

**Rational Choice with Passion:  
Virtue in a Model of Rational Addiction**

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Abstract

By incorporating a divided self into the rational addiction framework, this paper provides a rationale for and an explicit analysis of two types of budget-shrinking behaviors - actions taken to limit access to lifetime wealth in a given period, and actions taken to change the effective price of the addictive good. Moreover, internal conflict models provide a normative rationale, absent from rational addiction models, for policies which limit access to addictive goods. JEL D10, D11.

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## 1 Introduction

"I can resist everything except temptation." - Oscar Wilde

The rational addiction model (Stigler and Becker 1977, Becker and Murphy 1988, 1994, Dockner and Feichtinger 1993, Orphanides and Zervos 1995) explains some aspects of addictive behavior, and as such can claim some modest success as a positive approach to addiction. The model fails, however, to explain other important aspects of addictive behavior, especially actions taken by the addict (or potential addict) to shrink the budget set. The divided self-internal conflict literature (Strotz 1956-57, Winston 1980, Thaler and Shefrin 1981, Thaler 1981, Laibson 1997, O' Donoghue and Rabin 1999) offers a framework in which to address the shortcomings of the rational addiction model.

A single-period budget set may be altered through a change in the single-period budget or a change in the relative price of goods. The recent internal conflict literature (with the exception of Winston 1980), because it is geared more towards explaining savings behavior, addresses the incentives of consumers to restrict access to wealth in certain periods, but not the incentive to change the price of the addictive good. By incorporating into the rational addiction framework a divided self, framed in terms of the classical distinction between reason and passion, this paper provides a rationale for and an explicit analysis of both types of budget-shrinking behaviors - both changes in a period's budget and changes in the price of the addictive good.

Equally important, the incorporation of internal conflict into the theory eliminates the awkward normative result that addicts can never be made better off by being forced to quit. Current rational addiction models must rely on externalities arguments to justify

policies which curtail consumption of addictive goods. By modeling situations in which individuals would prefer a smaller budget set (in particular, a higher effective price of the addictive good), passion-reason internal conflict models provide a normative rationale for policies which limit access to addictive goods (cigarettes, pornography, etc.)

The remainder of the paper proceeds as follows. Section 2 addresses shortcomings of the rational addiction approach. Section 3 is a brief discussion of the incorporation of virtue into economic models. Section 4 lays out the passion-reason model, and examines the properties and implications of the model in describing behavior in any single period. Section 5 specifies the multiperiod optimization problem, and compares it with the rational addiction model of Becker and Murphy (1988). Section 6 concludes the paper.

## **2 Shortcomings of Rational Addiction Models**

Almost all economic models ignore inner conflict - an individual always choose what he wants most from the budget set. It matters not whether a person's reason or passion calls the shots, so long as it calls them all the time, and in a way that respects the usual preference axioms. Nevertheless, some significant proportion of consumers give evidence of internal conflict. Two behaviors are of particular note: consumers report that they wish they had more control over their purchases of certain goods, and they take actions to shrink their single-period budget set.

People often express a desire to rein in their consumption of certain goods (fatty food, chocolates, cigarettes), yet never manage to. Similarly, people often express a desire to increase their consumption of certain goods (savings, reading a book,

exercising, praying), yet never manage to. Their consumption is characterized by a chronic disparity between what they consume and what they claim they want. Examples of this disparity between desired and actual consumption are abundant. The Centers for Disease Control (1995) reports that 73% of the 22 million American females who smoke express a desire to quit; the same study finds that three quarters of young people who smoke or use smokeless tobacco report that they continue to use tobacco because they find it hard to quit. Rook and Hoch (1985) and Rook (1987) document the phenomenon of "impulse buying:" incidents in which the consumer buys a good against his or her better judgment, whose purchase often results in some sort of negative financial or social consequence. I will refer to these goods, whose consumption (or failure to consume) is accompanied by a persistent regret, as "passion goods."

Passion goods represent a significant portion of household consumption. The CPI weights for alcohol, tobacco, sugars and sweets suggest that the typical household spends 2.25% of its budget on the most obvious of passion goods. The U.S. alcohol and tobacco industries generate \$50 billion of yearly sales each. If consumers regret even a fifth of their consumption, the phenomenon of \$20 billion worth of undesired purchases merits attention.

Regret in this paper is different from regret as it is used in Orphanides and Zervos (1995). In that paper, individuals have imperfect information about their propensity to become addicted, and may learn their type when it is too late to avoid the addiction. Their regret is based on the fact that they would have made different consumption choices if their information had been better. They do not regret the choices they make as they are making them. In contrast, agents in passion models, and respondents to surveys

about addictive behavior, regret their behavior, even in the presence of complete information. They wish they had more control over their consumption choice.<sup>1</sup>

The possibility that people behave in ways which are not only not in their best interest, but which they know are not in their best interest, calls into question the strong assumption which undergirds the claim that revealed preference provides accurate information about an individual's welfare. Haslett (1990) notes that the identification of welfare with revealed preference rules out the possibility that someone might behave in a way that he knows is not in his best interest. Kahneman (1994), noting that current assumptions of rationality imply that no one ever fails to exploit a significant opportunity and that no one ever needs protection from his own actions, objects that the relationship between revealed preferences and the welfare of the individual should be studied, not assumed. Sagoff (1994) provides a more telling critique, noting that since any number of preferences can be inferred from a given action, preference cannot be considered a datum for analysis.

Among those strategies employed to control consumption are some which shrink the budget set, often by effectively raising the price of passion goods relative to other goods. These strategies include avoiding "occasions of sin" - contexts and locations in which the good is easily acquired, avoiding the company of those who consume the good and cultivating friendships with those who do not, often at some cost<sup>2</sup> - and even the deliberate purchase of smaller, more expensive packages.

