p<0.1 * p< .05 ** p< .01 *** p<0.001.