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Behavioral Decisions and Policy

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Abstract

We study the public policy implications of a model in which agents do not fully internalize all the conscequences of their actions. Such a model unifies seemingly disconected models with behavioral agents. We evaluate the scope of paternalistic and libertarian-parternalistic policies in light of our model, and propose an alternative policy approach, labeled soft-libertarian, which enables decision makers to internalize the conscequences of their actions. Psychotherapy is one example of a soft-libertarian policy. Moreover, we show that in our behavioral framework, policies that increase the set of opportunities or provide more information to the agent may no longer be individual welfare improving. (JEL codes: D03, D04, D60, I38)

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1 Introduction

> Most powerful is he who has himself in his own power (Seneca, 5 BC to 65 AD)

There is already accumulated evidence showing that the standard model of decision-making provides an inadequate description of human behavior. People make systematic mistakes in identifiable circumstances. People save less than what they would like; fail to take advantage of low interest loans available through life insurance policies; unsuccessfully attempt to quit smoking; maintain substantial balances on high-interest credit cards; etc.

To account for this evidence, behavioral economists have proposed alternative models that incorporate insights from psychology. Typically, these models predict outcomes that are suboptimal from the decision maker's (DM) point of view, and as such, challenge the grounding of welfare metrics solely on the basis of choice data alone (i.e. revealed preferences (Samuelson 1938)).

In decision scenarios where choices do not reveal what is best for the DM, under what conditions can observed choice data be used to evaluate the welfare implications of policy interventions? Can choices alone provide sufficient information to the planner on whether the DM is behaving sub-optimally or optimally? In what cases are policy interventions justified and what kind of policy approach is the most desirable?

In a recent paper, Dalton and Ghosal (2010a) (Henceforth DG (2010a)) propose a framework that answers the first two questions concerning the link between welfare and choices. Their approach highlights a typical mistake that leads DMs to systematically choose suboptimal outcomes. In their model, DMs fail to fully internalize how their own psychological states will change with their own actions. They may correctly forecast the near-term consequences of their actions (e.g. getting a nicotine rush from smoking a cigarette), but may fail to predict their more delayed consequences (e.g. developing nicotine dependency or lung cancer from smoking).

DG (2010a) show that assuming partial prediction of changes in psychological states is sufficient to unify seemingly disconnected models in behavioral economics, including those where the psychological state corresponds to the DM's current state (Tversky and Kahneman 1991), beliefs (Akerlof and Dickens 1982; Geanakoplos et al. 1989), emotional states (Loewenstein et al. 2003; Bracha and Brown 2007), expected consumption (Shalev 2000; Koszegi 2005; Koszegi and Rabin 2006, 2007), aspirations (Ray 2006; Dalton et al. 2010), or past consumption (Von Weizsacker 1971; Hammond 1976; Pollak 1978).

DG (2010a) also show that any behavioral economics model reduced in their framework is testable by a simple condition on observable choice data. This condition (introduced by Chernoff 1954 and Sen 1971) requires that if an alternative is chosen in a set, it must be chosen in all subsets of it to which the alternative belongs, although other alternatives in the smaller set may also be chosen. The DM is not fully internalizing all the consequences of her actions if (and only if) observed behavior is consistent with this condition.[1] Moreover, typically, when this condition is satisfied, the decision outcome is sub optimal.

Likewise, DG (2010a) show that if observed choices are consistent with Arrow's (1959) axiom of choice, behavior is consistent with a DM who is fully internalizing her feedback effect. In such cases, standard revealed preferences approach should be applied for policy analysis. If, however, observed choices violate Arrow's (1959) axiom and are consistent with

[1] Note that, contrary to the recent literature of behavioural welfare economics (Bernheim and Rangel (2009) and Salant and Rubinstein (2008)), Dalton and Ghosal's (2010a) focus is on identifying the way people make decisions, instead of dealing with the inconsistencies on choice correspondence (e.g. preferences reversal). The main point is that even when the ranking derived from choices is acyclic (which is sufficient for welfare analysis in Bernheim and Rangel (2009), it may still not represent what is best for the individual and, therefore, that acyclic ranking may not be an appropriate measure for welfare analysis.

Chernoff's (1954) axiom, then the planner knows that the DM is typically making a suboptimal decision and there is scope for intervention.

In this article, we build on these results to address the implications of behavioral decisions for policy analysis. We use a simplified version of DG's (2010a) to evaluate the scope of paternalistic, libertarian and libertarian–paternalistic (Thaler and Sustein 2003) policies. We show that the desirability of each policy approach depends on the information the planner has (i) on the underlying normative preferences of the DM and (ii) on the way the DM chooses. We argue for a novel policy approach, called 'soft-libertarian', that does not require the planner to know the underlying preferences. We conclude proposing a concrete road map for the planner, which incorporates the four approaches (i.e. paternalistic, libertarian, soft-paternalistic, and soft-libertarian) as complementary policies.