Neither persistent regret nor budget-shrinking behavior is addressed adequately in the existing rational addiction literature. Most economists, caring more about what people do than about what they say, are tempted to dismiss a person's complaint of

ongoing dissatisfaction with consumption choices. They argue that if a person really does not want to eat a pound of chocolate a day, he will simply allocate his budget to other things. This approach takes revealed preference as normative - people are always assumed to get their most preferred bundle from the available options. No inner conflict prevents a person from achieving a desired consumption bundle.

The economist's high regard for the normative value of revealed preference leads logically to statements such as this:

“... they [addicts] would be even more unhappy if they were prevented from consuming the addictive goods (Becker and Murphy 1988: 691).”<sup>3</sup>

A policymaker using the current rational addiction framework can never consistently argue (without recourse to externalities)<sup>4</sup> for involuntary restraints on addicted persons, could never admit that a convicted criminal might benefit from being forced to “dry out” in prison.<sup>5</sup> The rational addiction framework can explain why a consumer would quit “Cold turkey,” but does not explain why someone might try to quit and fail, or why a person might need help to quit (a fat farm). Moreover, the policymaker cannot, in the context of current rational addiction models, advocate policies that shrink a potential addict's budget set, through restricted access (of cigarettes to teenagers, say) or artificial increases in the price of the addictive good (cigarette taxes). Thus, an economist might find himself advocating an increase in cigarette taxes to discourage smoking (predicting a long run response greater than the short run response) without a corresponding theoretical justification for the benefits of decreased cigarette smoking.

Some researchers attribute the shortcomings of rational addiction models to the rationality assumption. As the discussion above makes clear, however, the rational

addiction approach comes up short not because of the rationality assumption, but because of the auxiliary assumption of full competence : the rational actor (reason) is assumed always to be able to choose the optimal bundle, or optimal consumption path. If, however, reason must contend with passion for control over the budget, many of the shortcomings of rational addiction models can be overcome. Models incorporating the struggle between reason and passion can explain the same patterns of consumption explained by conventional rational addiction models, and in addition give a reasonable account of budget-shrinking behaviors. In addition to their greater usefulness in positive analysis, economists using the reason-passion model need not advise policymakers that addicts are made worse off by the forcible curtailment of their consumption.

### **3 Virtue and Economic Modeling**

A common objection to the incorporation of notions of virtue or character into economics is that to do so is to inject moral judgments into economic theory, to confuse normative and positive economics. This objection is not valid in the treatment of passion goods, because what is at stake is the **positive** goal of explaining consumption behavior. The goal of the analysis is to shed light on why individuals consume certain bundles that they do not at some important level want, not why they consume certain bundles that the researcher thinks they should not have. The individual's utility is the reference point for the analysis.

Of course, crucial to the analysis is the distinction between desire, or passion, and what a person really wants. Several papers have drawn similar distinctions. Schelling (1984) posits two centers of planning within an individual - the higher (planning) center

and the lower (pleasure-oriented) center. He then draws an analogy between management of others and self-management. Thaler and Shefrin (1981) and Elster (1985) model several selves and the difficulties of collective action and intrapersonal exchange. All of these distinctions are echoes of the original, Aristotelian distinction between reason and passion, and the role of virtue in mediating the competition between the two. Aristotle's theory of virtue can illuminate some of the issues in self-management.

According to Aristotle (1980: 1.9), human happiness (flourishing, welfare) comes only through virtue. To Aristotle, a virtuous person is one who is disposed to perform good acts. This disposition requires three things. First, the virtuous person must know the good, at least in a general sense. When a virtuous person acts, he has a worthy goal in mind. He knows what is good for him.<sup>6</sup> Second, the virtuous person must be able to identify the best action in a particular circumstance (he must have what Aristotle calls practical wisdom, or prudence). One is tempted to call this second trait rationality, since it resembles the ability to identify the best consumption-leisure bundle from a constrained budget set. Third, the moral person must be able to do what he thinks is good - he must not be ruled by his passions, which often militate against reasoned deliberation and moral action (Aristotle 1980: 7.1). This submission of the passions to reason is called continence. Thus, a happy person knows what is good, knows how best to achieve the good in particular circumstances, and can control his passions when they urge him away from the good.<sup>7</sup>

Economic man meets the first two Aristotelian criteria for virtue : he knows the good (has perfect information about his preferences, knows what will make him happy in the broadest sense) and knows how to achieve the good efficiently. The third criterion is

not addressed in economic models. There is no struggle in economics comparable to that between reason and passion in Aristotle. To the economist, economic man is unitary - he is one set of stable, predictable preferences. He may have conflicting desires, but there is only one of him, as far as we can see. Both passion and reason may play a role in the formation of these preferences, but there is no ongoing struggle. If there was ever a struggle, it is over before the economist assumes the preferences. One can imagine either that reason won outright (and the individual is continent), that reason and passion have entered into some long-lasting and well-specified truce (the individual is incontinent), or that passion has won outright, and obliterated reason (the individual is brutish, in Aristotle's terms). In any event, the preferences are stable, unchanging.<sup>8</sup>

Without a recognition of the person's inner struggle, economics can adequately address neither actions voluntarily taken to restrict the budget set nor ongoing dissatisfaction with consumption choice. The next two sections lay out a model which incorporates this inner struggle.

## **4 A Simple Model of Internal Conflict over Consumption Choice**

### **4.1 Reason and Passion Preferences**

In a single period  $t$  of a discrete time model, assume a fixed budget  $B(t)$  and two goods,  $c(t)$  and  $y(t)$ .  $c(t)$  is the addictive good, and  $y(t)$  is a numeraire composite good.

The price of  $c(t)$  is  $\pi(t)$ .

