

RUNNING HEAD: What happens when payments end?

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**What happens when payments end?**

**Fostering long-term behavior change with financial incentives.**

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### **Statement of Relevance**

Researchers, practitioners, employers, and even parents frequently use financial incentives to get people to adopt new behaviors, but behavior change rarely persists after the financial incentives end. There is surprisingly little empirical research on the factors that contribute to the long-term effectiveness of programs involving financial incentives. Most programs are evaluated by measuring behavior either while financial incentives are still being distributed or shortly thereafter, skewing the literature towards short-term outcomes. In this review we identify four elements that foster long-term behavior change in the context of financial incentive programs with a limited duration. We compare successful and unsuccessful programs in various domains – public health, education, sustainability, and conservation – and demonstrate that each of the successful programs contained at least one of the four elements. The insights from the present paper not only suggest new avenues for future research but provide concrete advice on how to create and improve financial incentive programs so that they foster behavioral persistence. The findings and recommendations from this review are relevant to researchers, practitioners, and policymakers whose work is related to human behavior.

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### **Abstract**

Financial incentives are widely used to get people to adopt desirable behaviors. Many small landholders in developing countries, for example, receive multi-year payments to engage in conservation behaviors, and the hope is that they will continue to engage in these behaviors after the program ends. Although effective in the short-term, financial incentives rarely lead to long-term behavior change because program participants tend to revert to their initial behaviors soon after the payments stop. In this article, we propose that four psychological constructs can be leveraged to increase the long-term effectiveness of financial incentive programs: motivation, habit formation, social norms, and recursive processes. We review successful and unsuccessful behavior change initiatives involving financial incentives in several domains: public health, education, sustainability, and conservation. We make concrete recommendations on how to implement the four above-mentioned constructs in field settings. Finally, we identify unresolved issues that future research might want to address in order to advance knowledge, promote theory development, and understand the psychological mechanisms that can be used to improve the effectiveness of incentive programs in the real world.

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## **What happens when payments end?**

### **Fostering long-term behavior change with financial incentives.**

In many developing countries, landholders receive monetary compensation from the government in exchange for engaging in specific conservation practices. Globally, \$36-42 billion is invested annually in these so-called “Payment for Ecosystem Service” (PES) programs, which are considered crucial for mitigating climate change, maintaining biodiversity, and promoting the economic development of small landholders (Salzman et al., 2018). PES programs offer landholders short-term payments (~five years) to restore degraded ecosystems or replace environmentally harmful land use practices with sustainable ones (Pagiola et al., 2016). Although effective in the short term, these programs often fail to produce long-term behavior change because landholders tend to revert to previous unsustainable practices after the payments end (Dayer et al., 2018). One may then wonder, how landholders can be induced to continue to engage in conservation practices after a strong extrinsic incentive is removed (Kerr et al., 2017).

Behavior change among rural landholders in developing countries is merely one example of a larger phenomenon that psychologists and practitioners have struggled with for a long time: how to promote long-term behavior change when financial incentives are initially given and then removed. Companies pay employees to go to the gym (Carrera et al., 2018) or to eat more fruits and vegetables (Thorndike et al., 2016). Schools pay adolescents for reading books (Fryer, 2011). Cities implement temporary rewards programs for bicyclists who pass specific locations on the bike paths (Dong et al., 2016). In each of these programs, the goal is to create long-term behavior change, i.e., to get people to continue to do the desirable behavior even after the financial incentive is removed.

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1           It is well known that extrinsic incentives can decrease the likelihood that people continue  
2 to engage in enjoyable activities (Lepper et al., 1974; Rode et al., 2015). One might think that an  
3 easy way to promote long-term behavior change is to never use extrinsic incentives at all. But  
4 sometimes extrinsic incentives are unavoidable. A financial incentive may be necessary to get  
5 people to try a new behavior, so that they can realize it is less tedious and more enjoyable than  
6 they had assumed (e.g., biking to work). It may also be needed to overcome people's resistance to  
7 change or to bridge the gap until a new professional practice, like organic farming, becomes  
8 profitable (Carrera et al., 2020; Charness & Gneezy, 2009). On a policy level, financial incentives  
9 are frequently used because they are easily disseminated across local, state, and federal entities  
10 (Maki et al., 2016).

11           What needs to happen so that people continue to perform the desired behavior after the end  
12 of a financial incentive program? Although most developers of incentive programs seem to be  
13 aware that long-term behavior change will occur only if the financial incentive is replaced by one  
14 or more psychological incentives after the payment period, there seems to be a lack of  
15 understanding of what these psychological incentives might be and how to leverage them in a field  
16 setting. Surprisingly, the psychological literature provides relatively little guidance, which is in  
17 part due to scarcity of research on this topic (Fontecha et al., 2022). The purpose of the present  
18 paper is to provide both a theoretical and applied account of the factors that affect long-term  
19 behavior change in a context in which extrinsic incentives are initially given and then removed.

20           We start by briefly outlining the history and context of payment for ecosystem service  
21 programs to provide a concrete example. We then present four psychological constructs—  
22 motivation, habits, social norms, and recursive processes—that we have identified as being crucial  
23 for promoting long-term behavior change when initial financial incentives are discontinued. In the

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1 following section, we present recent empirical studies of interventions in public health, education,  
2 sustainability, and conservation that successfully used financial incentives to induce long-term  
3 behavior change. We identify why some programs are effective, whereas other programs are not.  
4 Our analysis leads to a set of specific recommendations for how to increase the long-term  
5 effectiveness of behavior change programs that employ short-term financial incentives. We end  
6 by suggesting next steps for advancing research in this area that has both important theoretical and  
7 applied implications.

## 8 **2. Overview of Payment for Ecosystem Service Programs**

9 To provide context about the application of financial incentives for conservation, we briefly  
10 describe “Payments for Ecosystem Service” (PES) programs in the present section. PES programs  
11 are an innovative policy that seek to increase engagement in conservation practices by providing  
12 small landholders with direct cash payments (Wunder et al., 2018). For example, most PES  
13 programs are focused on reducing deforestation – fueled by timber production and/or the creation  
14 of agricultural land – and instead promoting reforestation or sustainable forest management, which  
15 is beneficial for biodiversity, air filtration, pollination, and soil regeneration (Gómez-Baggethun  
16 et al., 2010; Kerr et al., 2017).

