Time Inconsistency, the Economics of Self-Control, and Religious Faith

by

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Abstract

For I know that nothing good dwells in me – my unspiritual self, I mean – for though the will to do good is there, the ability to affect it is not. The good which I want to do, I fail to do; but what I do is the wrong which is against my will; and if what I do is against my will, clearly it is no longer I who am the agent, but sin that has its dwelling in me.
(Romans 7:18-20, Rev. Eng. Bible)

Economists use the term "time inconsistency" to refer to a situation in which a plan for some periods $t+n$ and beyond that is preferred when made at some earlier time t (and is in some sense globally optimal) is not preferred when time $t+n$ arrives. With respect to an individual agent, "solutions" to the time inconsistency problem involve "self-control" issues – ways in which the agent can bind him/herself to adhere to the globally optimal plan.

This paper provides a simple overview of the time inconsistency problem and the related issue of self-control. I provide a discussion of some self-control strategies identified in the psychology literature and argue that the Christian understanding of human nature may be able to provide useful insights to economists working in this area. Specifically, I propose that the Christian idea of remembrance may be useful in this regard, though whether this idea may be used in a tractable way remains an open question.

Finally, I argue that some aspects of the conventional approach to teaching principles of microeconomics may be ill-serving students by making it more difficult for them to deal with self-control problems.

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1.   Introduction

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This paper provides a simple overview of the time inconsistency problem and the related issue of self-control. I provide a discussion of some self-control strategies identified in the psychology literature and argue that the Christian understanding of human nature may be able to provide useful insights to economists working in this area. Specifically, I propose that the Christian idea of remembrance may be useful in this regard, though whether this idea may be used in a tractable way remains an open question.

The paper proceeds as follows. Section 2 provides an overview of the basic model of intertemporal choice used by economists. Section 3 solves a very simple intertemporal choice model to illustrate the time inconsistency problem. Section 4 reviews the recent time inconsistency literature, while Section 5 considers strategies for self-control identified (primarily) by laboratory experiments reported in the psychology literature. The relation of religious faith to these issues is discussed in Sections 6 and 7, while Section 8 concludes the paper by questioning some time-honored concepts emphasized by microeconomics teachers.

2.   The Discounted Utility Model

Many interesting issues in economics – macroeconomics in particular – involve decision-makers considering trade-offs over time. A consumer increasing savings today incurs the cost of lower current consumption in exchange for the benefit of increased consumption capability in the future. Firms contemplating investment choices compare current costs to expected future cash flows. When members of Congress debate patent policy, they consider the benefits of competitive markets for existing products (an implication of weak patent protection) against the prospect of future innovation (a product of strong patent protection).

The standard framework used by neoclassical economists in their analysis of intertemporal choice is the discounted utility (DU) model, which was first proposed by Samuelson (1937). Consider a consumer formulating a plan for consumption spending between the present (date 0) and some future date T. Let c_t denote consumption in period t, for t = 0, 1, ..., T. Then the consumer in the DU model solves the following optimization problem (subject to relevant constraints):

(1)
$$\underset{\{c_0, c_1, ..., c_T\}}{Max} \quad U = \sum_{t=0}^{T} \rho_t \cdot u(c_t),$$

where $u(\cdot)$ is the (time invariant) instantaneous utility function in all periods and ρ_t is the period t "discount factor." The standard DU model incorporates the assumption of *exponential discounting* as follows:

(2)
$$\rho_t = \left(\frac{1}{1+\delta} \right)^t,$$

where $\delta > 0$ is the "rate of time preference." Note that equation (2) implies $\rho_0 = 1$. A larger value of δ means a lower value of ρ_t for any given t, which means the consumer is more impatient – i.e., has a stronger preference for present consumption vis-à-vis future consumption. In this case, one can also write $\rho_t = \lambda^t$, where $\lambda = \dfrac{1}{1+\delta}$. Thus with exponential discounting we have the following discount factors: $\rho_0 = 1$, $\rho_1 = \lambda$, $\rho_2 = \lambda^2$, $\rho_3 = \lambda^3$, . . ., and $\rho_T = \lambda^T$.

Exponential discounting implies that $\dfrac{\rho_i}{\rho_j}$ depends only on the value of i-j. For example, $\dfrac{\rho_i}{\rho_{i+1}} = \lambda$ for all i. That is, the relative desirability of utility at different points in time is independent of the proximity of the time periods to the present. For example, the value of utility in period 9 relative to utility in period 10 is no different from the value of utility in period 0 relative to utility in period 1: $\dfrac{\rho_0}{\rho_1} = \dfrac{\rho_9}{\rho_{10}}$.

An important alternative to exponential discounting is hyperbolic discounting. In this case, the discount factors are given by:

$$(3) \qquad \rho_t = \frac{1}{(1+\alpha \cdot t)^{\gamma/\alpha}}$$

With hyperbolic discounting, discount factors fall more rapidly than exponential discounting for t close to zero and less rapidly as t gets large. That is, $\dfrac{\rho_0}{\rho_1} > \dfrac{\rho_9}{\rho_{10}}$, so people are more inclined to prefer the smaller/sooner reward to the larger/later reward the

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closer to the present the two rewards are offered. A more analytically tractable formulation with this same basic property is quasi-hyperbolic discounting, in which case the set of discount factors $\{ \rho_1, \rho_2, \ldots, \rho_T \}$ is given by $\{ 1, \beta\delta, \beta\delta^2, \ldots, \beta\delta^T \}$, with $\beta <$ 1. In this case, $\dfrac{\rho_0}{\rho_1} = \dfrac{1}{\beta\delta}$, while $\dfrac{\rho_j}{\rho_{j+1}} = \dfrac{1}{\delta}$ for all $j > 0$.

