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Like ripples on a pond: behavioral spillovers and their implications for research and policy

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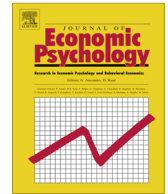
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Review

Like ripples on a pond: Behavioral spillovers and their implications for research and policy



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ABSTRACT

No behavior sits in a vacuum, and one behavior can greatly affect what happens next. We propose a conceptual frame within which a broad range of behavioral spillovers can be accounted for when applying behavioral science to policy challenges. We consider behaviors which take place sequentially and are linked, at a conscious or unconscious level, by some underlying motive. The first behavior leads to another behavior which can either work in the same direction as the first (*promoting* spillover), or push back against it (*permitting* or *purging* spillover). Looking through this conceptual lens at the existing evidence, we find pervasive evidence for all kinds of spillover effects across a variety of fields and domains. As a result, behavioral scientists, especially those seeking to inform policy, should try to capture all the ripples from one behavior to the next when a pebble of intervention is thrown in the pond, and not just at the immediate behavioral splash it makes.

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1. Introduction

Policymakers have begun taking seriously the results of behavioral research (Camerer, 1999; Camerer, Issacharoff, Loewenstein, O'Donoghue, & Rabin, 2003; Congdon, Kling, & Mullainathan, 2011; Dolan et al., 2011; Shafir, 2012; Sunstein, 2011; Thaler & Sunstein, 2003). This trend is to be welcomed but the various discussions of the evidence are typically made in 'behavioral silos', focusing on one specific behavioral response at a time (Thøgersen, 1999a). Yet no behavior sits in a vacuum and we need to consider the possible spillover effects from one behavioral response to the next.

Imagine an intervention that successfully reduces energy consumption in the home, e.g. by installing LED light bulbs, but that has the spillover effect of increasing energy use elsewhere, e.g. through leaving more lights on at work. Some or all of the benefits from the reduction in CO₂ emissions could be lost (Gillingham, Kotchen, Rapson, & Wagner, 2013; Jacobsen, Kotchen, & Vandenberg, 2012; Thøgersen & Crompton, 2009; Tiefenbeck, Staake, Roth, & Sachs, 2013). To inform policy, we should ideally capture all ripples of behavior when a pebble of intervention is thrown in the pond. The 'mapping of these ripples is now one of the most exciting pursuits in psychological research' (Kahneman, 2011, p.53).

2. Behavioral spillovers

We propose a conceptual frame within which a broad range of 'behavioral spillovers' (Thøgersen, 1999a) can be systematically interpreted when applying behavioral science to policy challenges. Our framework is based on three building blocks.

First, we begin by assuming that two *different* behaviors take place sequentially: *behavior 1* is followed by *behavior 2*. This differentiates the analysis of behavioral spillovers from the long-established, distinct, literature on *adaptive learning*, which typically focuses on the repetition of the *same* behavior over time (e.g. learning in repeated games, as opposed to playing one-shot games, Fudenberg & Levine, 1998; Goeree & Holt, 2001; Vega-Redondo, 1996).

The typical situation we have in mind is a sequence of two different behaviors where *behavior 1* is the target of an intervention. An intervention is defined broadly here: it could be a policy intervention by a public decision-maker, or an experimental manipulation by a researcher. Implicitly, the following discussion is conducted on the presumption that we can compare a 'treatment' case where *behavior 1* is targeted by an intervention with a 'control' group where there is no intervention. What we would like to emphasize, however, is that the key focus of our interest here is what happens to *behavior 2* as the consequence of the intervention.

It is not uncommon, in fact, to find studies in the economics and psychology literatures where it is looked at when and how a policy intervention could 'backfire' in the sense of having unintended compensatory or offsetting effects with respect to the ones originally envisaged by the decision-maker (e.g. Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007). For instance, for interventions in the context of risk and safety (e.g. seat belts in cars), the theories of *risk compensation*, *risk homeostasis*, or *behavioral adaptation* have since long argued that people can adjust their behavior in response to the perceived level of risk (Asch, Levy, Shea, & Bodenhorn, 1991; Bhattacharyya & Layton, 1979; Cohen & Einav, 2003; Evans & Graham, 1991; Garbacz, 1990a, 1990b, 1991, 1992; Peltzman, 1975; Rudin-Brown & Jamson, 2013; Schoemaker, 1993; Viscusi & Cavallo, 1994; Wilde, 1982a, 1982b, 1998; Wilde, Robertson, & Pless, 2002). This is an interesting but distinct question, the difference with our focus here being that those analyses typically look at the impact of the intervention on the *same* behavior originally targeted, not at what happens to *another* behavior occurring later on.

To narrow further down the scope of our analysis, we exclude from our remit two types of 'interventions' that deserve separate investigation. The first one refers to all those situations where *behavior 1* is not conceptually distinguishable from the intervention itself. Some archetypical examples of these situations refer to the literature on *priming* (Bargh, 1990; Gollwitzer, Heckhausen, & Steller, 1990). Priming occurs unconsciously when 'the passive activation of trait categories in one situational context carried over to influence social judgments in subsequent, ostensibly unrelated contexts' (Bargh, 2006, p.148). Among the many examples, more self-sufficient behavior was prompted by the mere presence of a pile of Monopoly notes or a screensaver with various denominations of currency (Vohs, Mead, & Goode, 2006), whereas more cooperative, or competitive, behavior was prompted by the mere presence of a backpack, or a briefcase, respectively (Kay, Wheeler, Bargh, & Ross, 2004). As another 'ideomotor' example, subjects shown pictures of a library spoke more quietly thereafter than subjects shown pictures of a railway station (Aarts & Dijksterhuis, 2003).

While in all these priming situations, the intervention clearly affects a subsequent behavior, it is also clear that '*behavior 1*' consists of the mere exposure to the priming manipulation itself which, more often than not, is a subliminal presentation of words or images. In other words, rather than a triplet '*intervention – behavior 1 – behavior 2*' most priming situations consist of a manipulation and a *single* behavior.

The second area excluded from our analysis pertains to *price mechanisms* and financial incentives. For instance, the overall use of energy can increase in response to an environmental policy intervention that results in lower costs of the energy. We

do not see this effect as a ‘behavioral spillover’, though: it is merely a market adjustment to a relative price change, similarly to many other ‘rebound’ effects commonly referred to as ‘Jevons paradoxes’ (Alcott, 2005; Jevons, 1866).