This article contributes to the emerging literature of behavioral public economics by examining the efficacy of a variety of policy interventions under the assumption that the planner has imperfect information about the type and size of mistake made by the DM. Much of existing work[2] proposes particular behavioral policies to solve specific behavioral problems, implicitly assuming that the planner is informed about DMs underlying normative preferences and the size and type of the mistake made by the DM. For instance, when DMs are time inconsistent and have self-control problems, this literature recommends to set unorthodox commitment mechanisms (Thaler and Bernatzi 2004). When DMs are sensitive to default options, the literature recommends policy makers to set the defaults thoughtfully (Thaler and Sustein 2003). In contrast, our focus here is not on the discussion of a specific policy to solve a particular mistake, but on the analysis of the scope of different policy approaches within a general framework where the planner has imperfect information about the type and size of mistake by the DM.

The remainder of this article is organized as follows. Section 2 briefly presents a special case of the model of DG (2010a), paper to which we refer the reader for additional details. Section 3 evaluates the scope of existing public policies and proposes the soft-libertarian approach. Section 4 provides philosophical grounds for the normative approach proposed. Section 5 concludes by outlining a road map of policy interventions with behavioral DMs.

[2] See, for example, Bernheim and Rangel (2007) and Koorman and Praast (2010) for a review of this literature.

2 The model

Let p be a psychological state (with P the corresponding set) and a the action chosen by the DM (with A the corresponding set[3]). The preferences of the DM are represented by a utility function $u : A \times P \to \Re$. In addition, there is a feedback effect from a to p represented by the function $\pi : A \to P$. A consistent decision state is a pair (a, p) such that $p = \pi(a)$.

A psychological state p is broadly interpreted as any state that affects DM's preference ranking over actions and, in turn, is affected by DM's actions. Examples of p are aspirations, beliefs, moods, states of mind, temptations, motivations, self-confidence, reference points, the same environment, life styles, etc.

Our setting is consistent with Bandura's (1977) psychological theory of 'reciprocal determinism', which sustains that a person's behavior both influences and is influenced by personal factors such as cognitive skills, beliefs, attitudes, and the social environment. According to Bandura's theory, people's own behavior (i.e. $a \in A$) informs and alters their environment (i.e. $p = \pi(a)$) which, in turn, inform and alter subsequent behavior through an 'environmental feedback effect'.

Our model considers two types of DMs. Those who internalize the feedback effect (standard DMs), and those who do not fully internalize the feedback (behavioral DMs).

In a standard decision problem (SDP), the DM fully internalizes the feedback effect via the map $\pi : A \to P$ and solves:

$$\text{Max}_{\{a \in A\}} v(a)$$

where $v(a) = u(a, \pi(a))$.

The FOC characterizing an interior solution a^* to an SDP is

$$\partial_a v(a^*) = \partial_a u(a^*, \pi(a^*)) + \partial_p u(a^*, \pi(a^*)) \partial_a \pi(a^*) = 0$$

In a behavioral decision problem (BDP), the DM does not internalize the feedback from actions to the psychological state. At a solution to a BDP, we require that (i) given the psychological state, the action is optimal for the DM and (ii) the psychological state is generated, via the feedback effect, by the chosen action.

Formally, for given p, let $\alpha(p) = \arg\max_{a \in A} u(a, p)$. A solution to a BDP is a pair $(\hat{a}, \hat{p})$ such that (i) Given $\hat{p}$, $\hat{a} \in \alpha(\hat{p})$ and (ii) $\hat{p} = \pi(\hat{a})$.

The FOC characterizing an interior solution $(\hat{a}, \hat{p})$ to a BDP is

$$\partial_a u\ (\hat{a},\ \pi(\hat{a})) = 0 \quad \text{and} \quad \hat{p} = \pi(\hat{a}) = 0$$

[3] In what follows we assume that both P and A are compact convex subset of a finite dimensional Euclidian space.

In a BDP, DMs choose a pair $(a, p = \pi(a))$ such that $u(a, p = \pi(a)) \geq u(a', p = \pi(a))$. Note that a' is now paired with $p = \pi(a)$ and not with $p' = \pi(a')$. This 'mispairing' is the decision-making mistake. Behavioral DMs compare actions using the psychological state associated with their chosen action, $p = \pi(a)$ instead of varying the psychological state as they consider alternative actions.

Following Harsanyi (1954), in order to make welfare assessments in this setting, we assume intrapersonal comparability of preferences. Formally, in our setting, the pair (a, p) dominates the decision state (a', p') when $u(a, p) > u(a', p')$. A consistent decision state (a, p) is optimal if there is no other consistent decision state that dominates it.

Clearly, except in exceptional cases, the outcomes of a BDP will be welfare dominated by the SDP outcome. In that sense, in a BDP the DM imposes an (internal) constraint on his decision problem as he does not internalize the feedback effect from one component of his object of choice into the other. Because of this additional constraint, behavioral equilibria are likely to be suboptimal, which explains self-defeating behavior.