Assume that each person contains two selves, reason and passion. A person's **reason preferences** are

$$(1) \quad U^R(y(t), c(t), S) = U(y(t), c(t), \bar{S})$$

$U$  is increasing and concave in  $c(t)$  and  $y(t)$ . Without loss of generality, let  $\bar{S}$  be an index of the strength of reason's desire for  $c(t)$ , which is fixed and independent of past consumption. Thus, we assume that past consumption does not enter into reason's utility - it affects neither the level of utility nor the marginal rate of substitution between  $y(t)$  and  $c(t)$ . Reason does not recognize any impact of past consumption on the marginal utility of consumption today. This assumption is restrictive (a cigarette smoker's reason should take into account the impact of smoking today on the **level** of utility tomorrow), but it allows us to focus more closely on the effect of consumption on passion.<sup>9</sup>

A person's **passion preferences** are

$$(2) \quad U^p(y(t), c(t), S) = U(y(t), c(t), S(t))$$

Passion preferences are the preferences of most rational addiction models; they differ from reasoned preferences only in that the stock of past consumption  $S(t)$  enters into  $U$ . To keep the analysis tractable, we will make the more restrictive assumption of Becker, Grossman, and Murphy (1994), that  $S(t)$  evolves over time in the following simple way:

$$S(0) = \underline{S} \text{ and}$$

$$(3) \quad S(t) = c(t-1).$$

Thus consumption enters the stock of consumption for one period, and then depreciates fully. We will assume that for passion, past and present consumption are complements ( $U_{cs} > 0$ ) and that  $U_S = 0$ .<sup>10</sup>

In this model, a sharp division is drawn between passion and reason over the intertemporal complementarity of consumption of  $c(t)$  - there is no intertemporal complementarity in reason's utility, since the argument  $S(t)$  is fixed at  $\bar{S}$ . The sharp

distinction is not crucial for model; what is crucial is that  $U_{cS(t)}^R \neq U_{cS(t)}^P, \forall S(t) \neq \bar{S}$ .

The model set forth here, in which  $U_{cS}^R = 0$ , makes the insights clearer.

The one-period marginal rate of substitution between  $c$  and  $y$  is a function of consumption of both goods, and of  $S(t)$  :

$$(4) \quad MRS^R(y(t), c(t), \bar{S}) = \frac{U_c^R}{U_y^R}$$

$$(5) \quad MRS^P(y(t), c(t), S(t)) = \frac{U_c^P}{U_y^P}$$

$MRS^P$  is increasing in  $S(t)$ , and

$$MRS^P(y(t), c(t), S(t)) \begin{matrix} > \\ < \end{matrix} = MRS^R(y(t), c(t), \bar{S}) \text{ as } S(t) \begin{matrix} > \\ < \end{matrix} \bar{S}, \forall y(t), c(t).$$

#### 4.2 Passion versus Reason

To begin, let us examine a one-period model of consumption, with fixed budget  $B(t)$  and consumption stock  $S(t)$ . If reason were in complete control of consumption it would choose a bundle such that  $MRS^R = \pi(t)$ . Similarly, passion's optimal consumption bundle satisfies  $MRS^P = \pi(t)$ . Because  $MRS^P$  is increasing in  $S(t)$ , reason's optimal consumption of  $c(t)$  will be smaller (larger) than passion's as  $S(t)$  is larger (smaller) than  $\bar{S}$ . Figure 1 shows the case when  $S(t) < \bar{S}$ ; figure 2 shows the case of  $S(t) > \bar{S}$ . A person's reason desires bundle  $R(y^R(t), c^R(t))$ , but a person's passion desires bundle  $P(y^P(t), c^P(t))$ .<sup>11</sup> Reason's preferences are fixed, but passion's evolve in accordance with consumption of  $c$ .<sup>12</sup>

This model is general enough to encompass both figures 1 and 2. In each case, the struggle of reason with its passions takes a slightly different form - passion may not always want more than reason, it may sometimes want less. In figure 1, passion wants less  $c$  than reason. In this case,  $c$  might be a good which requires the development of a taste, such as reading or fine wines. In figure 2, passion wants more  $c$  than reason. This accords more closely with the common conception of passion, in which passion always desires more chocolate, more cigarettes, etc.

Figures 1 and 2 make the point that passion's preferences may evolve in such a way that passion desires less  $c$  than reason at some times (figure 1) and more than reason at others (figure 2). Thus, you may have to learn to like even some addictive goods - figure 1 might be a person's preferences while learning to like scotch (when past consumption of scotch,  $S(t)$ , is low), and figure 2 the same person's preferences after addiction (when past consumption is high). Note that either of these two scenarios is possible for a good, regardless of whether it is negatively or positively addictive, as defined in Becker and Murphy (1988).<sup>13</sup>

Given the internal "difference of opinion" between passion and reason, how is consumption determined? If reason is in full control of the individual's choices, then the problem reduces to a standard model of consumption choice. If passion's desires affect consumption, then a theoretical mechanism is necessary to describe the interaction between reason's and passion's desires. Since the internal struggle of reason with passion is by definition hidden, it should be modeled as generally as possible, to capture only the outcome of the struggle as it is affected by the relevant parameters of the model (prices, the budget, consumption). We will attempt to capture the notion that reason at

times cannot choose its preferred bundle, because passion wants a different bundle and has enough power in the internal struggle (measured by  $S(t)$ ) to prevent reason from choosing its preferred bundle.