Analogously, the economic and psychology literature on *financial incentives* has since long highlighted the ‘hidden costs’ of incentives (Fehr & List, 2004), including crowding out of intrinsic motivation (Deci, Koestner, & Ryan, 1999; Frey & Oberholzer-Gee, 1997); changing social norms or individual beliefs about social norms (Gneezy & Rustichini, 2000a, 2000b; Heyman & Ariely, 2004); interacting in unpredictable ways with reciprocity, reputation, and social comparison concerns (Ariely, Bracha, & Meier, 2009; Dur, Non, & Roelfsema, 2010; Fehr & Gächter, 1997; Gächter & Thoni, 2010; Greiner, Ockenfels, & Werner, 2011; Rigdon, 2009); and ‘choking’ due to the anxiety aroused by relating payment to performance (Ariely, Gneezy, Loewenstein, & Mazar, 2009). In such cases, incentives may ‘backfire’, in that they result in the opposite effects to the ones originally envisaged (Bénabou & Tirole, 2003, 2006; Fehr & Falk, 2002; Kamenica, 2012). The focus of such ‘unintended consequences’ of financial incentives, however, has mainly been on the *same* behavior originally targeted by the incentive. With few exceptions (e.g. Al-Ubaydli, Andersen, Gneezy, & List, *in press*; Dolan & Galizzi, 2014), this stream of literature has not looked at the spillover effects that incentives may have on behaviors *other* than the one directly targeted. For the same reasons highlighted above about the studies on risk compensation and price adjustments, we thus exclude the literature on financial incentives from our analysis, and reiterate that our core interest here is on what happens to *behavior 2* after the intervention.

The second building block of our conceptual framework is that we assume that the two subsequent behaviors are linked, at a conscious or unconscious level, by some underlying *motive*. With motives here we mean a broadly intended range of factors that drive behavior (Bargh & Barndollar, 1996). When behaviors occur under conscious deliberation and individuals are fully aware of their *preferences*, the motive can be represented as the argument of a standard utility function, as typically postulated in traditional economics models.

More generally, motives can also be conceptualized as *deep preferences*, ‘self-defining’ or ‘identity goals’ (Wicklund & Gollwitzer, 1981, 1982), or ‘long-term goals, major affiliations, and basic values’ (Baumeister, 1986): individuals may at times be uncertain over these motives, may not consciously attend to them, or may even be unaware of them, because, for instance, of imperfect recall, or because distracted by other more salient or tempting options (Aarts & Dijksterhuis, 2000; Akerlof & Kranton, 2000; Bargh & Barndollar, 1996; Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001; Bénabou & Tirole, 2006, 2011; Chartrand & Bargh, 1996; DellaVigna, 2009; Dijksterhuis & Bargh, 2001; Dijksterhuis, Bos, Nordgren, & van Baaren, 2006; Dijksterhuis & Nordgren, 2006; Gneezy, Gneezy, Riener, & Nelson, 2012; Gneezy, Imas, Brown, Nelson, & Norton, 2012; Gollwitzer, 1990; Kahneman, 2003; Kruglanski et al., 2002; Norton, 2012; Novemsky & Dhar, 2005; Trope & Fishbach, 2000).

To visualize this most general case, what we have in mind is an analytical framework such as the prominent ‘Beliefs As Assets’ model for moral behavior by Bénabou and Tirole (2011), to which we refer for a full theoretical analysis. For the sake of illustration only, we report here a simplified variant of the Bénabou and Tirole (2011) model inspired to the ‘general satisfaction’ idea by Frijters (2000) and Van Praag, Frijters, and Ferrer-i-Carbonell (2003), and to its extension in terms of the *Adaptive Global Utility Model (AGUM)* by Bradford and Dolan (2010).

In our setting, we imagine that an individual derives satisfaction from $k = 1, \dots, K$ primitive life-satisfaction ‘accounts’: for instance, wealth, health, career, family, morality, friendship, pleasure, purpose, political engagement, the environment, and so on. In this setting, *motives* correspond to those life satisfaction accounts, the ‘ *deep preferences*’ driving individual choices and actions. The multiplicity of motives reflects the fact that, in reality, we may hold different, possibly conflicting, identity goals simultaneously (Baumeister & Vohs, 2007; Carver, 2003; Carver & Scheier, 1998; Dhar & Simonson, 1999; Fishbach & Dhar, 2005; Kruglanski et al., 2002; Louro, Pieters, & Zeelenberg, 2007; Simon, 1967; Stroebe, Mensink, Aarts, Schut, & Kruglanski, 2008; Susewind & Hoelzl, 2014), and corresponds to the case of ‘ *multidimensional identity*’ in Bénabou and Tirole (2011).

We next imagine that X^N represents the space of all possible *behavioral outcomes*. For instance, think at an outcome as a consumption bundle, an allocation of money across different destinations, or a distribution of time or effort among different activities. A specific behavioral outcome $x_i \in X^N$ is thus an observable metrics: the amount of money spent in a luxury good or donated to a charity; the hours in a day spent working, exercising, or volunteering; the number of CO₂ emissions. Individuals are assumed to have a, conscious or unconscious, single preference relation, \succsim , which supports a one-dimensional ranking across all pair-wise comparisons of possible outcomes $(x_i, x_j) \in X^N$ where (x_i, x_j) represent N -dimensional vectors of specific points in the overall behavioral outcomes space X^N .

What is more, we assume that there exists a *profile* of preference relations

$$P \equiv (\succsim_1, \succsim_2, \dots, \succsim_k) \quad (1)$$

which maps the possible outcomes $(x_i, x_j) \in X^N$ onto rankings defined over each of the $k = 1, \dots, K$ primitive life-satisfaction ‘accounts’ for a specific individual. Thus, for instance, one behavioral outcome can be preferred to an alternative over a motive (e.g. pleasure, career) but not over another one (e.g. health, family).

As in the *AGUM* model, one can visualize each preference relation using functional relationships $v^k(x_i) : X^N \rightarrow \mathbb{R}^+$, $\forall k = 1, \dots, k$, such that $v^k(x_i) \succ v^k(x_j)$ if and only if $x_i \succ_k x_j$. These functions can be rationalized as value functions of the *direct* satisfaction from a behavioral outcome for each of the $k = 1, \dots, K$ primitive accounts, such that the single vector of outcomes x_i simultaneously generates K measures of direct life satisfaction. This reflects the idea that the same behavior or mean can serve more than one identity goal (‘ *multifinality*’ in Shah, Friedman, and Kruglanski (2002)).