Internal constraints can emerge, for example, if DMs suffer from imperfect affective forecasting or projection bias (Loewenstein et al. 2003). There is vast empirical evidence showing that DMs make systematic inaccurate predictions about how their actions may affect their psychological states and well-being. For example, DMs misjudge their self-capacities to achieve certain outcomes (Baumeister and Scher 1988), mispredict affective reactions overestimating regret and rejoicing (Sevdalis and Harvey 2007), and fail to bear in mind that they will adapt (Fagerlin et al. 2005).

From DG (2010a) we know that any existing behavioral economics model reduced in the framework considered here (some of them mentioned in Section 1) is testable by a single condition on observable choice data. This condition (introduced by Chernoff 1954 and Sen 1971) requires that if an alternative is chosen in a set, it must be chosen in all subsets of it to which the alternative belongs. If observed behavior is consistent with this condition, we know that the DM is not fully internalizing all the consequences of her actions. Moreover, from DG (2010a) we also know that when this condition is satisfied, the outcome is typically suboptimal.

In the following section, we build on these results and study the implications of behavioral decisions for policy analysis.

3 Behavioral public policy

In scenarios where choices do not reveal what is best for the DM, when and what kind of policy interventions are justified?

The goal of any public policy ought to be to maximize people's well-being. The route a social planner chooses to take in order to achieve that goal will depend on the social planner's information on the underlying normative preferences and on the way the individual chooses (i.e. whether the DM is solving a BDP or an SDP).

From DG (2010a), we know that we can infer only from choices whether the DM is solving a BDP or an SDP. If observed choices are consistent with Arrow's axiom of choice, behavior is consistent with a DM who is solving an SDP. In such cases, standard revealed preferences approach should be applied for welfare analysis and a planner should choose whatever a person would choose for herself. If, however, observed choices violate Arrow's (1959) axiom and are consistent with Chernoff's (1954) axiom, then the planner knows that the DM is solving a BDP and, typically, making a suboptimal decision. In such cases, there is scope for intervention. Which type of intervention is more desirable will depend on the information a social planner has about a DM's preferences. Below we introduce some additional notation to clarify this argument.

Fix (A, P, π). As before, let $v(a) = u(a, \pi(a))$. We assume that the social planner's goal is to maximize $v(a)$ choosing an action $a \in A$. We consider a world in which information is incomplete in two ways. First, the social planner may have incomplete information about the intensity of the mistake of the DM. We assume that the planner attaches a probability μ (respectively $1-\mu$) to the DM solving an SDP (respectively BDP). Second, the social planner may have incomplete information about the normative preferences of the DM (i.e. preferences and feedback effect). We assume he attaches a probability μ' to correct preferences and feedback effect but with probability $(1-\mu')$ he uses a completely wrong set of preferences or feedback effect resulting in attaching a weight $(1-\mu')$ to some function $v' : A \to R$, $v'(\cdot) \neq v(\cdot)$ where $v'(a) = u'(a, \pi'(a))$.

In this scenario, we distinguish between four different kinds of interventions:

(A) direct paternalism: to impose a choice a on the DM;
(B) indirect paternalism: to impose a tax or a subsidy on the DM;
(C) liberarian–paternalism: to choose the initial p_0 (e.g. reference point) for the DM; and
(D) soft-libertarian: to use psychological therapies that allow the DM to internalize the feedback effect.

In what follows, we review these four approaches in a world with behavioral DMs. We finish the section showing that policies such as increasing opportunities or providing information that in a standard economic

framework are known to be individual welfare improving, may not longer be in a world with behavioral DMs.

3.1 Direct paternalism

Dworkin (2002) defines paternalism as 'the interference of a state or an individual with another person, against their will, and justified by a claim that the person interfered with will be better off or protected from harm.'

This definition assumes that (i) the planner has complete information about the DM's normative preferences (i.e. $\mu' = 1$) and (ii) the planner knows that the DM is solving a BDP, so typically, she would not choose optimally in the absence of the intervention (i.e. $0 < \mu < 1$). In which case, the planner believes that the individual solves:

$$\text{Max}_{\{a \in A\}} \mu v(a) + (1-\mu)\, u(a, p)$$

where with some probability μ she takes the feedback effect from actions to preference parameters into account, and with some probability $(1-\mu)$ she does not. The FOC is:

$$\mu \begin{bmatrix} \partial_a u(\tilde{a}, \pi(\tilde{a})) \\ +\partial_p u(\tilde{a}, \pi(\tilde{a}))\partial_a \pi(\tilde{a}) \end{bmatrix} + (1-\mu)[\partial_a u(\tilde{a}, \tilde{p})] = 0$$

$$\tilde{p} = \pi(\tilde{a}) \tag{1}$$

where $(\tilde{a}(\mu), \tilde{p}(\mu))$ denote the solution of the problem. Note that $(\tilde{a}(1), \tilde{p}(1)) = (a^*, p^*)$, the outcome of the SDP while $(\tilde{a}(0), \tilde{p}(0)) = (\hat{a}, \hat{p})$, an outcome of the BDP.