17 Though financial incentive programs are sometimes criticized for monetizing nature and  
18 undermining intrinsic motivation for conservation behaviors (Akers & Yasué, 2019), PES  
19 programs are hailed as a win-win solution for landholders and conservationists because  
20 participation is voluntary and financial compensation is provided (DeCaro and Stokes, 2008). PES  
21 programs contrast with so-called “protected area policies” that establish parks and reserves and  
22 expel local communities from their homes or implement fines for extracting natural resources  
23 (Brockington, 2002; Naughton-Treves et al., 2005). Therefore, PES programs are more ethical

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1 because landholders can remain on their land while simultaneously engaging in conservation  
2 practices, at least during the duration of the program (Piñeiro et al., 2020).

3         However, PES programs are not the panacea conservationists had hoped for (Arriagada et  
4 al., 2018; Börner et al., 2016; Costedoat et al., 2015). Though most of them effectively change  
5 short-term behavior, evidence suggests that they also have negative side effects, particularly in the  
6 long run (Akers & Yasué, 2019). First, financial incentives can have lasting negative consequences  
7 on how landholders view and value nature and their motivations for engaging in conservation.  
8 Behaviors that were once intrinsically motivated can become extrinsically motivated (Rode et al.,  
9 2015). For example, prior to financial incentives, landholders in Cambodia valued forests for their  
10 non-economic benefits like food, fuelwood, and medicine. Once a PES program was implemented,  
11 however, landholders focused more on the financial benefits of forests (Chervier et al., 2019).  
12 Second, research demonstrates that participants often revert to past behaviors once payments end  
13 (Barnes et al., 2020; Samii et al., 2014; Snilsveit et al., 2019; Swann & Richards, 2017). Although  
14 they support short-term adoption of conservation practices, financial incentives alone are often  
15 insufficient for creating long-term behavior change (Kemigisha et al., 2023). We review the few  
16 examples of successful PES programs in Section 4.4. As we will see, the successful programs all  
17 leveraged one or more of the psychological constructs that play a key role in enduring behavior  
18 change after the payments end.

### 19                 **3. Psychological Constructs Relevant for Long-term Behavior Change**

20         To identify the psychological constructs involved in long-term behavior change, we  
21 reviewed the relevant literature on financial incentives. We came to five major conclusions. First,  
22 most incentive-based programs are not evaluated, and thus we do not know if they are effective or  
23 not. Second, the incentive-based programs that are evaluated generally limit themselves to

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1 measuring behaviors toward the end of the payment period while financial incentives are still being  
2 distributed, with little to no consideration of whether the behavior change persists thereafter. Third,  
3 most of the programs that did assess long-term effects found financial incentives to be ineffective,  
4 meaning that participants reverted to their previous, undesirable behaviors after the payments  
5 ended. Fourth, a small number of incentive-based programs did lead to long-term behavior change,  
6 but it is often unclear why these programs were effective and what distinguished them from other,  
7 ineffective programs. Fifth, attempts to understand the complex processes that induce lasting  
8 behavior change are mired by inconsistent terminology, diverging definitions, and a lack of  
9 taxonomy (Dayer et al., 2018; Hecht et al., 2019).

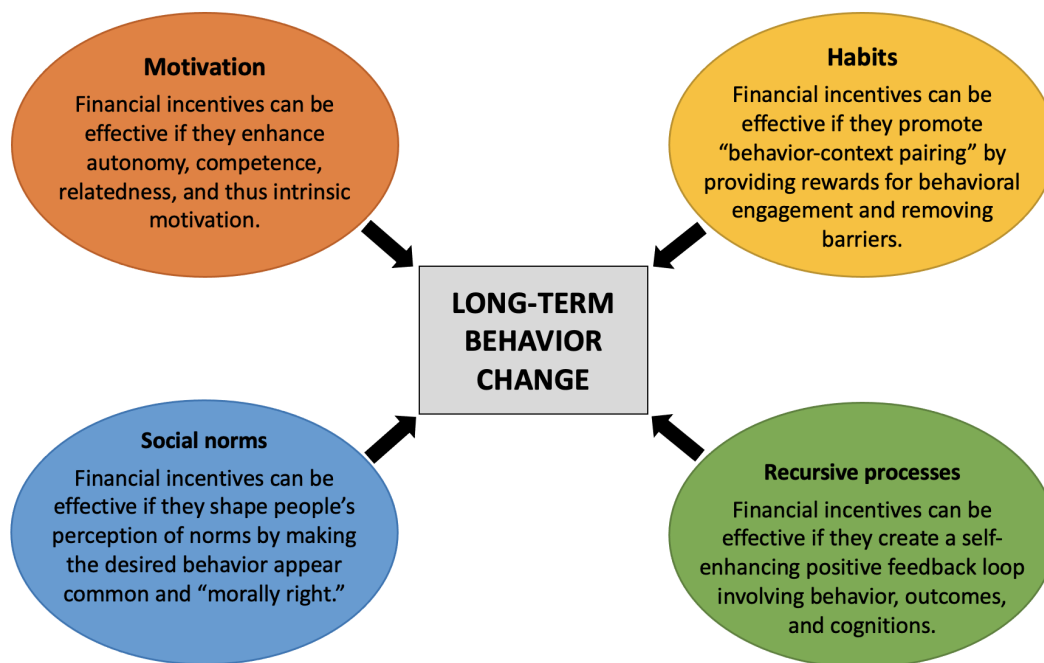
10       Based on the empirical literature, which we review in Section 4, and based on review  
11 articles by Dayer et al. (2018), Hecht et al. (2019), Gneezy et al., (2011), and Rogers and Frey  
12 (2014), we identified four psychological constructs—motivation, habits, social norms, and  
13 recursive processes (Figure 1)—that are relevant for long-term behavior change in contexts in  
14 which financial incentives are unavoidable or traditionally used. Although other psychological  
15 constructs play a role too, we decided to focus on the four that seem to be most impactful and for  
16 which there is the strongest empirical evidence. In the following subsections, we will discuss each  
17 psychological construct.

### 18 **3.1 Motivation**

19       Motivation is a strong driver of behavior and is often of central importance to  
20 understanding why people do or do not engage in specific behaviors (Asah & Blahna, 2013;  
21 Schultz, 2011). According to self-determination theory, individuals can be motivated for different  
22 reasons, aligned on a continuum ranging from extrinsic to intrinsic motivation (Ryan & Deci,  
23 2000). Individuals with purely extrinsic motivations engage in a behavior to obtain some reward



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1  
2 **Figure 1:** Four proposed psychological constructs that influence long-term behavior change in the  
3 context of financial incentive programs.