Importantly, besides direct satisfaction from a behavioral outcome, each motive's life satisfaction also includes indirect utility from *self-perception* or *self-image* $I^k(\cdot)$ over that same account. This reflects the idea that we may derive satisfaction not just from tangible behavioral outcomes, but also from the accumulation of signals and beliefs about our own identities (Bénabou & Tirole, 2011; Gomez-Minambres, 2012; Mazar, Amir, & Ariely, 2008; Nisan & Horenczyk, 1990; Tesser, 1988; Wicklund & Gollwitzer, 1981). For instance, in the prominent context of donations, one can derive direct utility from contributing to a public good ('*pure altruism*') but also indirectly from feeling good about the act of giving itself (e.g. the '*warm-glow*' in Andreoni (1990)). In line with the '*self-inference*' process described by Bénabou and Tirole (2011), in fact, individuals derive indirect satisfaction from signals because they may have no conscious access to their deep preferences, or because they recall their true motives and identities only imperfectly. The indirect satisfaction from self-image signals, moreover, is a key channel through which the various self-regulation mechanisms based on entitlement and justification take place (De Witt Huberts, Evers, & De Ridder, 2014; Hsee, 1995; Kivetz & Simonson, 2002; Kivetz & Zheng, 2006; Merritt, Efron, & Monin, 2010; Mukhopadhyay & Johar, 2009).

Alike in Bénabou and Tirole (2011) we imagine that the accumulation of *self-image* follows a dynamic process, where the levels of $I^k(\cdot)$ at $t = 2$ typically depends on the outcomes of behavior 1 and on the initial level of self-image in that account, that is: $I_{t=2}^k = I^k(x_{t=1}^k; I_{t=1}^k)$ where $t = 1, 2$ refers to the time when behavior 1 and 2 take place respectively. This reflects the idea that self-beliefs are, to some extent, '*malleable through actions*' (Bénabou & Tirole, 2011). In what follows we assume that there are no links between self-images across different motives (e.g. '*being healthy*' and '*being green*'), but we will return to this point in Section 7.

We further imagine that the account value functions can be combined into an ultimate '*global life-satisfaction*' function as in Frijters (2000) and Van Praag et al. (2003). Alike in the AGUM model, one way to do it is by attaching increasing and quasi-concave weights $\omega_k(\cdot)$ to each particular life account, and, for instance, taking a linear generalized utilitarian form for the global satisfaction such as

$$U(x) = \sum_k \omega_k(\cdot) V(v^k(x), I^k(\cdot)) \quad (2)$$

The weight attached, consciously or unconsciously, to a specific life satisfaction account reflects the facts that the value of a given motive can be known only at a subconscious level (Bodner & Prelec, 2003; Fishbach, Friedman, & Kruglanski, 2003; Simon, 1967), and that at times people may even be unaware of the existence of some accounts (e.g. one may be unaware of career or family motives before getting a job, or meeting the significant other, respectively). This also reflects the idea of '*multidimensional identity*' in Bénabou and Tirole (2011), where people tradeoff between different dimensions of identity '*linked by uncertainty over their relative value*' (p.815). Equivalently, the weights attached to each life satisfaction account can be interpreted in terms of *attention* (Chabris & Simons, 2011; Dolan, 2014; Kahneman, 1973; Moskowitz, 2002), or as indicators of the cognitive '*accessibility*' of each specific construct: the higher is the weight, the more accessible is the motive (Forster, Liberman, & Higgins, 2005; Goschke & Kuhl, 1993; Higgins & King, 1981; Kruglanski, 1996; Kruglanski & Webster, 1996; Shah & Kruglanski, 2002, 2003; Srull & Wyer, 1979; Zeigarnik, 1927).

Finally, alike in the AGUM model, we imagine that the weights attached to each account can also change over time following a dynamic process similar to the one imagined for the self-images. In particular, the weight of motive k at time $t = 2$, $\omega_k(\cdot)$ typically depends on the initial level of the weight at $t = 1$, and on the outcomes of behavior 1, that is $\omega_{t=2}^k = \omega^k(x_{t=1}^k; \omega_{t=1}^k)$ where $t = 1, 2$ refers to the time when behavior 1 and 2 take place respectively. Here too we imagine that there are no cross-motives effects on the weights. Such a dynamics of weights readjustment does not necessarily need to be conscious or deliberate, though. Weights attached to different motives can shift as result of an unconscious reprioritization process where an unattended goal '*demand*'s a higher priority by '*intruding on awareness*' (Carver, 2003; Simon, 1967). For instance, not only intrusive thoughts, rumination, and dreams, but also moods, affects, and emotions can often manifest themselves as calls for reprioritizing weights across identity motives (Carver, 2003; Forster et al., 2005; Fredrickson, 1998; Isen, 1987, 2000; Isen & Simmonds, 1978; Lewin, 1951; Martin & Tesser, 1996; Simon, 1967; Tesser, Crepaz, Collins, Cornell, & Beach, 2000; Trope & Neter, 1994; Trope & Pomerantz, 1998).

In our setting, thus, having a high *motive* is the amalgamation of three main factors: enjoying direct satisfaction from the behavioral outcome ('*I have just donated £10 to a good cause*'); benefitting from the associated self-inference ('*I am a good person*'); and, consciously or unconsciously, attaching a high weight to that motive in terms of life satisfaction ('*Being a good person makes me happy*').

This conceptualization of the motives naturally lends itself to introduce the last building block of our framework, the link between behavior 1 and 2. In our framework, in fact, the first behavior leads to a subsequent behavior which, as the motive is concerned, can either work in the same direction as the first, or push back against it.

Consider the initial motive to reduce CO₂ emissions by cycling or car-sharing to work (Evans et al., 2013). This could lead to another behavior which also reduces emissions, e.g. by using the train instead of the airplane for domestic travel. We refer to this sequence of behaviors with concordant sign as a *promoting* spillover: the initial push to the motive promotes a further increase later on.

The same first behavior, however, might instead lead to another behavior which increases emissions, e.g. using the car more with our family. We refer to this as a *permitting* spillover: the initially increased motive permits a subsequent disengagement from the same. There is then a final class of spillovers, which we call *purging*, where the second behavior is motivated out of a, conscious or unconscious, desire to undo some of the damage caused by the first behavior. For example, we

might use the train for holidays in response to using long-haul flights for work, so that the ‘environmental’ motive is first undermined and then restored.

In practice, the sequence of concordant or discordant signs can be visualized referring to the observable *behavioral outcome*, while the motive’s *self-image* and *weight* mainly illustrate the mechanisms linking the two behaviors. Consider these further examples.

Wearing a charity’s pin today (*behavior 1*) can have a number of effects on tomorrow’s charitable giving (*behavior 2*). On the one hand, it can highlight an underlying ‘pro-sociality’ motive of which we were previously unsure or even unaware, leading us to attach a higher weight to that account tomorrow. This more accessible motive, in turn, may lead us to deliberately maximize the direct utility from donating to a charity tomorrow, thus triggering a *promoting* behavioral spillover. Similarly, signing at the top of a tax return form before filling it out, can lead to unconsciously highlight a previously unattended ‘morality’ account, with the result of cheating less in the subsequent tax declaration (Shu, Mazar, Gino, Ariely, & Bazerman, 2012).