Suppose now a more realistic scenario, in which we allow the planner to have incomplete information about the DM. The planner attaches a probability μ' to correct preferences and feedback effect but with probability $(1-\mu')$ he uses a completely wrong set of preferences or feedback effect resulting in attaching a weight $(1-\mu')$ to some function $v' : A \to R$, $v'(\cdot) \neq v(\cdot)$ where $v'(a) = u'(a, \pi'(a))$. Then, the social planner maximizes:

$$\text{Max}_{\{a \in A\}} \mu' v(a) + (1-\mu') v'(a)$$

The FOC is:

$$\mu' \begin{bmatrix} \partial_a u(a', \pi(a')) \\ +\partial_p u(a', \pi(a'))\partial_a \pi(a') \end{bmatrix} + (1-\mu') \begin{bmatrix} \partial_a u'(a', \pi'(a')) \\ +\partial_p u'(a', \pi'(a'))\partial_a \pi'(a') \end{bmatrix} = 0 \tag{2}$$

Let $[a'(\mu), p'(\mu)]$ denote the solution. Note that $[a'(1), a'(1)] = [a^*, p^*]$.[4]

[4] In the extreme case in which the planner had complete information about normative preferences and also believed that the DM solves an SDP ($\mu = 1$ and $\mu' = 1$), we would be back to the standard welfare economics approach, in which the planner would simply

It follows that the extent of direct paternalism is limited by the trade-off between μ and μ'. If the DM is solving an SDP with very high probability (high μ) and the social planner has relatively imprecise information about the individual (low μ'), then intervention may cause more harm than good. On the other hand, if it is highly likely that the DM is solving a BDP (μ is low) and the social planner has precise information about the individual (high μ') then intervention could lead to welfare improvements. This trade-off explains, for example, why the sale of cigarettes and alcohol is legal for adult decision makers (who are supposed to be of high μ) but prohibited to minors. Children do not know what is on their best interest and their actions often fail to reflect valid preferences, probably because they give insufficient weight to consequences. Therefore, few economists will reject the view that a libertarian approach is appropriate when the DM is a 'responsible' adult, and a paternalistic approach is suitable when the DM is a child. However, the spectrum of DMs in real world is not determined by these two types of DMs only. We know from empirical work in psychology and behavioral economics that (highly educated) adults make suboptimal choices. As highlighted by Bernheim and Rangel (2007), 'it's difficult to justify, objectively, the sense in which the revealed preferences of an irresponsible nineteen-year-old are legitimate, whereas those of a fourteen-year-old are not. While turning eighteen has profound legal significance, it doesn't discontinuously change the mechanics of decision-making'. Usually, the planner has vague information about μ and μ', which weakens the case for libertarian and paternalistic policies. We will argue later on for an alternative approach, soft-libertarian, as solution to this problem. But before we embark on this route, we will discuss the cases for indirect paternalism and libertarian–paternalism.

3.2 Indirect paternalism

In the transferable utility case, instead of imposing an action directly on the individual, the social planner could impose a per unit tax (or a subsidy) which would induce the individual to make the right choice. If first-order conditions are valid in characterizing an optimum for both an SDP or a BDP, then the tax $t \in \Re$ would work as follows. The outcome $(\hat{a}, \hat{p})$ of a *BDP* with a tax $t \in \Re$ satisfies the first-order condition:

$$\partial_a u(\hat{a}, \hat{p}) + t = 0, \quad \hat{p} = \pi(\hat{a}). \tag{3}$$

By setting $t^* = -\partial_p u(a^*, \pi(a^*))\partial_a \pi(a^*)$, that is, at a level in which the marginal benefit of choosing a suboptimal action equals the marginal

choose $a \in \arg\max_{a \in A} v(a)$, i.e. what the person would choose for herself. So our framework incorporates standard welfare analysis as a special case.

internal damage that DM imposes on herself, the planner would ensure that in a BDP, the DM chooses the same action as in an SDP. Clearly, such a tax is equivalent to a Pigouvian tax per-unit, but instead of internalizing externalities producing on others, the tax ensures that the DM internalizes the externalities produced on herself.

Note, however, that the above solution relies on the social planner not only having information about the underlying preferences and feedback effect, but also on whether the individual is solving a BDP or an SDP.

Suppose that the social planner has incomplete information about the DM's way of solving the problem and attaches a probability μ to the DM solving an SDP. It follows from (2) that by imposing a tax $t^*(\mu) = -(1-\mu)\,[-\partial_p u(a^*,\, \pi(a^*))\partial_a \pi(a^*)]$, the social planner ensures that $[\tilde{a}(\mu), \tilde{p}(\mu)] = [a^*, p^*]$. Note that the absolute value of t^* is decreasing in μ and is a function of the degree of uncertainty the social planner has about whether the DM is solving an SDP or a BDP. However, for any fixed value of $t^*(\mu)$, the decision maker never achieves an SDP outcome. If the DM is solving an SDP, there will be distortion; further, by substitution in (3), the actual outcome of a BDP will not coincide with that of an SDP.