This theoretical mechanism can take one of two forms. For example, we might add a “psychic cost” to reason’s utility function. As reason attempts to move consumption closer to point R and farther from point P, passion’s resistance might result in a psychic cost, which reason will take into account.<sup>14</sup> A second approach, followed in this paper, is to allow reason to costlessly influence consumption within a range (which may or may not include reason’s desired consumption bundle  $c^R$ ). The boundaries of the constraint are determined both by passion’s desired consumption and relative power. The second approach allows us to focus more clearly on reason’s desired level of  $c$  under the binding influence of passion, and it allows us to examine reason’s incentives to shrink the budget when it has exhausted its ability to affect  $c$  directly.<sup>15</sup>

It should be noted that, although this model is superficially similar to divided-self models, in which several selves contend for control of consumption, or in which a succession of selves attempt to coordinate their actions across time, it has more in common with metapreference models, as described by George (1998). Just as there is only one self per individual in Aristotle, there is only one self in this model, reason, which must contend with unruly passion. Passion is an internal constraint, and although we may by analogy attribute strategic impulse to passion,<sup>16</sup> the true self of the agent is located in reason.<sup>17</sup>

It is, of course, arguable that passion should be treated as a self, in which case the normative claims of reason against passion cannot be resolved. Rarely do we actually

grant passion of the sort I am addressing that sort of normative weight, however. When a person expresses a desire to quit smoking, we do not berate her for depriving her passion of the pleasure of smoking. By granting a primacy to reason's preferences, we are modeling human behavior in line with Aristotelian thought, in which reasoned, examined preferences are quintessentially human. Within this tradition, we give more credence to a person's sober, well-reasoned judgments about his interests than we do to his impulses.

In figure 2, the conflict between passion and reason results in the constraint  $\underline{c}(t) \leq c(t) \leq \bar{c}(t)$ . Reason's preferred bundle  $R$  may be within the region defined by the constraint, or it may lie outside of it. The boundaries of the constraint are functions of passion's preferred bundle  $c^P$  and the stock of past consumption  $S(t)$ :

$$(6) \quad \underline{c}(t) = \underline{c} \left( \begin{matrix} + & + \\ c^P(t), S(t) \end{matrix} \right)$$

$$(7) \quad \bar{c}(t) = \bar{c} \left( \begin{matrix} + & - \\ c^P(t), S(t) \end{matrix} \right)$$

The signs of the first partials are indicated above each argument. As passion's desired consumption of  $c$  increases, the constraint moves to the right in figure 2, and as passion becomes stronger in the internal struggle (as  $S(t)$  increases), the constraint constricts.

$c^P(t)$  corresponds to point  $P$  in figure 2; it is a function of  $\pi(t)$ , the price of  $c$ , of the one-period budget constraint  $B(t)$ , and of consumption capital  $S(t)$ . It solves passion's myopic, one-period consumption problem:

$$(8) \quad c^P(\pi(t), B(t), S(t)) = \arg \max U^P(B(t) - \pi(t)c, c, S(t)).$$

The concavity of  $U^P$  insures that  $c^P$  is decreasing and convex in  $\pi$ . We assume that  $c^P$  is increasing in  $S(t)$ . By modeling passion's desired consumption, we are assuming that passion is a self only by analogy to reason; the outcome of the internal struggle between

passion and reason will depend in part on passion's optimal one-period consumption bundle. By modeling passion's desired consumption in this way, we can explore the possibility of controlling passion through actions taken to increase the effective price of  $c$ , or to shrink the budget in periods when passion is strong.

In the event that passion desires more  $c$  than reason (figure 2),  $c(t)$  will fall anywhere between 0 and  $c^P(t)$ . Taking  $c^R(t)$  as Aristotle's "golden mean," we can classify the virtue of the consumer as follows:

$c(t) \leq c^R(t)$	(line segment AR)	continent (virtuous)
$c^R(t) \leq c(t) \leq c^P(t)$	(line segment RP)	incontinent
$c(t) = c^P(t)$	(point P)	brutish

Note that, in a dynamic model, a continent person may consume less than the golden mean, in order to reduce the power of passion in future periods, thus keeping future passions in check. We will explore this aspect of reason's choices more fully in the next section.<sup>18</sup>

The emphasis in this model is on reason's choices - we do not assume that reason alone acts strategically. To incorporate fully the strategic interaction between reason and passion in this model would complicate it immensely. In place of a strategic analysis, we shall highlight reason's desired consumption targets when impeded by passion. Likewise, we shall examine reason's incentives to change the budget  $B(t)$  and prices  $\pi(t)$ , if possible. Thus we can show, for example, that budget-shrinking behaviors may sometimes be desirable, without making assumptions about their feasibility in the face of resistance from passion.

Although the model presented here is similar in structure to those of Thaler and Shefrin (1981), and those suggested by Strotz (1956-57), Schelling (1984) and Laibson (1998), the emphasis of their models is on intertemporal choice, and the internal conflicts which arise in the savings decision. Consequently, their models address internal conflicts that arise when the costs of an action occur far in the future, and capture internal struggles over control of the allocation of lifetime wealth to each period's consumption. This previous work, while outlining the desirability of imposing constraints on the self, does not explicitly show the desirability of changes in the single-period budget, and does not address the desirability of changing relative prices within a single period.

An exception is Winston (1980), which, as a critique of Stigler and Becker (1977), offered a model in which a person alternates between two myopic utility functions, one of which reflects a stronger preference for the addictive good. At any one point in time, the conflict in Winston is not between the two utilities, but between whichever myopic utility is currently active and the person's lifetime utility, which is a lifetime average of the two myopic utility functions. Consumption of the addictive good, when the addictive utility is active, will increase lifetime utility directly through the addictive utility, but may lower lifetime utility through the negative effects of the addiction in future periods, both when the non-addictive and addictive utilities are active.

There are three major differences between Winston's model and the model presented here. First, a person's addictive and non-addictive preferences are given equal normative standing in Winston – lifetime utility is a weighted average of both. In Winston, the person does not struggle against unwanted preferences; instead he must manage preferences which may conflict with each other across time. As a result of this,

in Winston's model, a person may be observed taking actions to limit his choices in order to make himself better off, but external constraints, imposed without the agreement of the individual, can never make the addict better off. It is possible in Winston's model for the addict's best course of action to be remaining addicted. Some, but not all, of the addicts in Winston (1980) are happy addicts.

Second, this paper goes further than Winston (1980) in analyzing the conditions in which budget-shrinking behaviors (including changes in effective prices) become desirable. Third, in Winston's model, the person can not affect the length of time that his addictive utility is active – the power of the utilities is fixed, independent of past consumption. Thus, there is no mechanism by which reason can increase control over consumption choice through habit, increasing his ability to resist passion.