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8 or desired outcome. Intrinsically motivated individuals, however, perform a behavior out of  
9 genuine enjoyment and/or interest. There are intermediate forms of motivation that differ in the  
10 extent to which extrinsic or intrinsic motivations are the primary driver of the behavior. Research  
11 on self-determination theory has shown that the more a behavior is intrinsically motivated, the  
12 greater an individual's performance, creativity, and persistence (Steinhorst & Klöckner, 2018).  
13 Furthermore, people often cease to engage in extrinsically motivated behaviors when the reward  
14 is removed or when the behavior no longer leads to the desired outcome (Ryan & Deci, 2000).

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1           Self-determination theory further suggests that individuals' motivation can change over  
2 time. For example, it has been shown that offering rewards for genuinely enjoyable activities can  
3 shift motivation toward the more extrinsic extremity of the continuum (i.e., "crowding out");  
4 (Ezzine-de-Blas et al., 2019). The opposite is also possible, in that people can be initially  
5 extrinsically motivated, but over time assimilate and integrate the behavior into their own goals,  
6 values, and identity, a process referred to as "internalization" or "crowding in" (Akers & Yasué,  
7 2019). The following constructs have been shown to promote internalization: 1) autonomy: the  
8 ability to choose one's actions and make choices that reflect true interests and values (Wichmann,  
9 2011); 2) competence: the perceived ability to accomplish a task or achieve personal development;  
10 and 3) relatedness: the quality of one's relations and feelings of social belonging with others  
11 (Chervier et al., 2019). Taken together, this research suggests that financial incentives tend to  
12 undermine intrinsic motivation and thus long-term behavior change. However, these detrimental  
13 effects can be reduced if they are paired with program features known to promote autonomy,  
14 competence, and relatedness.

### 15 **3.2. Habits**

16           At least 40% of our daily behaviors are habitual (Wood et al., 2002), making habits one of  
17 the best predictors of behavior (Mazar et al., 2020). Habits are mental associations that form  
18 through repeated engagement in a behavior in a specific situation (i.e., "behavior-context pairing")  
19 in the pursuit of a goal (Kruglanski & Szumowska, 2020). The stronger the mental association and  
20 automation of the behavior, the stronger the habit (Klößner, 2013). Although self-determination  
21 theory provides a strong theoretical grounding for motivation-driven behavior, it fails to account  
22 for behavior that requires less self-regulation, like habits. Habits can impel us to act even without  
23 conscious effort or attention, when we have low willpower, are stressed, or are unable to respond

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1 deliberately (Linder et al., 2022). Once a behavior has turned into a strong habit, individuals tend  
2 to act in accordance with their past behavior while intentions play only a secondary role (Wood &  
3 Neal, 2009). This is particularly true when there are no barriers (or “behavioral friction”) that  
4 prevent the execution of the habitual behavior (Gardner et al., 2020).

5       Because the human brain is reward sensitive, individuals quickly develop mental  
6 associations between actions that are pleasant or result in rewards and the context in which these  
7 actions occur (Kruglanski & Szumowska, 2020). Incentives, financial or otherwise, can foster the  
8 development of habitual behavior (Allcott & Rogers, 2014), especially when they are disbursed in  
9 close spatial and temporal proximity to the behavior (Carden & Wood, 2018). As a result, financial  
10 incentives can lead to long-term behavior change if they foster habit development. It is important  
11 for the rewards to support behavior-context pairing, for example by making the rewards contingent  
12 upon doing the behavior in the same context (i.e., time, place, or social environment). Behavior  
13 change programs using incentives can also be effective if they remove psychological, physical,  
14 and logistical barriers that might prevent the habitual behavior from being executed naturally  
15 without much conscious guidance (Rogers & Frey, 2014).

### 16 **3.3 Social Norms**

17       The human desire to belong and feel connected drives individuals to act in accordance with  
18 social norms, the unwritten rules of society (Farrow et al., 2017). Social norms signal which  
19 behaviors are common and/or socially appropriate and are reinforced through interactions between  
20 people (i.e., social approval versus sanctioning; Prentice, 2018). According to the theory of  
21 normative conduct (Cialdini et al., 1991), there are two types of social norms: descriptive norms  
22 represent how common a certain behavior is, while injunctive norms define what is right and  
23 wrong. Both types of norms influence behavior, and when they contradict each other (e.g., the

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1 “wrong” behavior is common), the more salient norm has the greatest impact on behavior (Miller  
2 & Prentice, 2016).

3 Financial incentives can shape people’s perceptions of what is “descriptively normative”  
4 through: 1) engaging a large percentage of the population in the incentivized behavior, and  
5 2) bringing people together to see their peers engaging in the desired behavior. Financial rewards  
6 can also change injunctive norms. If decision makers or community leaders incentivize certain  
7 behaviors, then these authority figures clearly value that behavior; the importance of the behavior  
8 can be highlighted in outreach campaigns. Because people often underestimate the influence of  
9 external factors on others’ behavior, they develop the belief that most of their peers engage in the  
10 desired behavior because they enjoy it or consider it the socially acceptable thing to do (Ross,  
11 1977). As such, an incentive-induced shift in descriptive norms can sometimes lead to a subsequent  
12 shift in injunctive norms (Brauer & Chaurand, 2010).

### 13 **3.4 Recursive Processes**

14 Recursive processes have been shown to play a major role in long-term behavior change,  
15 especially in educational settings. The literature on “Wise Interventions” describes recursive  
16 processes as positive feedback loops in which multiple variables reciprocally influence one another  
17 (Walton & Wilson, 2018). Behavior change is most likely to persist if the intervention triggers the  
18 following three elements: the initial *behavior* change leads to positive *outcomes*, which in turn  
19 affects individuals’ *cognitions* (e.g., beliefs, attributions, and identities). The cognitions in turn  
20 promote greater adoption of the desired behavior, which then lead to even better outcomes, and so  
21 forth. As such, recursive processes involve a self-enhancing cycle where behavior, outcomes, and  
22 cognitions mutually reinforce each other (Hecht et al., 2019).