Suppose now the social planner attaches a probability μ' to the correct preferences and feedback effect and with probability $(1-\mu')$, the social planner uses a completely wrong set of preferences or feedback effect resulting in attaching a weight $(1-\mu')$ to some function $\tilde{v}: A \to R$, $\tilde{v}(\cdot) \neq v(\cdot)$. Then, the target for the social planner is $[a'(\mu'),\ p'(\mu')]$. If the social planner believes that the individual is solving a BDP with probability 1, the social planner will set a tax $t'(\mu) = -(1-\mu)$ $[-\partial_p u(a'(\mu'),\ \pi(a'(\mu'))\partial_a \pi(a'(\mu'))]$ which will distort matters further, a conclusion reinforced if, in addition, the social planner believes with probability $1-\mu$ the individual is solving a BDP.

As in the case of direct paternalism, the extent, and usefulness, of indirect paternalism is limited by the information available to the social planner.

3.3 Libertarian–paternalism

So far we have considered only the case of 'hard' paternalism, in which the social planner chooses an action instead of the individual or sets a tax to induce the individual to choose a particular action. Intermediate forms of soft-paternalism have recently emerged as a compromise between fully libertarian and hard-paternalistic views.[5] The ultimate goal of

[5] See Loewenstein and Haisley (2008) for a review of methodological issues that arise in designing, implementing, and evaluating the efficacy of 'soft' paternalism. See also Koorman and Prast (2010) for discussion of libertarian–paternalistic policies related to health and saving behavior.

soft-paternalistic policies is to guide individual's behavior in directions that will promote individual's welfare while minimizing coercion.

Thaler and Sustein (2003) recommend a type of soft-paternalism labeled libertarian–paternalism. They argue that, in the cases in which the choice is reference dependent (e.g. status quo bias or default option bias), the social planner should choose the reference point or default option in order to steer people's choices in desirable directions. In this way, the social planner would achieve her goal of maximizing people's welfare without forcing anybody to do anything they would not do.

To what extent are their conclusions affected when reference points are endogenous? Note that if there is a unique outcome of a BDP, then the initial policy-determined reference point will not have an impact on the steady state preferences to which the DM with adaptive preferences converges to. On the other hand, if the BDP has multiple behavioral outcomes, then the initial policy-determined reference point might have an impact by selecting which steady-state preferences the decision maker converges to. Consider the following example. Suppose p is the label attached to objects of choice (such as 'default option'). Let $A = \{a, a'\}$ and $P = \{p = \text{“}a \text{ is the default option”}, p' = \text{“}a' \text{ is the default option”}\}$. Consistency requires that if the chosen action is a, the default option is p while if the chosen action is a' the default option is p'. In a BDP, the individual will take the label as given (without taking into account that it is a characteristic pertaining to the object) and may choose a over a' at p and a' over a at p'. In an SDP, the individual will consider the label as a characteristic of the available object of choice and will choose the optimal pair which without loss of generality we may set as (a, p). Solving an SDP in this setting requires DM to be aware that frames (such as labels or defaults) can mislead her decision, so she should internalize it when making her optimal choice. We acknowledge that this is a strong assumption to make. In fact, in some cases (like the default options for 401(k) retirement plans), the planner knows the normative preferences of the DMs (it is objectively beneficial to invest in a 401k plan), and knows that most of the DMs make the same mistake (they tend to stick with the status quo). So in those cases, it makes sense to change the usual default from not contributing (with the possibility of signing up) to contributing (with the possibility of opting out).

However, there are many other cases in which the planner has incomplete information about the normative preferences, the feedback effect and the mistake the person makes. In such situations, we argue that the libertarian–paternalistic approach can be misleading.

To justify our claim, consider the following example where an internal state of the individual (such as self-confidence) adjusts to her actions.

The payoff-relevant variables are as follows:

(i) a set of actions $A = \{\underline{a}, \overline{a}\}$, $\underline{a} < \overline{a}$, where $\underline{a}$ represents maintaining the existing status quo and $\overline{a}$ represents changing the existing status quo by undertaking higher effort (e.g. going to College) and
(ii) a set of psychological states P where $p \in P$ represents the internal state of the DM (e.g. self-confidence level).

The preferences of the DM are represented by a utility function $u(a, p) = b(a) - c(a, p)$, where $b(a)$ is the benefit the individual obtains from her new social status and $c(a, p)$ is the perceived cost of effort, which is decreasing in p but increasing in a. For simplicity, assume that $u(\underline{a}, p)$, the DM's utility from preserving the status quo, is normalized to zero for all values of p and for each p, $u(\overline{a}, p)$ is the perceived net gain (or loss) to the DM in deviating from the status quo. Then, under the assumptions made so far, $u(\overline{a}, p') > u(\overline{a}, p)$, for $p' > p$. For example, if $\overline{a}$ is interpreted as going to College, and $\underline{a}$ as staying at home, this inequality implies that the higher the person's self-confidence, the more she enjoys College. In addition, assume that $u(\overline{a}, p)$ is continuous in p.