## **5 Reason's Choices Under the Influence of Passion**

### **5.1 Reason's Problem**

In this section, I will sketch a simple, discrete-time specification of reason's problem.<sup>19</sup> The agent chooses consumption over  $T$  periods, subject to a wealth constraint and the constraints imposed by the struggle with passion. Because reason and passion may contend over the allocation of the wealth to each period's budget, we will focus first on the choice of consumption in each period, given a series of predetermined single-period budgets. Next we will look at reason's preferred dynamic budget allocation, and the incentive to allocate the budget away from periods in which passion is strongest. Finally, we will examine the incentive to increase the price of  $c$  in periods when passion is strong and desires more  $c$  than reason.

Reason's utility maximization problem is as follows:

$$(9) \quad \begin{aligned} & \text{Max}_{c(t), B(t)} \sum_{t=0}^T \beta^t U^R(B(t) - \pi(t)c(t), c(t), \bar{S}) \\ \text{s.t.} \quad & c(t) \geq \underline{c}(c^P(t), S(t)) \\ & c(t) \leq \bar{c}(c^P(t), S(t)) \\ & \sum_{t=0}^T \rho^t B(t) \leq W. \end{aligned}$$

$\beta$  is the utility discount factor, and is less than 1. The first two constraints (the **passion constraints**) are a result of the internal struggle between passion and reason; the last is a lifetime wealth constraint;  $\rho$  is the financial discount factor, and is less than 1.  $W$  is lifetime wealth. The stock of consumption capital in the initial period is  $\underline{S}$ ; equation 3 describes the evolution of  $S$ . The shadow value of the lower and upper boundaries of the passion constraint are  $\underline{\lambda}(t)$  and  $\bar{\lambda}(t)$ , respectively; the shadow value of lifetime wealth is  $\lambda_W$ .

There is no uncertainty in this model, although uncertainty can be incorporated into it (see Orphanides and Zervos 1995). Since the model can be solved at period 1, it is possible that the individual can anticipate interventions (by concerned friends, authorities) in future periods, if he expects to lose control of his consumption choices to passion. The possibility of these future interventions is not incorporated into the model, but if it were, it is possible that the anticipation of future rescue from the consequences of inflamed passion might lead to increased consumption of the addictive good in earlier periods.

## 5.2 First-Order Conditions when $c^P > c^R$

Let us first examine the case in which passion always desires more than reason ( $c^P(t) \geq c^R(t), \forall t$ ). In this case, only the lower boundary constraint  $\underline{c}$  is relevant. The first order condition for  $c(t)$  is

$$(10) \quad \beta^t (U_C^R - \pi(t) U_Y^R) + \underline{\lambda}(t) - \underline{\lambda}(t+1) (\underline{c}_{c^P} \underline{c}_S^P + \underline{c}_S) = 0.$$

If the consumer is constrained in neither this period nor the next,  $\underline{\lambda}(t)$  and  $\underline{\lambda}(t+1)$  equal zero, and he will choose  $c=c^R$ , where the marginal rate of substitution equals the price of  $c$ . If passion is never strong enough to constrain reason's choices in any relevant way, the consumer's problem reduces to the standard intertemporal consumption choice problem.

If the passion constraint binds in period  $t$  but not period  $t+1$ , the last term in equation 10 is zero, and  $\underline{\lambda}(t)$  equals  $\beta^t (-U_C^R + \pi(t) U_Y^R)$ , the marginal value of a relaxation of the constraint. The greater the power of passion in period  $t$ , the greater the distance between reason's desired consumption and actual consumption ( $c(t)-c^R(t)$ ), and the greater is  $\beta^t (-U_C^R + \pi(t) U_Y^R)$ , by the convexity of the utility function. Thus, when the passion constraint is binding, the stronger is passion (the greater  $S(t)$ ), the greater the shadow value of the constraint,  $\underline{\lambda}(t)$ .

If the passion constraint does not bind in period  $t$  but binds in period  $t+1$ , the consumer will cut back on consumption of  $c$  in period  $t$  in order to loosen the anticipated constraint in period  $t+1$ . Again, the greater the power of passion in period  $t+1$ , the greater the shadow value of the constraint,  $\underline{\lambda}(t+1)$ , and the greater the incentive to cut back on consumption today to rein in passion next period.

The first order condition for the choice of  $B(t)$  is

$$(11) \quad \beta^t U_y^R(t) - \underline{\lambda}(t) c_{c^P} c_B^P(t) = \rho^t \lambda_w .$$

Consumers whose passion is relatively weak, and who thus are never constrained from seeking reason's optimal bundle, solve the standard intertemporal consumption problem, since  $\underline{\lambda}(t)=0$ . If the passion constraint is binding, reason has incentive to decrease the budget allocated to that period. The stronger passion in period  $t$  (the larger  $S(t)$ ), the greater is  $\underline{\lambda}(t)$ , and the smaller the optimal budget for period  $t$ . Consequently, the consumer will want to allocate a smaller budget  $B(t)$  to those periods in which passion is strongest. This is not to say that an addicted consumer will be able to achieve this budget allocation - if passion has greater control over the **budget** in periods when it is strong, reason may not be able to allocate the budget optimally, or may be able to do so only at some cost. It does, however, provide a rationale for restrictions on access to wealth for addicted, bingeing persons. In cases of severe addiction, friends and family sometimes act as agents for reason, when possible attempting to restrict the addicted person's access to his or her own wealth.