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1           Financial incentives can lead to long-term behavior change if they stimulate recursive  
2 processes. First, it is important that the rewarded behavior actually leads to a desirable outcome  
3 for participants, be it weight loss, better grades, or revenue from sustainable forest management.  
4 Second, the positive outcome needs to alter an individual’s cognitions. For this to occur, the  
5 behavior change program may need to assist individuals with the process of changing how they  
6 perceive themselves and the situation. Ideally, people develop the identity of a person who engages  
7 in the desired behavior (e.g., “I am a runner”) and related self-enhancing attributions (e.g., “I can  
8 do this”; Houser-Marko & Sheldon, 2006). Finally, the financial incentive needs to ensure that the  
9 individual’s altered cognitions translate into an increased adoption of the desired behavior. For  
10 example, an intervention can help students adopt a “growth mindset” rather than a “fixed mindset.”  
11 Having a growth mindset can change low-achieving students’ beliefs about their academic aptitude  
12 (cognitions) and motivate them to study more (behaviors). More time and effort invested in  
13 studying can improve grades (positive outcomes).

#### 14   **4. When Do Financial Incentives Work?**

15           When reviewing the empirical literature on financial incentives and behavior change, we  
16 identified four domains with the most relevant research: public health, education, sustainability,  
17 and conservation. We briefly review these empirical findings in this section. In each of the four  
18 domains, we selected studies that provided insights into why financial incentives sometimes do  
19 but often do not lead to long-term behavior change. More precisely, for a study to be included in  
20 our review it had to: 1) have a control group or a baseline measure, 2) measure behavior more than  
21 three months after the end of the payment period, and 3) include three conditions: no incentives,  
22 incentives only, and “incentives plus”, meaning that the program included at least one additional  
23 method for changing behavior. Because our initial search yielded only a handful of studies that

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1 met these conditions, we decided to relax our criteria to include studies that measured behavior as  
2 short as two weeks after the end of the payment period or lacked one of the three abovementioned  
3 conditions.

4 As we will conclude below, the programs that produce long-term effects do more than just  
5 provide financial incentives. They successfully leverage one or more of the psychological  
6 constructs discussed in the previous section, i.e., they contain program elements specifically  
7 designed to promote intrinsic motivation, facilitate habit formation, alter people's perceptions of  
8 social norms, and/or initiate a recursive process. Some incentive programs only engage one of  
9 these constructs, while others try to leverage multiple.

#### 10 **4.1 Public Health**

11 Financial incentives in both public (e.g., Medicaid programs) and private health sectors  
12 (e.g., employer wellness programs; see Lieberman et al., 2019; Vulimiri et al., 2019) are not only  
13 popular but also have been frequently evaluated. In a recent “megastudy,” Milkman et al. (2021)  
14 tested the effectiveness of various interventions to increase gym visits. The authors included one  
15 baseline condition and 53 treatment conditions. Participants in all conditions engaged in planning,  
16 were sent reminders, and received small financial incentives for four weeks, but those in the  
17 treatment conditions were exposed to additional materials or messaging.

18 The 53 interventions varied in effectiveness. Although 24 led to significant behavior  
19 change during the intervention, only four increased gym visits four weeks after the financial  
20 incentives ended. In one successful intervention, the researchers provided participants with a  
21 captivating free audiobook to listen to at the gym (e.g., *The Hunger Games*), while another  
22 successful intervention conveyed normative messages to promote working out (e.g., “Research  
23 from 2016 found that 73% of surveyed Americans exercised at least three times per week. This

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1 has increased from 71% in 2015.”). The findings are well aligned with our discussion on the four  
2 psychological constructs relevant for long-term behavior change (see Section 3 above).  
3 Participants who received an audiobook were more intrinsically motivated to go to the gym  
4 because they genuinely enjoyed listening to the novel. Participants who received normative  
5 messages likely changed their perceptions of how often people work out and how common  
6 working out is.<sup>1</sup>

7         Interventions that foster relationship building also can have lasting effects. Participants in  
8 a weight loss program who were given payments as a group, rather than individually, continued to  
9 lose weight three months after payments ended, whereas those who received individual payments  
10 did not (Kullgren et al., 2013). In another study, participants who received seven weeks of group  
11 counseling and financial incentives quit smoking for up to a year after the program ended.  
12 Individuals with only counseling did not (van den Brand et al., 2018; unfortunately, the study did  
13 not include an incentives-only condition). These interventions, which helped participants develop  
14 new relationships, likely fostered relatedness among participants and changed their perceptions of  
15 which behaviors are socially normative. Unlike individual payments or programs, group payments  
16 and group counseling encouraged participants to interact and hold each other accountable. Seeing  
17 one’s peers persist in healthy behaviors likely reinforced the notion that these behaviors are  
18 descriptively normative, leading to long-term behavior change.

19         In so-called “deposit-contract programs” participants wager their own money and only get  
20 it back (plus additional financial incentives) if they make the necessary behavioral changes by a  
21 predetermined deadline. These programs, which combine commitment devices with financial  
22 incentives, are becoming increasingly popular (Boonmanunt et al., 2023). In one smoking

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<sup>1</sup> The two other successful interventions included a bonus for returning to the gym after a missed workout and an intervention that encouraged people to plan their workouts. Both of these likely promoted habit formation.

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1 cessation study, participants were randomly offered either cash incentives of \$800 or deposit-  
2 contracts of \$150 plus up to \$650 in cash incentives that were distributed at specific benchmarks  
3 throughout the six-month intervention (Halpern et al., 2015). Unsurprisingly, the uptake rate of  
4 deposit-contracts was much lower than that of cash incentives—14% versus 90% respectively.  
5 However, 52% of the participants with deposit-contracts abstained from smoking for six months  
6 after the end of the intervention compared to only 17% who accepted the cash incentives. Deposit  
7 contracts can help amplify participants' existing intrinsic motivation to change their behavior by  
8 pairing it with an additional extrinsic reward (de Walque, 2020). Taken together, the findings from  
9 the public health domain highlight the importance of designing financial incentive programs that  
10 not only distribute payments but that also increase participants' intrinsic motivation or change their  
11 perceptions of relevant social norms.

## 12 **4.2 Education**

13         Some practitioners and researchers have employed financial incentives in schools to reduce  
14 achievement gaps between marginalized and non-marginalized populations. The goal is to  
15 motivate students and parents alike to prioritize school attendance, studying, and grades (Bettinger,  
16 2012; Visaria et al., 2016). While there are relatively few studies evaluating financial incentives  
17 in the education domain, the existing research is robust and provides useful longitudinal insights.