For each p, the DM solves the maximization problem $\max_{a \in A} u(a, p)$. This generates an optimal action correspondence $\alpha(p) = \arg\max_{a \in A} u(a, p)$. Under our assumptions, there is a unique solution $\hat{p}$ to the equation $u(\overline{a}, p) = 0$. The threshold $\hat{p}$ is the level of self-confidence that makes the DM indifferent between going to College and staying in the status quo. Given p, the optimal action correspondence is determined as follows:

(i) whenever $p < \hat{p}$, $\underline{a} = \alpha(p)$;
(ii) whenever $p > \hat{p}$, $\overline{a} = \alpha(p)$; and
(iii) whenever $p = \hat{p}$, $\{\underline{a}, \overline{a}\} = \alpha(p)$.

Therefore, a DM with sufficiently low p will prefer to remain in status quo, whereas an individual with sufficiently high p will see it as convenient to exert effort to change her status quo.

The feedback effect from actions to p is captured by an increasing function $\pi : \{\underline{a}, \overline{a}\} \to P$, that assigns a p to each action. For example, the fact that the DM goes to College generates a higher p. Let $\underline{p} = \pi(\underline{a})$ and $\overline{p} = \pi(\overline{a})$, $\underline{p} < \overline{p}$, be the lowest and highest values of the psychological variable consistent with the actions available. That is, going to College is consistent with endorsing high self-confidence, and staying at home is consistent with endorsing low self-confidence.

In an SDP, the DM internalizes the effect of her actions on her self-confidence and then chooses $a \in \arg\max_{a \in A} u(a, \pi(a))$. In other words, the

standard DM is able to predict how it will feel to be a student. She anticipates that by going to College she will gain confidence, and given that confidence, she will make her decision.

In a BDP, the DM takes as given the effect of her actions on her confidence and then chooses $a \in \text{argmax}_{a \in A}\, u(a, p)$ given $p \in P$. The initial level of confidence is crucial to predict the outcome of a behavioral DM as the DM will not foresee that going to College will give her a higher confidence, maybe needed to make the decision to go to College in the first place.

Suppose $\underline{p} \leq \hat{p} \leq \bar{p}$. Then, there is a unique SDP outcome $(\overline{a}, \overline{p})$, but two BDP outcomes $\{(\underline{a}, \underline{p}), (\overline{a}, \overline{p})\}$[6]. Call $(\underline{a}, \underline{p})$ a type I equilibrium and $(\overline{a}, \overline{p})$ a type II equilibrium. In a type I equilibrium, there is no change in the status quo while in a type II equilibrium there is a change in the status quo: observe that a type II equilibrium welfare dominates a type I equilibrium.

If the social planner knows the preferences and the feedback effect, by fixing $p_0 > \hat{p}$, irrespective of whether the individual is solving an SDP or a BDP, the individual will end up choosing a: the social planner can always ensure that the individual will always end up at a type II equilibrium.

However, for this to be effective, the planner must know the correct value of $\hat{p}$ which, in turn, requires the planner to know the underlying preferences. If the social planner does not know this, she could end up choosing a value of p_0 that is too low and therefore, ineffective.

Again, as in the cases of direct and indirect paternalism, the extent and usefulness of soft paternalism is limited by the information available to the social planner. In light of this problem, we propose an alternative policy approach labeled 'soft-libertarian', which does not require the planner to know or impose the normative preferences of the individual. We argue in favor of interventions that directly target the abilities needed to internalize the feedback from actions to psychological states.

3.4 Soft libertarian

Finally, we consider a soft-libertarian approach which directly addresses the point that in a BDP, the individual does not internalize the feedback effect. A soft-libertarian policy stands in between a fully libertarian and a libertarian–paternalistic approach. Instead of being the social planner and the 'architect of the decision-maker choice' as proposed by the libertarian–paternalistic approach, we propose the DM herself to become the 'architect of her own choice' or, in Elster's (1983) words, her 'own character

[6] The two other cases are as follows—(i) if $\bar{p} < \hat{p}$, there exists a unique standard and behavioural equilibrium: $(a^*, p^*) = (\underline{a}, \underline{p})$; (ii) if $\underline{p} > \hat{p}$, there exists a unique standard and behavioural equilibrium: $(a^*, p^*) = (\overline{a}, \overline{p})$.

planner'. In that sense, the approach is not coercive. Moreover, it does not require the social planner to have information about underlying preferences, the feedback effect or the decision-making procedure. If observed choices satisfy Chernoff axiom (which characterizes a BDP and violates SDP) then helping the DM to learn how to internalize his own feedback effect will improve her welfare (at least weekly).

Note, however, that in order to internalize the feedback effect, the DM must acknowledge the existence of a feedback map, understand which actions and how they impact on her psychological states, and finally internalize it. We acknowledge that this may not be an easy task for the DM. It requires capacities and information that may seem unimportant with the lens of standard economic theory but they are crucial in the framework proposed here.