Equation 11 provides a rationale for budget-shrinking behavior, through the allocation of wealth to period  $t$  consumption. To the extent that consumers have control over the effective price of the addictive good  $\pi(t)$ , equation 12 addresses the desirability of affecting the budget set through relative prices. A consumer may take actions to either increase or decrease the price of the addictive good. The effective price of a good may be increased by the purchases of smaller packages, by cultivating a circle of friends (an AA group) who will impose non-monetary costs on consumption of the addictive goods, or by otherwise rearranging shopping, commuting, and travel habits to avoid opportunities to purchase the good (avoiding "occasions of sin"). The effective price of a good may be

decreased in certain periods by incurring fixed costs in earlier periods (e.g., prepaid memberships in health clubs) which lower the marginal cost of a good.<sup>20</sup>

Actions taken to affect a certain period's price do not receive much attention in the literature; an increase in price will never make a fully competent consumer better off, and a competent consumer has no reason to prepay, unless by prepaying she incurs a lower discounted price. By contrast, a consumer who is not in full control of consumption in period  $t$  may have an incentive to take actions which affect the price in that period. Equation 12 shows the first order condition for the price of the addictive good,  $\pi(t)$ :

$$(12) \quad -\beta^t c(t) U_y^R - \underline{\lambda}(t) \underline{c}_{c^P} c_\pi^P = 0.$$

As the first term in equation 12 makes clear, a consumer who is not constrained by passion has no incentive to increase the price of  $c$ ; such an increase unambiguously lowers the consumer's welfare. If reason cannot consume its optimal bundle because the passion constraint is binding, the second term is positive ( $c_\pi^P$  is negative), and reason may desire a higher price in period  $t$ .

An example of a utility-increasing price increase is shown in figure 3. For simplicity, assume that  $\underline{c}^P = c^P = \bar{c}$ ; passion is so strong relative to reason that it gets its preferred bundle  $P$ . Because reason is not at its preferred bundle, an increase in the price of  $c$  will induce passion to choose a new point  $P'$ , moving reason to a higher indifference curve.

Equation 12 is not a full analysis of the desirability of changes in  $\pi(t)$  - it shows only that a change in a single period's price itself may be beneficial. A full account of the incentives to change the effective price of a good must take into account the costs of such

a change. Of course a higher price may only be achieved at some cost (the addict may prefer his old addicted friends to his new sober ones, or steps taken to avoid a particular consumption opportunity may entail effort). Such costs can be incorporated into the model without changing its basic thrust : a consumer under the influence of passion may have an incentive to increase the effective price of the addictive good.

### 5.3 First-Order Conditions when $c^P < c^R$

When reason desires more  $c$  than passion ( $c^P(t) \leq c^R(t), \forall t$ ), only the upper boundary of the passion constraint  $\bar{c}(t)$  is relevant. The first order conditions corresponding to equations 10,11, and 12, become

$$(13) \quad c(t): \quad \beta^t (U_C^R - \pi(t) U_Y^R) + \bar{\lambda}(t) - \bar{\lambda}(t+1) (\bar{c}_{c^P} \bar{c}_S^P + \bar{c}_S) = 0$$

$$(14) \quad B(t): \quad \beta^t U_Y^R(t) - \bar{\lambda}(t) \bar{c}_{c^P} c_B^P(t) = \rho^t \lambda_w$$

$$(15) \quad \pi(t): \quad -\beta^t c(t) U_Y^R - \bar{\lambda}(t) \bar{c}_{c^P} c_\pi^P = 0.$$

The analysis of these three conditions is parallel to the analysis of equations 10-12. If the consumer is constrained in neither period  $t$  nor  $t+1$ , he will choose  $c=c^R$ . If the passion constraint binds in period  $t$  but not  $t+1$ ,  $\bar{\lambda}(t)$  equals  $\beta^t (U_C^R - \pi(t) U_Y^R)$ , the marginal value of a relaxation of the constraint. The anticipation of a binding passion constraint in period  $t+1$  ( $\bar{\lambda}(t)=0$  but  $\bar{\lambda}(t+1)>0$ ) may lead to an increase or decrease in consumption of the addictive good in period  $t$ . This ambiguous result is due to the way in which  $c(t)$  affects the passion constraint, detailed in equation 7. An increase in  $c(t)$  will lead to a relaxation of the upper boundary of the passion constraint in  $t+1$  by increasing passions desired consumption ( $\bar{c}_{c^P} c_S^P > 0$ ), but it will lead to a tightening of the upper

boundary constraint by increasing passion's power in the internal struggle ( $\bar{c}_s < 0$ ).

Although one might imagine that the total effect on the upper boundary would be positive, the model itself does not impose that restriction.

Equations 14 and 15 make the respective points that reason will prefer to allocate a larger budget to those periods when the passion constraint is binding, and will attempt to lower the effective price of the positively addictive good in those same periods. As was shown in the last section (where  $c^P > c^R$ ), such an allocation of the intertemporal budget and changes in prices are desirable, but are not necessarily achievable in the face of resistance from a person's passions.

## 6 Extensions and Conclusions

This paper draws from the internal conflict literature to the rational addiction model. Passion models of rational addiction differ from conventional models in their treatment of the costs of consumption of addictive goods. In conventional models, current consumption of an addictive goods lowers future utility. It also increases the marginal utility of the good in future periods, but the increased desirability is not a cost in the conventional model. In contrast, in the passion model the cost of current consumption is an undesirable increase in future consumption, as passion become inflamed by indulgence.

The incorporation of the passion-reason distinction into rational addiction models improves them in two ways. First, passion models enable the economist to explain behaviors taken by consumers to limit their options (budget-shrinking behavior). Second, because they break the connection between observed behavior and preference, passion

models avoid the normative implication that addicts are necessarily made worse off by restrictions on their consumption. Thus, passion-reason models provide a normative rationale for common policies which seek to curb access to certain classes of goods.

Passion models can be extended, in much the same way that the basic rational addiction models are extended, to accommodate cyclical consumption and uncertainty. By adding another consumption stock, Dockner and Feichtinger (1993) explains binge cycles in consumption. Orphanides and Zervos (1995) incorporates uncertainty about the individual component of a person's addictive nature, and thus explains how a person might become addicted against his will (*ex post*). Both of these extensions can easily be incorporated into the rational addiction framework.