On the other hand, if the ‘pro-sociality’ motive has already some positive weight attached to it, today’s wearing of the charity’s pin can boost our self-image of ‘being a do-gooder’. In turn, this can lead to *permitting* spillovers through two channels. If the utility from self-image is a, perfect or imperfect, substitute for the direct satisfaction from donating money, we can end up donating *less* to a charity tomorrow. Alternatively, or concurrently, having already accomplished, or attended to, the ‘pro-sociality’ motive today means that resources can be, consciously or unconsciously, redirected toward other accounts tomorrow, with a consequent reprioritization of weights that also leads to donate *less* to the charity tomorrow.

On the other hand, a small lie today when claiming a welfare benefit (*behavior 1*) can have various effects on tomorrow’s ‘moral’ behavior (*behavior 2*). For instance, as long as the ‘morality’ motive is already accessible, today’s lying can depress our self-image of ‘being a good person’. In turn, this can lead to *purging* spillovers through two channels. If the disutility from a depressed self-image is a, perfect or imperfect, substitute for the direct satisfaction from paying taxes, we can cheat *less* in our tax declaration tomorrow in order to restore our satisfaction in that account. Alternatively, or concurrently, depressed self-image leads to a weight reprioritization that increases the accessibility of the ‘morality’ motive tomorrow. This heightened accessibility, in turn, may also lead us to cheat *less* in our tax declaration tomorrow.

Finally, one can also imagine cases of *all-negative promoting* spillovers. For instance, lying to claim a welfare benefit today can compress or temporarily ‘shut down’ the underlying ‘morality’ motive, leading us to no longer attach any weight to that account of life satisfaction tomorrow. This reduced accessibility, in turn, may lead us to cheat *more* in the tax declaration tomorrow under the presumption that our moral identity ‘has already gone’, thus triggering a ‘downward spiral’ all-negative promoting spillover.

Fig. 1 illustrates some further possible examples of promoting, permitting, and purging spillovers in the context of *health* behavior.

Our tri-partition of behavioral spillovers is thus in line with the well-established distinctions in psychology between *consistency* (assimilation) and *contrast* (compensatory) behavior (Bargh et al., 2001; Bem, 1972; Cialdini, Trost, & Newsom, 1995; Conway & Peetz, 2012; Cooper & Fazio, 1984; Dijksterhuis & Bargh, 2001; Dijksterhuis et al., 1998; Festinger, 1957; Gneezy, Imas et al., 2012; Liberman, Forster, & Higgins, 2007; Mussweiler, 2003; Norton, 2012; Schwarz & Bless, 2005); and between *reinforcing* (highlighting) and *compensating* (balancing) self-regulatory dynamics (Baumeister, Heatherton, & Tice, 1994; Carver, 2003; Carver & Scheier, 1981, 1998; Dhar & Simonson, 1999; Fishbach & Choi, 2012; Fishbach & Dhar, 2005; Fishbach, Koo, & Finkelstein, in press; Fishbach & Zhang, 2008; Fishbach, Zhang, & Koo, 2009). In economics, our tri-partition echoes the distinctions between motivation *crowding-in* and *crowding-out*; *complement* and *substitution* effects; and *positive* and *negative externalities* (Bénabou & Tirole, 2003, 2006; Frey & Oberholzer-Gee, 1997; Gneezy & Rustichini, 2000a, 2000b).

Also, our tri-partition openly reckons that, when it comes to compensatory or contrast behavior, the order of discordant signs really matters (Forster, Grant, Idson, & Higgins, 2001; Truelove, Carrico, Weber, Raimi, & Vandenberg, 2014). The psychological drivers beyond *permitting* and *purging* spillovers, in fact, are conceptually and practically very distinct. The permitting versus purging distinction, for instance, is closely in line with ‘*self-completion theory*’ (Wicklund & Gollwitzer, 1981, 1982), which postulates that, upon achieving an identity-relevant goal, we can feel ‘complete’ and thus ‘temper’ our future identity goal strivings. Conversely, upon experiencing a failure in pursuing an identity goal, we can feel ‘incomplete’ and step up our goal striving. The distinction is also in line with the closely connected ‘*cybernetic control*’, ‘*feedback-loop*’, or ‘*cruise control*’ model (Carver, 2003; Carver & Scheier, 1981, 1982, 1990, 1998): while after feeling a failure we

		Behavior 2	
		Eat healthy	Eat Less Healthy
Behavior 1	A run after work	Promoting	Permitting
		<i>I ran an hour, let's keep up the good work</i>	<i>I ran an hour, I deserve a big slice of cake</i>
	Sofa-sitting after work	Purging	Promoting
		<i>I've been lazy today, best not eat so much tonight</i>	<i>I've been lazy today, so what the heck, let's have a big slice of cake</i>

Fig. 1. Examples of promoting, permitting, and purging behavioral spillovers in health behavior.

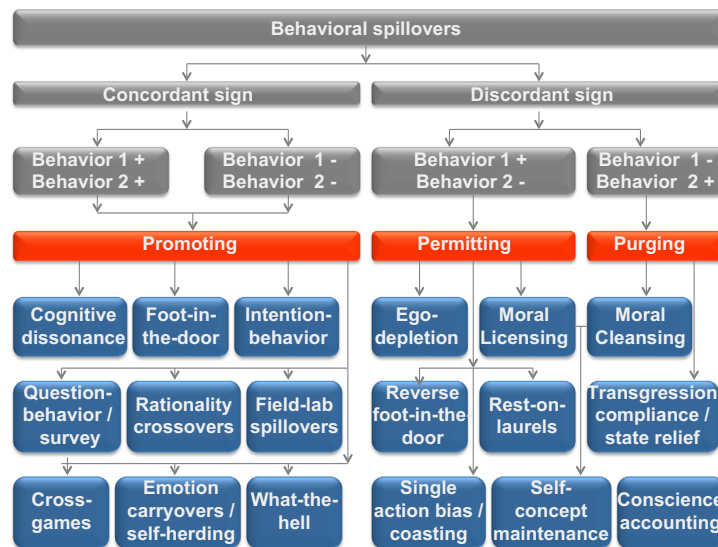


Fig. 2. Main types of promoting, permitting, and purging behavioral spillovers documented in the behavioral science literatures.

typically try harder in an attempt to catch up, after experiencing a progress in excess of our envisaged target we are likely to ‘coast’ a little, *‘not necessarily stop, but ease back’* (Carver, 2003, p. 246). In our setting, this temporary ‘pull back’ dynamics is one of the mechanisms explaining how ‘freed up’ resources can lead to reprioritize weights across motives.