18         Two large-scale studies examined the effectiveness of financial incentives for high school  
19 students. In one five-year study, high school freshmen in low-performing public schools with high  
20 dropout rates near Chicago were paid monthly incentives if they met attendance, behavior, grade,  
21 and test score requirements. Though the overall effects were modest, the program had a large,  
22 beneficial impact on students who were on the threshold of meeting graduation requirements at



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1 baseline. Grades for this group increased by 11 to 12 percentage points two years after financial  
2 incentives ended (Levitt et al., 2016).

3 In another study in Houston, fifth-grade students, parents, and teachers across fifty  
4 traditionally low-performing public schools received financial incentives when students mastered  
5 math objectives via an online math platform that tailored assignments and assessments to the  
6 student's level (Fryer & Holden, 2013). Despite an increase in effort by all students, both during  
7 the intervention and two years later, only high-achieving students performed better in math  
8 compared to their baseline scores. Low-achieving students did not improve in math and, even  
9 worse, their reading scores decreased significantly.

10 Why do the results of these two programs, which are similar in design, differ so drastically?  
11 In Houston, incentives were linked to outcomes (e.g., grades, test scores), which did not engage  
12 one of the four psychological constructs. In Chicago, payments rewarded students for the process  
13 of learning (also see Fryer, 2010, 2011), which likely ignited a recursive process. Due to increased  
14 attendance and improved studying behavior, students likely got better grades, which shifted how  
15 students thought about themselves (e.g., I am a capable student). When financial incentives are  
16 linked to the process of learning they can be more effective over the long run because they initiate  
17 a self-perpetuating positive feedback loop (Hecht et al. 2019).

18 Other education programs integrated financial incentives with “educational services”  
19 such as mentoring, academic advising, tutoring, and study groups. In research conducted in the  
20 United States, Rodríguez-Planas (2012) found that five years after the program ended, students  
21 who received mentoring, tutoring, and workshops on life skills in addition to financial incentives  
22 were 13% more likely to attend postsecondary training and 23% more likely to complete two  
23 years of college or postsecondary education than control students who were offered neither

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1 incentives nor educational services. Likewise, at a Canadian university, students with average  
2 academic performance were assigned to one of four experimental groups who received the  
3 following services: 1) peer advising and organized study groups, 2) a scholarship, or 3) peer  
4 advising, study groups and a scholarship, or 4) a control group who received nothing (Angrist et  
5 al., 2009). One year after the intervention ended, students who received peer advising, study  
6 groups, and the scholarship achieved better grades and completed more course credits than those  
7 in the other groups.

8 Programs that provided educational services in addition to financial incentives were likely  
9 successful because they effectively leveraged several of the aforementioned psychological  
10 constructs. Scholarships incentivized students to spend more time on schoolwork, while  
11 mentoring, peer-advising, and study groups increased students' competence (i.e., intrinsic  
12 motivation) and helped students establish new relationships that reinforced positive social norms.

### 13 **4.3 Sustainability**

14 For almost fifty years, researchers have explored how financial incentives can influence a  
15 variety of pro-environmental behaviors (e.g., recycling, meat consumption; Maki et al., 2016).  
16 Here, we compare three large-scale field experiments that tested the effects of financial incentives  
17 on sustainable commuting behaviors. The first study in Sweden provided 14,000 participants with  
18 free transit passes and measured the effects over eight months (Gravert & Olsson Collentine,  
19 2021). The first group of participants received four weeks of free rides while the second group  
20 received two weeks of free rides as well as social norms messaging. Both treatment groups were  
21 compared to participants in a baseline condition who only received two weeks of free rides. During  
22 the intervention, ridership across all three groups increased, but only participants from the four-

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1 week treatment group rode public transport significantly more than the baseline group during the  
2 eight months after incentives ended.

3         The second study provided 475 participants in Norway with financial incentives to cycle  
4 to work, which was tracked via a phone application during the five-week intervention (Ciccone et  
5 al., 2021). Participants were randomly assigned to the control or one of three treatment groups.  
6 Group 1 received 20 cents per kilometer cycled, group 2 received one lottery ticket for each  
7 kilometer cycled, which were entered into a lottery for NOK 9000 (~\$900 USD), and group 3  
8 participated in a conditional lottery, which had the same design as group 2, but at the end  
9 researchers randomly selected one day out of the treatment period and if the participant of the  
10 winning lottery ticket had not logged any kilometers for the selected day, they received an email  
11 saying they won but wouldn't receive the jackpot. All participants, including those in the control  
12 group, were entered into a different lottery for NOK 1000 (~\$100 USD) as an incentive to use the  
13 app for the duration of the experiment. During the intervention, all treatment groups cycled about  
14 2.4 more kilometers a day than the control group, but only the conditional lottery group cycled  
15 significantly more kilometers two weeks post-intervention.

16         The third study promoted commuting via public transit in an undisclosed European city  
17 among airport employees who lived along bus routes but were not bus users (n=7,564; Kristal &  
18 Whillans, 2020). In the first condition, a letter was sent to the participants with bus route  
19 information and how to purchase a discounted bus pass through their employer. In the second  
20 condition, participants received the same letter plus one week of free bus tickets. Only 103  
21 participants used at least one of the free bus tickets. Thereafter, recipients who did not use any of  
22 the free bus tickets were randomly assigned to either the control group, who did not receive another  
23 letter, or the treatment group, who received a letter highlighting the amount of money 'lost' by not

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1 using the free bus tickets and additional information about discounted travel opportunities. All  
2 three interventions had negligible effects on commuting behavior.

3         Though the goal of all three interventions was to promote sustainable commuting practices,  
4 only the programs in Sweden and Norway were successful. We suggest that program success  
5 hinged on the engagement of the four psychological constructs. The studies in Sweden and Norway  
6 successfully changed long-term commuter behaviors by providing financial incentives for a  
7 sufficient time frame, leading participants to develop strong habits and overcome preconceptions  
8 about the difficulty of sustainably commuting to work. However, in Sweden, it seems that intensely  
9 leveraging one construct (habits) was more effective than weakly leveraging two constructs (habits  
10 and norms), while in Norway, encouraging daily cycling was more effective for habit development  
11 than intermittent cycling. Contrastingly, airport employees did not change their commuting  
12 behavior. Ultimately, one week of financial incentives was insufficient, whereas four or more  
13 weeks of financial incentives fostered new habit development. Thus, financial incentives must be  
14 provided for a sufficient time frame to produce durable behavior change (Gravert & Olsson  
15 Collentine, 2021; Maki et al., 2016).