An important policy question is how a DM gets to learn to internalize her feedback effects. The answer to this question depends very much on the type of decision problem at hand. Simple feedback effects can be learned with personal experience or the experiences of similar others (e.g. role models).[7] For example, as highlighted in Beshears et al. (2008), only after paying late fees video renters learn to return their videos on time (Fishman and Pope 2007) and credit card account holders learn to pay their bills on time (Agarwal et al. 2007). In a similar vein, sex workers begin using condoms only when the information about the use of condoms is provided by other trained sex workers and no behavioral change is observed when the information is provided by bureaucrats (Rao and Walton 2004). There is also empirical evidence of sophisticated people who actually implement strategies that show an internalization of a feedback effect. For example, some people with self-control problems choose activities that reduce the likelihood of encountering cues that trigger binges. They purchase costly precommitment devices like small packages of junk food even when the unit price is lower for larger packages (Wertenbroch 1998) or self-impose costly deadlines to overcome procrastination (Ariely and Wertenbroch 2002).

More complex feedback effects (such as those involving emotions), however, may require some sort of expert advice in order to be learned and internalized. One class of expert advice consistent with our framework is psychological therapies (such us Cognitive Behavioral Therapy).[8]

[7] Dalton et al. (2010) propose a behavioral decision model with aspirations failure where it is shown the way role models can impact aspirations and help the DM to scape from a lack of aspirations/poverty trap.

[8] Lowenstein and Haslie (2008) mention therapy as a methaphore for the new type of behavioral economics policies. We do not consider it as a metaphore, but as a policy tool itself.

Most if not all psychological therapies are about identifying the appropriate coping strategies (i.e. the feedback effects) to modify thoughts, beliefs, behavior, and environments to improve people's psychological states (Hawton et al. 1989). Clinical psychologists know why people make mistakes in the first place (they know possible feedback effects), and, more importantly, they apply this understanding in their daily practice. A key normative principle of psychological therapies is not to force the DM to undertake any action that the DM does not want. The main aim is to help the DM to achieve what the own DM considers the good life. In that sense, individual autonomy is not only fully respected but also enhanced. Psychological therapies have been shown to be effective in helping people to cope with depression, stress, anger, fear, anxiety, or low self-confidence. They either change the DMs response to a situation (emotion-focused problem) or change the environment (problem-focused coping) (Lazarus and Fockman 1984; Hawton et al. 1989). In the case of addiction, behavioral therapies teach cue-avoidance without providing new information (Bernheim and Rangel 2007). As argued by Baron (2006), emotions are (partly) under people's control and individuals can 'induce or suppress emotions in themselves almost on cue'. Some people may even reshape their character, so that their emotional responses change.

What types of institutions can provide the capacities needed to internalize the feedback effect? As Mullainathan (2006) argues, good institutions also help to reduce problems that arise within a person. An example of such institution is 'The Improving Access to Psychological Therapies' programme (IAPT) initiated in 2006 in the UK. IAPT aims at offering evidence-based psychological therapies and psychological support to a wide range of the population. Layard et al. (2008) argue that IAPT does not only improve individual well-being but also social well-being by reducing other public costs associated with psychological disorders (e.g. welfare benefits and medical costs) and increasing revenues (e.g. taxes from return to work and increased productivity).

3.5 Other standard policies

To conclude this section, we highlight other typical policies that are thought to be (at least weakly) welfare improving, but they can also be misleading in a behavioral framework. For instance, it easy to construct examples where providing more information or more opportunities to the DM may make her worse-off. Below we present two of these examples.

More *information may make the decision-maker worse-off*

Consider a decision problem with payoff relevant uncertainty, with two states of the world $\{\theta_1, \theta_2\}$ where preferences are

$\theta_1 \rightarrow$

	p_1	p_2	p_3
a_1	−1	0	0
a_2	0	3	$\frac{1}{2}$
a_3	1	4	1

$\theta_2 \rightarrow$

	p_1	p_2	p_3
a_1	1	4	1
a_2	$\frac{1}{2}$	3	0
a_3	0	0	−1

where $\pi(a_i) = p_i$. Suppose, to begin with, the DM has to choose before uncertainty is resolved. At the time when she makes the decision, the individual attaches a probability $\frac{1}{2}$ to θ_1 and $\frac{1}{2}$ to θ_2. In this case, expected payoff matrix is

	p_1	p_2	p_3
a_1	0	2	$\frac{1}{2}$
a_2	$\frac{1}{4}$	3	$\frac{1}{4}$
a_3	$\frac{1}{2}$	2	0

It follows that the unique BDP outcome is (a_2, p_2) with expected payoff 3.

Next, suppose that the DM knows with probability one the true state of the world. Then, when the state of the world is θ_1, a_3 strictly dominates all other actions and the unique BDP outcome is (a_3, p_3) with payoff 1 and when the state of the world is θ_2, a_1 strictly dominates all other actions and the unique BDP outcome is (a_1, p_1) with payoff 1. Therefore, the decision-maker is worse-off with more information[9,10].

[9] Note that in this example we are referring only to information that solves the uncertainty about exogenous states of the world. Our statement 'the decision-maker is worse-off with more information' would not be right in the case in which additional information helps the decision maker to learn about the feedback.

[10] The example is consistent with Carrillo and Mariotti's (2000) results, although we do not need a dynamic model with time-inconsistent preferences to make the point.