All the above conceptualizations in psychology and economics have insofar proceeded along parallel streams, and our framework attempts to bring them closer together. Looking at the evidence from behavioral science through our conceptual lens, we can see that spillovers are documented extensively across a variety of fields and domains: Fig. 2 summarizes the main types of promoting, permitting, and purging spillovers.

3. Promoting spillovers

The two archetypical promoting spillovers are the *cognitive dissonance* (Bem, 1972; Festinger, 1957; Festinger & Carlsmith, 1959) and the *foot-in-the-door* effects (Burger, 1999; Freedman & Fraser, 1966; Pliner, Hart, Kohl, & Saari, 1974). What they have in common is that both essentially posit a *preference for consistency* (Alberracin & Wyler, 2000; Cialdini, 1984; Cialdini et al., 1995): we tend to behave consistently with our prior actions and beliefs. So, for instance, if we have already agreed to a relatively costless request (e.g. signing a petition in favor of ‘Keeping California Beautiful’), we are more likely to agree to another more costly request (e.g. displaying a large signboard in the front lawn supporting safe driving) (Burger, 1999; Freedman & Fraser, 1966). In an all-negative analogy, if we have already rejected a highly demanding initial request, we are less willing to grant a smaller request later on (DeJong, 1979).

In some ways analogous to von Heisenberg’s *uncertainty principle* in physics, the *intention-behavior effect* posits that the mere measurement of intention can have an influence on subsequent behavior (Morwitz & Fitzsimons, 2004; Morwitz, Johnson, & Schmittlein, 1993). Simply asking people whether they intended to vote increased their actual participation in the following day’s elections, whereas merely measuring purchasing intention led to higher purchases of PCs or cars (Fitzsimons & Morwitz, 1996).

Similarly, in *question-behavior* and *survey effects*, the mere fact of answering hypothetical questions or being surveyed can remind subjects of a motive not previously attended to (Fitzsimons & Moore, 2008; Fitzsimons & Shiv, 2001; Fitzsimons & Williams, 2000; Levav & Fitzsimons, 2006; Moore, Neal, Fitzsimons, & Shiv, 2012). Households assigned to more frequent health surveys, one year later had higher levels of chlorine in their stored drinking water, or were more likely to take up health insurance (Zwane & et al., 2011). Consumers who, during a door-to-door survey, were asked to imagine themselves subscribing to cable TV, few months later were more likely to actually subscribe to it than neighbors who just received information about the service (Gregory, Cialdini, & Carpenter, 1982).

Rationality crossovers promote the use of economic rationality from a behavior occurring in market-like settings (e.g. a choice between two lotteries in presence of arbitrage), to a subsequent behavior taking place in the absence of financial incentives (e.g. non-market valuation of willingness to pay) (Cherry, Crocker, & Shogren, 2003; Cherry & Shogren, 2007). Similar forms of *extrapolation* have been documented by experimental economists looking at the links between the lab and the field (Harrison & List, 2004; Levitt & List, 2007a, 2007b; Levitt, List, & Reiley, 2010). Successful skills and heuristics evolved in some familiar situations carryover to other similar field or lab settings: for instance, experienced sports-cards dealers did not fall prey to the typical winner’s curse in a lab auction (Harrison & List, 2008), whereas professional football players played more equilibrium strategies than students in laboratory coordination games (Palacios-Huerta & Volji, 2008). These

rationality crossovers are conceptually close to some of the *semantic* or *procedural priming* effects documented in the psychology literature (Forster, Liberman, & Friedman, 2007; Gollwitzer et al., 1990; Kruglanski et al., 2002; Neely, 1977).

Experiments in game theory have found that playing a sequence of two different strategic games is not the same of playing one of the games in isolation (Knez & Camerer, 2000). Two distinct *cross-games spillovers* can occur, both of which are essentially promoting spillovers (Bednar, Chen, Liu, & Page, 2012). First, players can learn about the structural properties of a game and transfer this knowledge to another game, e.g. whether the game is a coordination game (*structural learning, cross-games learning*: Cooper & Kagel, 2003; Huck, Jehiel, & Rutter, 2011; Mengel & Scuibba, 2010). Second, when playing a game, subjects can resort to cognitive or behavioral heuristics developed while playing *another* game (Bednar et al., 2012). If subjects had previously bid more aggressively in an auction, they next tended to contribute less in a subsequent public good game (Cason & Gangadharan, 2013; Cason, Savikhin, & Sheremeta, 2012; Savikhin & Sheremeta, 2013). Low donors to a charity cooperated less in a subsequent, unrelated, prisoners' dilemma game (Albert, Guth, Kirchler, & Maciejovsky, 2007). Players managed to coordinate their moves more efficiently in a game if they had previously played another game in which they had experienced efficient coordination (*precedent*: Knez & Camerer, 2000) (Ahn, Ostrom, Schmidt, Shupp, & Walker, 2001; Devetag, 2005; Knez & Camerer, 2000). If subjects had played a structurally similar (different) game before, they were quicker (slower) to achieve equilibrium in another game (Grimm & Mengel, 2012).

Carryover effects of emotions and self-herding suggest that incidental emotions not only directly affect decisions at an unconscious level, but also indirectly spillover on other subsequent choices and actions taking place long after the initial emotional experience (Harlé & Sanfey, 2007; Lerner, Small, & Loewenstein, 2004). This is because, when we look back to our initial behavior, we tend to misattribute it to some of our deep preferences rather than to a fleeting emotion, and we choose our subsequent actions to follow suit the same inferred path (Andrade & Ariely, 2009). For instance, subjects who first watched a video that induced anger were not only more likely to reject unfair offers in a following, unrelated, ultimatum game than subjects who watched a happy video; but also made fairer offers to their partners in a subsequent dictator game, and even in a second ultimatum game where they acted as proposers (Andrade & Ariely, 2009). Conceptually similar is the already discussed *self-signaling* or *self-inference* tendency (Bénabou & Tirole, 2011; Gneezy, Gneezy et al., 2012). For instance, wearing counterfeit sunglasses can send a self-signal that we are cheaters, which can then lead us to actually cheat more when reporting our performance in a math puzzle task (Gino, Norton, & Ariely, 2010).

According to the *what-the-hell* effect, another all-negative promoting spillover, once individuals decide upon a course of behavior that is inconsistent with a motive (a diet), they are less likely to take the middle ground (low fat cookie) and more likely to exacerbate their failure to behave in line with the motive (eating the whole bag of cookies) (Herman & Mack, 1975; Herman & Polivy, 2010; Urbaszat, Herman, & Polivy, 2002). Similar *abstinence violation* effects have been documented among alcoholics (Collins & Lapp, 1991), smokers (Shiffman et al., 1996), and drug users (Stephens & Curtin, 1994).