#### 16 **4.4 Conservation**

17         Although payment for ecosystem service (PES) programs have existed for 30 years, only  
18 a handful of studies have evaluated long-term impacts (Kemigisha et al., 2023). In Ecuador, two  
19 similar PES programs, SocioBosque and SocioParamó, were established by the government.  
20 SocioBosque paid private landowners to conserve their forests, which reduced the relative rate of  
21 deforestation by as much as 76% during the program (Jones et al., 2017). In SocioParamó,  
22 Indigenous communities were included in designing the PES program, which provided group  
23 payments to reduce livestock grazing on ecologically important land (Hayes et al., 2021). During

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1 the intervention, grazing declined by 12%. Five years into both programs, funding was  
2 unexpectedly suspended.

3         Though the two programs were both financial incentive programs, the results differed  
4 drastically due to program design. Once payments were suspended, the rate of deforestation  
5 increased to pre-program levels on properties enrolled in SocioBosque (Etchart et al., 2020). In  
6 contrast, less than 5% of participants in SocioParamó were grazing animals on ecologically  
7 sensitive land over two years after payments ended, compared to around 20% of households in the  
8 control communities (Hayes et al., 2021). SocioParamó participants stated that because the  
9 program was aligned with their values, they felt obligated to uphold the contract even once  
10 payments stopped (Rode, 2022). Including Indigenous communities during program design likely  
11 increased autonomy and intrinsic motivation and allowed participants to align their pro-  
12 environmental beliefs with their livelihood behaviors, which created a recursive process to foster  
13 persistence (Akers & Yasué, 2019). Moreover, the switch in livelihoods made reverting to old  
14 habits difficult once payments ended.

15         Some studies examined the effectiveness of PES programs with shorter contracts. In 2003,  
16 the World Bank funded a multinational program in Nicaragua, Costa Rica, and Colombia. In each  
17 country, about 100 participants received financial incentives for two or four years to plant trees to  
18 increase wildlife habitat, shade, and food production (Worldbank, 2008; Pagiola & Arcenas, 2013).  
19 The program allowed landholders to select which species to plant and where to plant them. During  
20 the program, tree cover increased and persisted beyond the program payments across all treatment  
21 groups, but results varied by country.

22         In Colombia, eight years after the program ended, landholders in treatment groups had 6%  
23 more trees in their pastures and 8% more trees on their land overall compared to the control group

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1 (Calle et al., 2020). In Costa Rica, nine years post-intervention, there was considerably more forest  
2 and natural pasture with high tree density on treatment farms compared to control farms, indicating  
3 that the planted trees were still standing (Rasch et al., 2021). In Nicaragua, four years post-  
4 intervention, the area of farmland covered by trees expanded from 35% to 43% (Pagiola et al.,  
5 2020). The land used for annual crops (i.e., non-tree crops) also remained well below its baseline  
6 level.

7         These programs were likely effective for three reasons. First, farmers were allowed to  
8 choose the type of trees and location to plant them (Worldbank, 2008), which fostered autonomy  
9 and competence. Second, planting trees resulted in direct economic and environmental benefits  
10 that increased over time, and supported the internalization of extrinsic motivation (Calle, 2020).  
11 Third, the program increased the perception that tree-based agriculture was the norm. Farmers with  
12 more social ties and bigger networks were more likely to maintain and plant additional trees (Rasch  
13 et al., 2021).

14         In contrast, a PES program in Uganda was designed as a large-scale randomized control  
15 trial and paid participants for two years to protect forests. Half the 120 villages received payments,  
16 while the control villages did not (Jayachandran et al., 2017). During the program, deforestation  
17 fell from 9% to 4%, but once payments ended, deforestation resumed to previous rates  
18 (Jayachandran et al., 2018; Wunder et al., 2020). A follow-up study conducted household surveys  
19 and revealed that solely providing payments was insufficient for creating lasting forest  
20 conservation practices (Kemigisha et al., 2023).

21         These international examples allow us to make insightful comparisons. The multinational  
22 program and SocioParamó integrated various psychological constructs. By providing training and  
23 alternative livelihood opportunities, landholders became more intrinsically motivated and

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1 recursive processes were ignited, while the SocioBosque and the Uganda programs solely provided  
2 monetary incentives for forest conservation, which amplified extrinsic motivation rather than  
3 fostering internalization.

#### 4 **4.5 Summary of Empirical Studies**

5 The empirical literature on the long-term effects of financial incentive programs is scarce  
6 and somewhat inconclusive. Some financial incentive programs produced enduring behavior  
7 change, but it is often unclear why this is the case because the evaluation studies failed to compare  
8 an “incentive only” condition to an “incentive plus” condition where some other form of treatment  
9 is included (e.g., mentoring, social norms messaging). One general conclusion can be drawn,  
10 however: financial incentive programs that produce long-term behavioral effects do more than just  
11 hand out payments. They usually include program elements designed to affect one or more  
12 psychological processes, and these processes generally align with motivation, habits, social norms,  
13 and recursive processes.

#### 14 **5. Concrete Recommendations for Researchers and Practitioners**

15 It is relevant to know which psychological constructs need to be targeted to make financial  
16 incentive programs effective in the long run, but this abstract knowledge provides limited insight  
17 into what researchers and practitioners need to do when they want to promote particular behaviors  
18 in real-life settings. Although the factors affecting tree planting behavior differ from those that  
19 influence weight loss, academic achievement, or commuting, it is nevertheless possible to make  
20 some concrete recommendations about the elements of financial incentive programs that make  
21 them effective. In the present section we suggest eight recommendations for maximizing the  
22 impact of short-term financial incentive programs that emerged from our review of the empirical  
23 literature. Although many of the recommendations have ties to more than one of the four

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1 psychological constructs discussed above, we grouped them in categories based on the  
2 psychological construct that they are most closely associated with (Figure 2).