More *actions may make the decision-maker worse-off*

Consider first a situation where the payoff table is

	a_1	a_2
a_1	−1	0
a_2	0	3

where $\pi(a_i) = p_i$. The outcome of the BDP is (a_2, p_2) with payoff 3. Now, expand the set of choices so that the following payoff table represents the decision problem

	a_1	a_2	a_3
a_1	−1	0	0
a_2	0	3	1
a_3	1	4	2

where $\pi(a_i) = p_i$. Note that the unique BDP outcome is (a_3, p_3) with payoff $2 < 3$. This means that although the action set of the decision maker has been expanded so that (i) the ranking of existing actions is unaffected and (ii) the new action strictly dominates all existing actions, the individual is made worse-off.

4 Normative grounds

The policy approach advocated in this article is based on autonomy as a normative criterion for welfare evaluation. As argued by philosopher Friednman (2003: p. 4), 'autonomous behavior is based on the deeper wants and commitments of the person, is partly caused by her reflections on and reaffirmations of them.' To realize autonomy a person must first somehow reflects on her wants and takes up an evaluative stance with respect to them. Friednman (2003: p. 4) makes very clear the endogeneity of psychological states when she argues that 'for choices and actions to be autonomous, the choosing and acting self as the particular self she is must play a role in determining them [...] When wants and desires lead to choice or action without having been self-reflectively endorsed by the person, the resulting choices and actions are not autonomous.' The notion of self-government (the capacity to govern oneself) is central to the concept of autonomy (Trout 2005). A standard DM, as defined in our framework, captures precisely that notion. As Ryan and Deci (2006) illustrate, a man who decides to 'have another drink' would not be autonomous unless, in reflecting on this motive, he could fully endorse it. The preferences that the standard DM maximizes are exactly the preferences that Elster (1983: p. 22) defines as autonomous preferences: 'those

that have been deliberately chosen, acquired or modified – either by an act of will or by a process of character planning.'

The soft-libertarian approach, therefore, advocates interventions that promotes the autonomy of the DM. The way in which the autonomy is enhanced is by helping the DM to internalize her feedback effects and thus to become a standard DM.

5 A policy road map

We conclude by outlining a road map detailing the nature of policy interventions with behavioral DMs.

A first step would be to check if observed choice data satisfies Chernoff (1954). In such a case, a paternalistic planner would either choose the optimal action for the DM or induce the DM to choose that optimal action via taxes. A libertarian–paternalistic planner (Thaler and Sustein 2003) would choose the reference point (or the distribution of reference points) such that the DM is induced to choose the optimal action.

In order to be implemented effectively, both approaches require the planner to have information about the DM's normative preferences and the intensity of her mistake. The cost of acquiring this information varies across different situations. There are situations, for example, in which the DM will choose suboptimally with high probability (e.g. children adolescents or adults incapable of engaging in contracts). In these extreme cases, the cost is null and paternalistic interventions may be desirable. Also, there are situations where DMs (even highly educated adults) choose systematically suboptimal outcomes and where their normative preferences are clear for the planner.[11] In these cases, there is scope for the libertarian–paternalistic policies proposed by Thaler and Sustein.

However, in most of the cases, the probability that the planner knows the individual normative preferences is low, so the applicability of hard- or soft-paternalistic policies is, at least, contentious. For instance take the case of smoking. Clearly, there are smokers who do not want to quit smoking and whose behavior is perfectly aligned with their normative preferences. There are also smokers who wish to quit smoking, who attempt to do so, but who fail. In such cases, paternalistic policies will

[11] An example of this situation that has received considerable research attention is default options for 401(k) retirement plans. If it is objectively beneficial to invest in a 401k plan (i.e. normative preferences are clear), but people tend to stick with the status quo (i.e. the mistake is also clear), then it may make sense to change the usual default from not contributing (with the possibility of signing up) to contributing (with the possibility of opting out).

inevitably violate the autonomy of those DMs who do not wish to quit smoking.

For cases like the one above, we propose an alternative policy approach labeled 'soft-libertarian' which does not require the planner to know or impose the normative preferences of the individual. We argue in favor of interventions that directly target the abilities needed to internalize the feedback from actions to psychological states. In these cases, the role of the planner should be to create the institutional structure to assist the DM's in achieving her own normative preferences.

To sum up, we have outlined a novel road map for policy intervention in a general framework where DMs do not necessarily follow their own best interest and the planner has imperfect information about normative preferences. We argue that the planner should first identify whether the DM is choosing optimally or not (DG (2010a)). If DM is choosing optimally, then standard revealed preferences approach applies. Otherwise, the optimal extent of public intervention depends on the trade-off between the information the planner has about the DM's normative preferences and about the size of the mistake of the DM. In the extreme cases, when the planner knows with high (low) probability the normative preferences of the DMs and there is a high (low) probability that the DM is making a mistake, there is scope for paternalistic (libertarian) policies. For the intermediate cases, when the information about preferences and mistakes is less clear or very costly to acquire, we propose an alternative policy approach, labeled 'soft-libertarian', which does not require the planner to know about the normative preferences of the DM and allow the DM's herself to learn how to make better choices.

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