4. Permitting spillovers

Ego depletion is perhaps the 'classic' case of *permitting* spillovers: after having exerted high levels of self-control or effort in the first behavior, the same subject exerts lower levels of effort or self-control in the second behavior. Having resisted the temptation of indulging in sweets, or stifled emotions in emotion-arousing movies, subjects gave up earlier in impossible-to-solve puzzles (Baumeister, Bratslavsky, Muraven, & Tice, 1998). Having completed a difficult puzzle, subjects were more likely to cheat on their performance in an ostensibly unrelated task (Mead, Baumeister, Gino, Schweitzer, & Ariely, 2009). Ego depletion has physiological roots, in that to exert self-control we draw from a limited pool of mental energy: physical, but also mental activities consume energy that is converted from glucose into neurotransmitters (Baumeister & Vohs, 2007; Baumeister, Vohs, & Tice, 2007; Gailliot et al., 2007).

Moral licensing is a *permitting* spillover where, after having done 'well' in behavior 1, we act as if we have earned the moral entitlement to reward ourselves in behavior 2. Using the metaphor of a 'moral bank account', good deeds establish moral credits that can be withdrawn to purchase the right to undertake 'bad' actions. Subjects who, in a hypothetical choice to appoint a manifestly better candidate for a job, had the chance to establish they were not racist or sexist, were more likely to make prejudiced choices in a subsequent harder hiring decision (Monin & Miller, 2001). Subjects who said they were endorsing Obama in political elections, then allocated money to a charity fighting poverty in a white rather than in a black neighborhood (Effron, Cameron, & Monin, 2009). Advisors who disclosed their conflict of interest to advisees provided more biased advices (Cain, Loewenstein, & Moore, 2005). Subjects who first imagined teaching homeless children were less likely to donate to a local charity part of the experimental earnings, and made more frivolous purchases afterwards (Khan & Dhar, 2006; Strahilevitz & Myers, 1998).

Other related 'permitting' spillovers are the *resting on laurels effect*, by which seeing a progress as a sub-goal makes us spending less effort toward the final goal (Amir & Ariely, 2008); the *single-action bias*, by which an initial motive-directed action induces the impression that no further action is needed, even when is actually beneficial (Weber, 1997); the *reverse foot-in-the-door* effect, by which having said 'yes' to a request (e.g. signing a petition in favor of greater government aid for the homeless) leads to say 'no' to another request later on (e.g. volunteering to help at a canned food drive for the homeless) (Guadagno, Asher, Demaine, & Cialdini, 2001); and the already mentioned '*coasting*' tendency, by which after having exceeded our target rate of progress, we typically 'ease back' subsequent effort for the same motive (Carver, 2003).

5. Purging spillovers

Moral cleansing (or ‘*Lady Macbeth effect*’) is the reverse of licensing: a *purging* spillover where, after having done ‘badly’, we act as if we need to restore our integrity. Subjects who hand-copied a story describing in the first person an unethical act, manifested higher desirability of cleansing products over neutral items, and, when offered the choice between an antiseptic wipe and a pencil, were more likely to take the antiseptic wipe (Zhong & Liljenquist, 2006). Participants who recalled a past unethical deed but also had cleansed their hands with an antiseptic wipe volunteered less to help out a colleague (Zhong & Liljenquist, 2006). Subjects who first hand-wrote a story using words for negative traits gave more to a local charity (Sachdeva, Iliev, & Medin, 2009), while participants who were induced to lie to a fictitious person on the phone, preferred mouthwash over soap, whereas the opposite held for subjects induced to lie in an email (Lee & Schwarz, 2010).

Similarly, the *conscience accounting* effect posits that people who have earned a given payoff by lying or stealing are more likely to donate to a charity than subjects who have earned the same amount without deceiving: anticipating this, subjects lied more when they knew that there would be an opportunity to donate immediately afterwards (Gneezy, Imas, & Madarasz, in press).

Other ‘purging’ spillovers related to moral cleansing are the *transgression-compliance* effect and the *negative state relief* by which, after that our personal values or moods (respectively) are affected by a negative state, we tend to act more altruistically in the attempt to restore them (Carlsmith & Gross, 1969; Manucia, Baumann, & Cialdini, 1984). Subjects led to believe that they had harmed someone else, were then more likely to comply with a request or to help a third person when given the opportunity (Manucia et al., 1984). Subjects with artificially ‘lowered’ mood but who also received an unexpected gratifying praise, however, no longer had to act altruistically to restore their mood (Manucia et al., 1984).

The *moral balancing* and *self-concept maintenance* effects share the same ‘compensatory ethics’ idea of both moral licensing and cleansing (Zhong, Ku, Lount, & Murnighan, 2010), and posit that people who think highly of themselves in terms of honesty behave dishonestly only to the extent to which they can retain their positive views of themselves (Mazar et al., 2008; Nisan & Horenczyk, 1990): when given the possibility to cheat on their payments with no consequences, subjects cheated only about 20 percent of the maximal possible amount they could get away with (Mazar et al., 2008).

6. Facilitating conditions for promoting, permitting, and purging spillovers

Spillovers from one behavior to the next could thus lead to either amplify or offset the initial intervention effect on the motive. From both the research and the policy perspective it seems imperative to explore under which conditions behavioral spillovers are more likely to manifest themselves as promoting, permitting, or purging: when is an initial nudge likely to feed into a further push to the motive, and when instead into a push-back?

There is, surprisingly, relatively little systematic research on this key point (Fishbach et al., in press; Susewind & Hoelzl, 2014). Mazar and Zhong (2010), for instance, explicitly compare *priming* and *licensing* effects. Subjects who previously were merely exposed to a store selling green items, then, in an ostensibly unrelated dictator game, shared more money than those who were exposed to a conventional store. This pattern, however, completely reversed when subjects selected products to purchase: participants who had purchased in the green store shared *less* money in the dictator game than those who had purchased in the conventional store.

Looking more broadly at the various literatures in the behavioral science, it is possible to identify at least five main streams of research that have looked at the boundary conditions that facilitate the occurrence of promoting, permitting, and purging spillovers. They focus, respectively, on: (i) the relative costs of behavior 1; (ii) the completeness of behavior 1 and its interaction with the focus of attention; (iii) the concreteness and the (temporal or spatial) proximity of behaviors 1 and 2; (iv) the trade-offs between different motives, or between a motive and a resource; and, finally, (v) the cognitive mindset during the two behaviors. In what follows we try to distill and summarize the state-of-the-art evidence from those streams of literature.