3 *1. Use “motivational mixes” so participants have many reasons to change their behavior.* The  
4 more reasons participants have to engage in the desired behavior aside from the financial  
5 incentives the less likely they are to revert to previous practices when the payments end  
6 (Kemigisha et al., 2023). It is thus important to design programs that leverage both extrinsic  
7 motivators like financial incentives, and intrinsic motivators such as learning opportunities for  
8 personal development or community building. Programs can also highlight the potential  
9 positive outcomes via messages or activities. For example, weight loss programs can ask  
10 participants to reflect on what they look forward to doing after losing weight, teachers can  
11 share the real-world applications of course materials to stimulate student interest, and

12  
13  
14

MOTIVATION	HABITS	SOCIAL NORMS	RECURSIVE PROCESSES
<p><i>1. Use “motivational mixes” so participants have many reasons to change their behavior.</i></p> <p><i>2. Make the desired behavior fun and pleasant.</i></p>	<p><i>3. Make program participants check in regularly.</i></p> <p><i>4. Make sure the financial incentives are paid long enough.</i></p>	<p><i>5. Promote contact with other program participants.</i></p> <p><i>6. Use messaging to shift participants’ perceptions of social norms.</i></p>	<p><i>7. Foster participant “buy-in” to new behaviors.</i></p> <p><i>8. Link financial incentive to the process of behavior change, not solely the outcome.</i></p>

15  
16 **Figure 2:** Recommendations to researchers and practitioners for designing financial incentive  
17 programs that elicit long-term behavior change.



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- 1 agricultural technicians can highlight to landholders the importance of creating a better future  
2 for their children.
- 3 2. *Make the desired behavior fun and pleasant.* Just as Milkman et al. (2021) gave their  
4 participants an interesting audiobook to listen to while working out, it is often possible to add  
5 program elements that make the to-be-adopted behavior more enjoyable. For example, farmers  
6 reported that they enjoy doing farm work together so they can socialize (Tey et al., 2017). Fun  
7 activities foster intrinsic motivation since the financial incentive is no longer the only reason  
8 why the behavior is performed (Woolley & Fishbach, 2016). Furthermore, habits develop  
9 faster when behaviors are enjoyable (Kruglanski & Szumowska, 2020). Ideally, pleasant  
10 program elements such as listening to audiobooks or doing communal farming will be  
11 continued by individuals after the program ends.
- 12 3. *Make program participants check in regularly.* Increasing the frequency with which  
13 participants are in contact with program advisors (e.g., farm technicians, guidance counselors)  
14 can increase participants' accountability which in turn can help establish durable habits.  
15 Students who received educational services likely earned better grades because they had  
16 guidance and structured study schedules to support strong habit development (Angrist et al.,  
17 2009). The support of qualified advisors can also help individuals understand the causal  
18 connections between the behavior and the desired outcomes (e.g., transitioning to organic  
19 farming can increase production and reduce environmental impact) and can help promote  
20 favorable self-attributions (e.g., "you are a farmer who cares about the environment"), which  
21 can ignite recursive processes.
- 22 4. *Make sure the financial incentives are paid long enough.* Individuals need time to become  
23 competent in new behaviors (e.g., learning to use the transit app, effective exercise regimens).

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1 Ideally, the incentives last for a sufficiently long time so participants can develop habits and,  
2 better yet, make it difficult for participants to revert to past behaviors (e.g., a family may have  
3 sold the second car). Like others, we noticed that the duration of most programs was not  
4 justified, and that the length of the payments were likely determined by the program creators'  
5 intuition or budget (Cawley & Price, 2013; Fontecha et al., 2022). Pilot-testing is helpful to  
6 determine the definition of “long enough” because the ideal length of a program depends on  
7 the difficulty of the desired behavior.

8 5. *Promote contact with other program participants.* Group sessions, group payments, or cohort-  
9 based interventions all bring participants together. Providing opportunities for participants to  
10 see their peers engaging in the desired behavior or hearing their peers talk about the behavior  
11 reinforces positive social norms (Dayer et al., 2018). For example, group therapy for smokers  
12 (van den Brand et al., 2018) and community-based PES payments (Hayes et al., 2021) were  
13 more successful at changing long-term behavior than similar programs that used individual  
14 payment structures. An added benefit of increasing participant contact is that it also promotes  
15 relatedness and thus can foster intrinsic motivation.

16 6. *Use messaging to shift participants' perceptions of social norms.* During interventions,  
17 communicating frequently about the large number of peers who are engaging in the desired  
18 behavior or participating in the program can highlight desirable norms. Tailoring  
19 communication methods to specific audiences can help make messages more persuasive. In  
20 some societies, particularly Indigenous or non-western ones, statistics might not be very  
21 persuasive or accessible (Martínez-Reyes, 2016). Instead, narratives are one alternative that  
22 can be used to communicate that the desired behavior is either already common (“descriptive  
23 norms”) or is becoming more common (“dynamic norms;” Sparkman & Walton, 2017), such

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1 as in the Milkmen et al., (2020) study that communicated a 2% increase from 2015 to 2016 in  
2 the number of Americans exercising three days a week. Another way to make programs more  
3 effective is by communicating that the desired behavior is “morally the right thing to do” and  
4 is endorsed by opinion leaders, decision makers, and admired peers (Dungan et al., 2019). Such  
5 communications can shift individuals’ perceptions of injunctive norms and increase the  
6 likelihood that they will continue with the behavior after the payments end.

7 7. *Foster participant “buy-in” in new behaviors.* The more participants are invested in the  
8 program, the more opportunities they have to connect their cognitions and behaviors with  
9 outcomes, which can ignite a recursive process. Including participants in the design phase  
10 allows participants to shape concrete elements of the program and increases their investment.  
11 This was seen in the SocioParamó program in Ecuador where Indigenous landholders helped  
12 design the program, so it was aligned with their beliefs and values. Once payments stopped,  
13 they didn’t resume grazing because partaking in program design helped them connect their  
14 beliefs, behaviors, and outcomes (Hayes et al., 2021). Another way to increase participant  
15 investment is by providing choices during the intervention. For example, allowing landholders  
16 to select which tree species to plant (Pagiola et al., 2016; 2020) or letting participants choose  
17 which time of day to exercise (Milkman et al., 2021) increases autonomy and buy-in, which  
18 fosters persistence.