Passion models modify conventional revealed preference analysis by breaking the simple link between choice and consumer preference. Because consumers in passion models are rational but not necessarily competent, their observed consumption bundles are not always preferred to other bundles in the budget set. Welfare analysis in the presence of goods which are identifiable as passion goods - goods which consumers take (sometimes halfhearted) pains to avoid, and goods which are the subject of consumption-control measures (diets, drug treatment centers) - is clearly complicated by the limited competence of the consumer.

The passion model of addiction raises important issues in public policy towards the marketing and sales of addictive goods. In the passion model, a person fighting an addiction sometimes will attempt to raise the effective price of the addictive good, through actions which limit access to it. For example, a commuter may change his route to avoid liquor stores or strip joints. In light of consumer efforts to limit their own access

to certain goods, the efforts of retailers to locate stores for easy access to consumers may sometimes be undesirable.<sup>21</sup> Restrictions on the location of liquor stores and X-rated theaters can be justified on the grounds that many consumers want access to these goods to be more difficult. Similarly, if advertising strengthens passion in its struggle with reason, there may be situations in which restrictions on advertising are justifiable (see George, 1993, for a similar insight).

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Figure 1

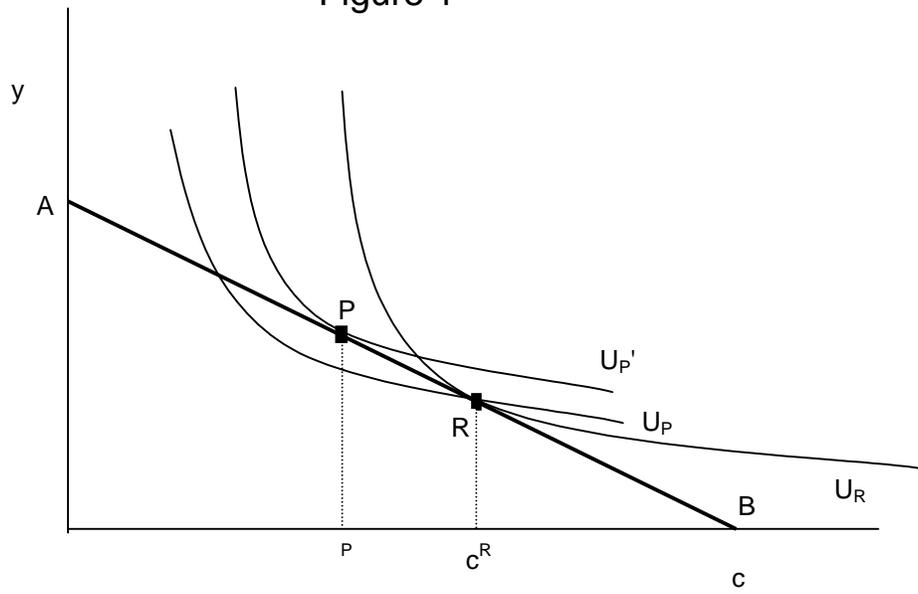


Figure 2

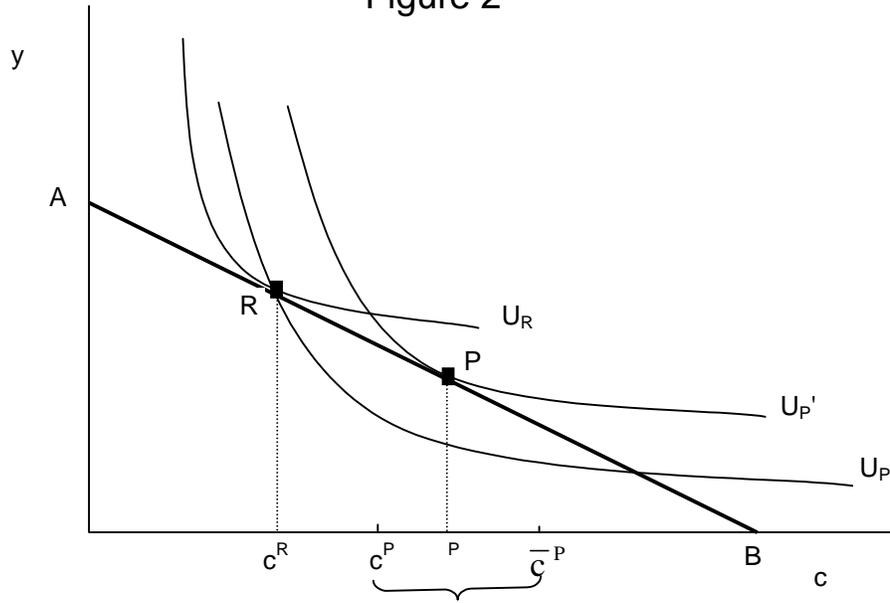
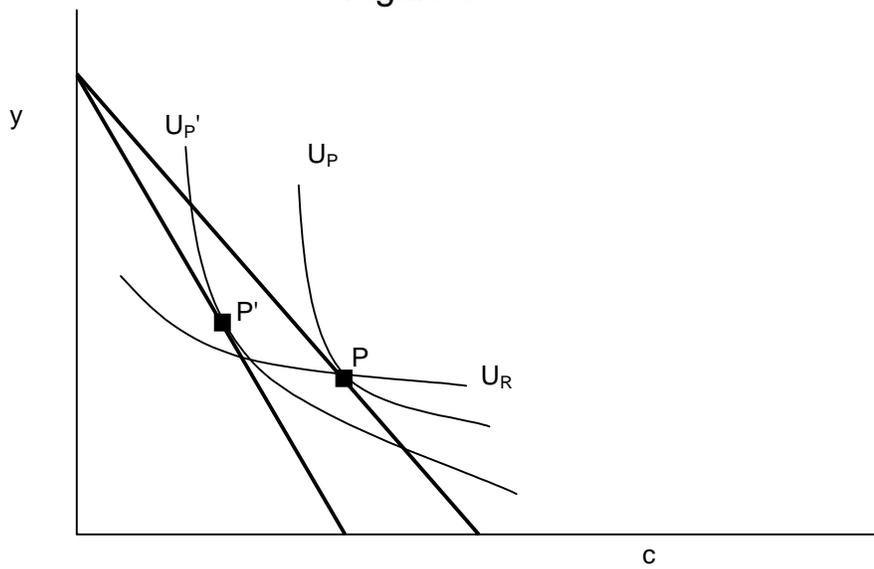


Figure 3



## Endnotes

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<sup>1</sup> For types of regret other than those noted here (such as regret that goods are scarce, and regret that one must choose), see George (1993).