On (i), Gneezy, Imas et al. (2012) explicitly investigate the role of different costs of behavior 1 on the type of spillover. They find that subjects who donated part of their own earnings to a charity were less likely to deceive their counterpart in a subsequent sender–receiver game, while subjects who participated into a costless charitable donation were *more* likely to lie. This suggests that permitting spillovers are more likely over promoting when the costs of behavior 1 are low. High costs, in fact, self-signal the commitment toward the motive in question. Dolan and Galizzi (2014) link these findings to the distinct literature on financial incentives in health: they focus on whether incentives targeting one health behavior (physical exercise) spillover to another non-targeted health behavior (healthy eating), and find that spillovers are more likely to manifest themselves as permitting when the incentives associated to behavior 1 significantly outdo its costs. Relatedly, and in line with *counter-attitudinal advocacy*, promoting spillovers are less likely to occur when we can attribute our behavior 1 to an external cause, such as being paid or coerced to do something (Pittman, 1975; Zanna & Cooper, 1974). The different overall costs of behavior 1 can also explain why in some situations encountering and resisting a temptation can automatically activate the weight attached to a motive and thus lead to promoting spillovers, as postulated by *counteractive control theory* (Fishbach et al., 2003; Kroese, Evers, & De Ridder, 2009, 2011), while in other occasions it can trigger permitting spillovers through the activation of *justification* and *entitlement* feelings (De Witt Huberts et al., 2014; Hsee, 1995; Kivetz & Simonson, 2002; Kivetz & Zheng, 2006; Merritt et al., 2010; Mukhopadhyay & Johar, 2009). The literatures on justification

and entitlement, in fact, show that what matters for self-regulatory dynamics are *perceived* costs and efforts, rather than their actual levels (Clarkson, Hirt, Jia, & Alexander, 2010; De Witt Huberts, Evers, & De Ridder, 2012; Kivetz & Zheng, 2006; Werle, Wansink, & Payne, 2011).

On (ii), Fishbach et al. (in press) argue that permitting spillovers are more likely over promoting when, while pursuing a goal, individuals focus on completed, rather than missing, actions. This is because, generally, missing actions increase motivation by self-signaling a need for progress. This, however, depends on the underlying motive and focus of attention (Marsh, Hicks, & Bink, 1998). Similarly to what discussed above, Fishbach and Dhar (2005) argue that what really matters is the *perception* of progress rather than its objective level. Attention to completed actions, in fact, signals personal commitment and increases motivation when we are not yet committed to our goals, while attention to missing actions signals a need to progress and increases motivation when we are already committed.

Fishbach et al. (in press) observe that this combines with the so-called '*goal-gradient hypothesis*': regardless of the focus of attention, motivation increases with proximity to a goal's end state (Brown, 1948; Forster, Higgins, & Idson, 1998; Hull, 1932; Kivetz, Urminsky, & Zheng, 2006). For instance, consumers in a coffee-shop's '*buy 10, get 1 free*' program (a song-rating website) accelerate their purchases (site visits) as they get closer to the final reward (Kivetz et al., 2006). A simple psychophysical explanation of the *goal-gradient* effect is that '*the last action accomplishes 100% of the remaining progress, which is twice the impact of the second-to-last action*' (Fishbach et al., in press, p. 39). Using a similar psychophysical argument, Fishbach et al. (in press) observe that, when striving toward a goal, we are more motivated when we focus on whichever is smaller in size between the completed and the missing actions. According to this '*small-area hypothesis*', at the beginning of goal pursuit, when our commitment is typically low, the focus on completed actions increases motivation by signaling commitment, while later on, beyond the midpoint, the focus on remaining actions increases motivation by self-signaling need to progress (Fishbach et al., in press). This potential mechanism for promoting spillovers would also explain why motivation is typically lower in the middle of goal pursuit, a phenomenon known as '*stuck in the middle*' (Bonezzi, Brendl, & De Angelis, 2011).

On (iii), Conway and Peetz (2012) find that permitting spillovers are more likely over promoting when we visualize behavior 1 in a concrete and tangible fashion. This is because abstract construals tend to activate self-identity considerations, while concrete constructs may activate self-regulatory or compensatory mindsets (Trope & Liberman, 2003). For instance, subjects who were asked to describe how they would perform a '*fair, friendly, generous*' behavior donated less money to a charity than subjects who described how they would perform an '*unfair, unfriendly, greedy*' behavior, whereas no difference was found for subjects discussing what those traits would mean for their personality. Similarly, subjects who were asked to make concrete plans to exercise later that day, consumed more sweet snacks in a subsequent tasting test than control subjects who only wrote abstract statements (Kronick & Knauper, 2010). Coherently with the idea that distal events are perceived in a more abstract way, while temporally proximate events are perceived more concretely (Liberman, Sagristano, & Trope, 2002; Trope & Liberman, 2003), the same pattern emerged when concreteness was manipulated in terms of recalling deeds '*within the past week*' (concrete), as opposed to '*over one year ago*' (abstract). Similarly, Fishbach and Zhang (2005) find that permitting spillovers are more likely over promoting when in each behavior the two options (e.g. healthy and unhealthy food items) are physically presented together, and they seem to complement each other. Conversely, promoting spillovers are more likely to occur when the two options appear spatially apart, and seem to compete against each other.

On (iv), Dhar and Simonson (1999) propose that promoting spillovers are more likely in situations where each behavior involves a trade-off between a motive (e.g. pleasure) and a resource (e.g. money): for instance, after having chosen a tasty, expensive entrée over a less tasty, less expensive entrée, we are more likely to choose a tasty, expensive main course over a less tasty, less expensive one. Permitting spillovers, however, are more likely to occur in situations where each behavior involves a trade-off between two motives (e.g. pleasure and health): for instance, after having chosen a healthy entrée over a tasty one, we are more likely to prefer a tasty, over a healthy, main course.

On (v), Cornelissen, Bashshur, Rode, and Le Menestrel (2013) argue that permitting spillovers are more likely over promoting when we are in an outcome-based mindset rather than a rule-based mindset. The reason is that in an outcome-based (consequentialist) mindset we appraise the consequences of each behavioral alternative both for ourselves and for the others involved, allowing us to be relatively flexible when trading off different motives. Moral rules, at the contrary, do not naturally lend themselves to such trade-offs, because '*a rule is a rule*'. They find that subjects who recalled a past episode that they thought was ethical '*because it benefitted other people*' (outcome-based mindset) cheated more in their payments than subjects who recalled a past episode that was unethical '*because it hurt other people*'. In contrast, subjects asked to recall a past episode that was ethical because they did their '*duty to follow an ethical norm or principle*' (rule-based mindset) cheated less in their payments than subjects who recalled a past episode that was unethical because they did not their duty.