19 8. *Link financial incentives to the process of behavior change, not solely the outcome.* Remember  
20 that students performed better when they were paid for attendance and good behavior rather  
21 than for their grades (Levitt et al., 2016). Likewise, conservation programs that engaged  
22 landholders in planning and tree planting were more successful at creating long-term change  
23 than programs that solely paid farmers to protect existing forests (Calle, 2020). Providing

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1 financial incentives for outcomes establishes a *quid pro quo* relationship that magnifies the  
2 extrinsic motivations for engaging in the desired behavior. On the other hand, providing  
3 financial incentives for the process of behavior change helps participants jumpstart a self-  
4 perpetuating recursive process by altering cognitions, behaviors, and outcomes. These changes  
5 in cognitions and behaviors can also help form habits that outlast financial incentives.

## 6 **6. Future Directions**

7 Although some programs with financial incentives led to long-term behavior change, our  
8 knowledge about the factors that made these programs effective is still rather limited. There are  
9 only a few studies in which researchers measured actual behaviors several months or even years  
10 after the payments ended. Some of the recommendations in the previous section are based on a  
11 single empirical study. Furthermore, most of the literature stems from the Global North, lacking  
12 socio-geographic diversity to make these findings broadly applicable. In the following paragraphs  
13 we attempt to identify the most pressing research questions in the field. Finding answers to these  
14 questions will further our understanding about how to create long-term behavior change with  
15 financial incentive programs and more generally, about the factors that causally affect human  
16 behavior.

17 What is the best way to promote habit formation? Drawing on what we know about habits,  
18 should participants be rewarded more frequently? More frequent incentives can serve as reminders  
19 to reinforce habits and foster persistence (de Walque, 2020; Thirumurthy et al., 2019). Moreover,  
20 how much flexibility should be built into programs? While rigidity can help establish habits at  
21 first, flexibility can help participants persist (Milkman, 2021). If participants struggle to maintain  
22 their newly adopted behaviors, programs can provide additional support (e.g., bonuses after missed  
23 workouts). Research on how to balance the rigidity needed to form habits and the flexibility needed

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1 to sustain them will provide insight on how to foster strong habits. Most studies do not provide an  
2 explanation for the incentive dissemination schedule (Vlaev et al., 2019). Further research on  
3 when, where, and how often incentives are disbursed could help us understand how to maximize  
4 habit formation during financial incentive interventions.

5         How can we create recursive processes? What design choices can be made to help  
6 participants see positive outcomes as a direct consequence of their new behavior? How can  
7 programs harness these positive outcomes to shift participants' cognitions so that they think  
8 differently about themselves and their social and physical environment? The goal is to shift  
9 people's attributions for why they do a behavior and reframe their thinking (Walton & Wilson,  
10 2018). For example, providing students with financial incentives to go bird watching could  
11 eventually become an enjoyable hobby. In turn, students may change their beliefs about birds,  
12 which may change their self-image to "I am a birder." To align their behaviors with their attitudes  
13 (i.e., value-action gap), students may become motivated to engage in bird-friendly behaviors like  
14 adding stickers to windows to prevent collisions (Campbell & Brauer, 2020; Kollmuss &  
15 Agyeman, 2002). Concern for birds could grow into broader engagement in conservation  
16 behaviors. But how can the incentive structure be designed in a way to make recursive processes  
17 more likely? Though people are initially financially motivated (i.e., "I am doing this behavior for  
18 the financial incentive"), ideally as the intervention progresses participants attribute the behavior  
19 to their cognitions (i.e., "I am doing this behavior because I believe it is the right thing to do and  
20 my identity is tied to this practice").

21         What method of disbursing financial incentives leads to greater long-term behavior  
22 change? Currently most programs hand out a fixed amount for a certain time period, and then the  
23 payments end abruptly. One may wonder whether it would be more effective to progressively

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1 decrease the payments. For example, rather than receiving the same monthly payment over a five-  
 2 year period, one might consider paying PES participants a monthly base rate for three years and  
 3 then decreasing the payments by 20% every year over four additional years (see Figure 3). The  
 4 total amount spent on each participant is the same, but a decreasing pay structure likely facilitates  
 5 the process of internalization discussed in Section 3.1. The psychological literature on sunk costs,  
 6 escalation of commitment, and maladaptive persistence suggests that people are often hesitant to  
 7 change their behavior when a situation deteriorates progressively (Merkle et al., 2022; Weeth et  
 8 al., 2020; Woods & Branlat, 2011). We are not aware of any studies that tested a decreasing  
 9 payment structure, despite the theoretical arguments that suggest a superior effectiveness.

10 The questions outlined above are only starting points. The more we learn about the  
 11 psychological constructs that promote behavioral persistence, the better we understand the factors  
 12 influencing human behavior and are able to design financial incentive programs that improve long-  
 13 term outcomes in the real world.

Year	1	2	3	4	5	6	7	Total income
Fixed monthly payments	\$200	\$200	\$200	\$200	\$200	-	-	\$12,000
Decreasing monthly payments	\$200	\$200	\$200	\$160	\$120	\$80	\$40	\$12,000

18

19 **Figure 3:** Example of payment schemes with fixed or decreasing payments over a seven-year  
 20 period.

21

1 **7. Conclusion**

2 The ephemeral effects of financial incentive programs have plagued social scientists and  
3 practitioners across disciplines for many decades. Financial incentive research has largely focused  
4 on changing behavior during an intervention but failed to produce concrete recommendations on  
5 how to promote persistent change after the payments end. Through this review, we show that  
6 financial incentive programs that leverage motivation, habits, social norms, and recursive  
7 processes promote long-term behavior change. If future financial incentive programs harness  
8 psychological insights, they will be among our most effective tools for solving diverse behavioral  
9 issues.

10 We conclude by appealing to psychologists to study conservation among small landholders  
11 in developing countries (Cinner, 2018; Nielsen et al., 2021). In particular, restoring and conserving  
12 tropical forests in the Global South is one of the most effective strategies for mitigating climate  
13 change and biodiversity loss—two of the most important challenges of the 21<sup>st</sup> century (Lewis et  
14 al., 2019). In addition, PES programs are an ideal setting for psychologists to conduct research on  
15 financially induced long-term behavior change. With millions of recruited participants who are  
16 paid by public funds, it is relatively easy to implement large-scale randomized control trials. The  
17 outcomes are not only clearly defined and behavioral in nature, but sometimes even measured by  
18 other people. For the survival of people and our planet, it is of the utmost importance that  
19 psychologists delve deeper into the design of financial incentive programs to develop effective  
20 solutions for mitigating climate change and protecting biodiversity.

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