<sup>2</sup> Elster (1985) notes that this is an instance where interpersonal cooperation can be used to solve intra-personal conflicts.

<sup>3</sup> This quote shows the tenuousness of the distinction between positive and normative statements in economics. The normative statement (that addicts are always worse off when their consumption of the addictive good is thwarted) depends crucially on a positive statement about the addict's welfare (the addict always prefers the bundle he consumes to all other affordable bundles).

<sup>4</sup> The economist might justify a cigarette tax on the grounds that cigarettes have negative externalities, but this does not directly address the widespread conviction (often shared by the addicted person) that a decline in consumption may make the addicted person better off, and that (with regards to certain other goods), most people are better off consuming less than they do. In other words, some restriction on consumption may be Pareto improving, even in the absence of compensation. Those whose consumption of passion goods is decreased by policy actions may be better off, if the decrease enables them to rein in their passions.

<sup>5</sup> It should be noted that Akerlof and Dickens (1982) justify Pareto-improving **external** constraints on behavior in the presence of cognitive dissonance. Cognitive dissonance does not, however, explain why an individual would take steps to constrain his **own** behavior.

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<sup>6</sup> It should be noted here that Aristotle does not equate what a person thinks is good and an absolute notion of good. He admits that people might pursue illusory goods. See Aristotle (1980: 1.4).

<sup>7</sup> In Aristotle's description of the continent person, the exercise of prudence is not independent of the passions. It is possible that a lack of certain virtues (courage, temperance) can cloud prudential judgment (Aristotle, 1980: 7.10). The account of the struggle between reason and passion given in this paper does not take the effect of the passions on the ability to reason into account explicitly.

<sup>8</sup> Economic theory often suggests that passion has the upper hand. The absence of satiation implicit in the assumption of monotonic preferences is a contradiction of Aristotle's "golden mean;" Aristotle would call anyone whose preferences satisfied this axiom seriously incontinent, even brutish.

<sup>9</sup> Note that reason's (or passion's) utility could easily incorporate an effect of past consumption on the level of utility. Such an effect would create an intertemporal complementarity in consumption of the addictive good. The analysis of the effect of such an effect on consumption is straightforward, and would not significantly affect any of the results derived here.

<sup>10</sup> See footnote 9.

<sup>11</sup> If reason takes into account the effect of  $c$  on utility in future periods it may want to consume at some point other than  $R$ . The next section addresses dynamic considerations.

<sup>12</sup> As noted above, it is not necessary that reason's preferences be unaffected by  $S(t)$ , only that  $S(t)$  affect reason differently than it affects passion.

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<sup>13</sup> In Becker and Murphy (1988), a negatively (positively) addictive good is defined as one whose past consumption affects the **level** of utility negatively (positively). The model here assumes away addiction as Becker and Murphy defined it ( $U_S^R = 0$ ), but it could easily incorporate either positive or negative addiction. Either figure 1 or 2 might describe the internal conflict over consumption both when  $U_S^R < 0$  (negative addiction) or  $U_S^R > 0$  (positive addiction).

<sup>14</sup> Psychic cost in this model would be immune from the criticism of psychic cost in Elster (1998). The psychic cost criticized by Elster is the cost imposed by reason on passion (guilt) in order to restrain passion's excesses. In this model, the psychic cost is a result of passion's resistance to reason, and prevents reason from achieving its preferred bundle. Thus, while the person who experiences the psychic cost of Elster would never take a pill to erase the psychic cost, the person in the passion model would.

<sup>15</sup> The second approach is a special case of the first, with zero psychic costs of deviating from passion's preferred bundle up to a certain point, and infinite costs thereafter.

<sup>16</sup> Schelling (1984) suggests that passion can deceive reason, and pursue strategies aimed at increasing its power or affecting reason's control over budget and prices.

<sup>17</sup> This model does not fall into the class of multiple utility models of Etzioni (1988) : the two preferences that appear in multiple-utility models belong to the same "self." When a person acts deontologically, he does not really act against his own interests, even if he excludes from consideration goods which could conceivably be desired by his more standard preferences. In the model presented here, the multiple utilities are of the same nature, and they conflict with each other.

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<sup>18</sup> George (1998) uses the designations "temperate, incontinent, self-indulgent," corresponding to my use of the designations "virtuous, incontinent, brutish," to indicate a similar set of circumstances to figure 2. The main difference is that George posits a certain equality between the self-indulgent (brutish) case and the temperate (virtuous) case, and is unable to claim that the self-indulgent person would be better off temperate.

<sup>19</sup> Alternatively, one might specify a continuous time optimal control problem with a constraint on the control variable  $c$ . While the necessary conditions of such a problem are informative, the problem is intractable; since dynamic budget allocation plays an important role, differential equations for the stock of assets, consumption capital, and the shadow value of consumption capital play a prominent role. The optimal control specification of the problem is available from the author upon request.

<sup>20</sup> Prepaying may have commitment effects beyond its effect on marginal cost (Hoch and Loewenstein, 1991).

<sup>21</sup> Of course, the market may to some extent recognize this desire for limited access, via no-candy grocery store checkout lines, for example.