More broadly, it should be noted that exploring under which conditions spillovers are most likely to be promoting, permitting, or purging, is a necessary but not a sufficient condition to be able to draw conclusions on the overall effect of a sequence of behaviors. Both researchers and policy-makers, in fact, would typically be interested also in quantifying the relative magnitude of behavioral spillovers. There is virtually no evidence at date, in the lab nor in the field, from systematically testing head-to-head two or more types of spillovers, with the objective of measuring their relative strength, magnitude, and persistence over time. Quantifying the magnitude of permitting and purging spillovers, in particular, is imperative in order to disentangle '*rebound*' from '*backfire*' (or '*boomerang*') effects (Gillingham et al., 2013; Goeschl & Perino, 2009; Jacobsen et al., 2012; Jenkins, Nordhaus, & Shellenberger, 2011): although the two terms are often used interchangeably, from a policy

perspective it is crucial to conceptually distinguish when the net effect of the two behaviors results in an overall increase or decrease in the behavioral outcome (Tiefenbeck et al., 2013).

7. Future directions and challenges

Lab and field experiments across all the behavioral sciences thus show that behaviors are history-dependent and that spillovers are pervasive. From the methodological perspective, this reinstates the importance of the current best practices by lab researchers of counter-balancing sequences of tasks and explicitly controlling for order effects. It is encouraging to see that field and online experiments increasingly adhere to such practices even in settings which are naturally less controllable than the lab.

Evidence shows that spillovers occur through deliberation and also unconsciously. This confirms the importance of considering a broad operational definition of behaviors and motives, consistent with the recognition of the major role of automatic, involuntary, and unconscious processes in human decisions and behavior (Aarts & Dijksterhuis, 2000; Bargh & Chartrand, 1999; Chaiken & Trope, 1999; Chartrand & Bargh, 2002; Chartrand, Huber, Shiv, & Tanner, 2008; Dijksterhuis & Nordgren, 2006; Fitzsimons et al., 2002; Kahneman, 2003, 2011; Wilson & Schooler, 1991). Our framework can be used to consider the ripple effects of sequences of behavior and not just the initial splash from the first behavioral response. As such, it provides the glue that can help to hold together our understanding of the conscious and unconscious spillovers from one behavior to the next. It also provides a useful lexicon for researchers and policy decision-makers from different fields and perspectives.

From a research and policy perspective, we should abandon ‘behavioral silos’ and ‘sector-thinking’ (Thøgersen, 1999a). The impact of a policy intervention can be greatly enhanced in presence of promoting spillovers, but it can also be severely hindered, or completely jeopardized, by the occurrence of permitting effects. And this is to further disregard the possible role of purging spillovers as potential levers to trigger envisaged changes in behavior.

There are a number of outstanding issues. Most of the evidence to date documents the occurrence of spillovers within short temporal horizons. We know very little about the longevity of spillovers beyond the time frame typically considered in lab experiments (Fitzsimons & Morwitz, 1996; Gregory et al., 1982; Tiefenbeck et al., 2013; Zwane et al., 2011). The design of field experiments in naturalistic settings is practically challenging if one really wants to map all possible ramifications of a behavior. This gap in the evidence calls for a further integration of longitudinal surveys and experimental methods in behavioral science, and for higher efforts to link experiments, administrative records, and ‘big data’ that are already available (Dolan & Galizzi, in press).

Future efforts should also be directed toward understanding the contexts and domains under which spillovers are most likely to take place. Most of the evidence at date, in fact, considers spillovers occurring within the same domain, such as environmental behavior (Evans et al., 2013; Jacobsen et al., 2012; Lanzini & Thøgersen, 2014; Poortinga, Whitmarsh, & Suffolk, 2013; Thøgersen, 1999a, 1999b; Thøgersen & Crompton, 2009; Thøgersen & Olander, 2003; Tiefenbeck et al., 2013); pro-social behavior (Brañas-Garza, Bucheli, Espinosa, & Garcia-Muñoz, 2013; Cornelissen et al., 2013; Efron, Miller, & Monin, 2012; Gneezy, Imas et al., 2012; Gneezy et al., in press; Jordan, Mullen, & Murnighan, 2011; Merritt et al., 2010, 2012; Norton, 2012; Ploner & Regner, 2013; Zhong & Liljenquist, 2006); or health behavior (Chiou, Wan, Wu, & Lee, 2011; Chiou, Yang, & Wan, 2011; De Witt Huberts et al., 2012; Dolan & Galizzi, in press; Efron, Monin, & Miller, 2013; Epstein, Dearing, Roba, & Finkelstein, 2010; Kroese et al., 2009, 2011; Van Kleef, Shimizu, & Wansink, 2011; Werle, Wansink, & Payne, 2010; Wilcox, Vallen, Block, & Fitzsimons, 2009; Wisdom, Downs, & Loewenstein, 2010).

There is little evidence on whether spillovers can occur across different domains, and whether such cross-domains spillovers are most likely to be promoting, permitting, or purging (Baird, Garfein, McIntosh, & Özler, 2012; Khan & Dhar, 2006; Mazar & Zhong, 2010; Sachdeva et al., 2009). Conceptually, such spillovers can be visualized as cross-motives links between self-images (*‘I am healthy and environment-friendly’*), accounts weights (*‘what makes me happy is working hard and being a good father’*) or both. From the policy perspective, a comprehensive mapping of the links between behaviors, contexts, and domains will illuminate not only *which* areas to target to induce behavior change, but also *where* to start from (Thøgersen, 1999a). For example, does more responsible behavior at school feed into healthier choices, or what happens if we start by ‘nudging’ healthy behavior instead?

Evidence is also missing on whether behavioral spillovers are only related to specific contexts, domains, and situations, or whether they are also explained by differences across people, such as personality, cognitive skills, and socio-economic conditions (Borghans, Duckworth, Heckman, & ter Weel, 2008; Heckman, 2007a, 2007b; Heckman & Rubinstein, 2001).

We should finally seek to better understand the neuro-physiological roots of behavioral spillovers. Research in neuroscience has substantially advanced our current understanding of the neural correlates of human decision-making and behavior (Camerer, Loewenstein, & Prelec, 2005; Glimcher, Fehr, Camerer, & Poldrack, 2008). The forthcoming efforts to thoroughly map the human brain will provide precious insights on how the numerous ripples documented here might spread through the complex network of our mind.

Notwithstanding these open questions, the time seems ripe to explicitly account for the pervasive impact of behavioral spillovers. Behavioral scientists, especially those seeking to inform policy, should try to capture all the ripples when a pebble of intervention is thrown in the pond, and not just the immediate splash it makes.

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