Strotz (1955-1956) raises the interesting question of whether consumption plans are consistent over time. Let $c_t^*(j)$ denote the optimal level of period t consumption determined from a plan formulated in period j. Thus in period $j = 0$, the optimal plan is $\{ c_0^*(0), c_1^*(0), c_2^*(0), \ldots c_T^*(0) \}$, while the plan formulated in period $j = 2$ yields $\{ c_2^*(2), c_3^*(2), c_4^*(2), \ldots c_T^*(2) \}$. Strotz raised the interesting question of whether $c_t^*(j)$ for a given t is the same for all j. For example, is the optimal level of period 2 consumption in the plan formulated in period 2, $c_2^*(2)$, equal to the optimal level of period 2 consumption foreseen at period 0, $c_2^*(0)$? If the answer to Strotz's question is "yes", the period 0 plan is said to be "time consistent". If not, it is "time inconsistent."

Strotz demonstrates that optimal plans in the DU model are time consistent only with exponential discounting – that is, if and only if $\rho_t = \lambda^t$ for all t. Any other pattern of discount factors implies time inconsistency. I will now proceed to illustrate this result in a simple model.

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3.   Time Inconsistency: A Simple Example[1]

Suppose in period *0* a consumer has a certain level of wealth, W_0, to allocate to consumption over three periods *(0, 1, and 2)*. One might think of W_0 as including the present value of current and future income along with other wealth holdings. For simplicity, assume a zero rate of interest and logarithmic instantaneous utility. Thus the consumer's problem in period *0* is given by:

(4)
$$\max_{\{c_0,c_1,c_2\}} U = ln(c_0) + \rho_1 \cdot ln(c_1) + \rho_2 \cdot ln(c_2),$$

$$\text{s.t. } c_0 + c_1 + c_2 = W_0$$

In period *0*, the solution to the above problem is denoted $\{c_0^*(0), c_1^*(0), c_2^*(0)\}$. In period *0* actual consumption will be $c_0^*(0)$, so the consumer enters period *1* with total wealth of $W_1 = W_0 - c_0^*(0)$. In period *1* the consumer again formulates a consumption plan by solving

(5)
$$\max_{\{c_1,c_2\}} U = ln(c_1) + \rho_1 \cdot ln(c_2)$$

$$\text{s.t. } c_1 + c_2 = W_1$$

The solution to this problem is denoted $\{c_1^*(1), c_2^*(1)\}$. Table 1 shows the optimal levels of consumption in each period according to the period *0* plan and the period *1* plan.

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[1] The model in this section is a slight generalization of the simple example presented by Hall (1998).

Table 1
Optimal Consumption Plans in 3-period log-utility model
Plans beginning at t=0 and t=1

	Plan formed at time $t = 0$	Plan formed at time $t = 1$
c_0	$c_0^*(0) = \dfrac{1}{1 + \rho_1 + \rho_2} \cdot W$	--
c_1	$c_1^*(0) = \dfrac{\rho_1}{\rho_1 + \rho_2} \cdot \left[W - c_0^*(0) \right]$	$c_1^*(1) = \dfrac{1}{1 + \rho_1} \cdot \left[W - c_0^*(0) \right]$
c_2	$c_2^*(0) = \dfrac{\rho_2}{\rho_1 + \rho_2} \cdot \left[W - c_0^*(0) \right]$	$c_2^*(1) = \dfrac{\rho_1}{1 + \rho_1} \cdot \left[W - c_0^*(0) \right]$

In both plans, $c_1 + c_2 = W_1 = W_0 - c_0^*(0)$. We see in the table that $c_1^*(0) = c_1^*(1)$ if and only if [2]

$$ (6) \qquad \frac{\rho_1}{\rho_1 + \rho_2} \cdot W_1 \;\; = \;\; \frac{1}{1 + \rho_1} \cdot W_1 \; . $$

Condition (5) holds if and only if $\rho_2 = \rho_1^2$, which is the case of exponential discounting. If $\rho_2 \neq \rho_1^2$, then $c_1^*(0) \neq c_1^*(1)$ and the plans are time inconsistent.

At first glance one might think that this "time inconsistency problem" is really no problem at all for economists. In the above example, for instance, there would appear to be a clear prediction that observed consumption will be $\{c_0^*(0), c_1^*(1), c_2^*(1)\}$. That is, the consumer will follow the $t=0$ plan in $t=0$ and the $t=1$ plan in $t=1$ and $t=2$. [At $t=2$ there is no need to recompute the plan because the budget constraint dictates that the only option is to consume remaining wealth, $c_2 = W_0 - c_0 - c_1$.] This conclusion, however, assumes that the person in period 0 does nothing at all in period 0 to constrain her behavior in period 1. If she is able to do so, however, she may choose to pre-commit to the period 0 plan and thereby be somehow "locked in" to $\{c_0^*(0), c_1^*(0), c_2^*(0)\}$. Thus whether the model predicts observed period 1 consumption of $c_1^*(1)$ or $c_1^*(0)$ depends on the ability of the individual in period 0 to place effective constraints on her future choices. In fact, period 1 consumption may turn out to be equal to ___**neither**___ $c_1^*(1)$ or $c_1^*(0)$ if the pre-commitment technology in period 0 is effective but imperfect. The simple DU model no longer has unambiguous observable implications. In recent years a

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[2] If $c_1^*(0) = c_1^*(1)$, the budget constraint implies that $c_2^*(0) = c_2^*(1)$. Any plan that is consistent for period 1 will necessarily also be consistent for period 2.

number of economists have explored in detail the ability of agents to pre-commit to future actions, and I will henceforth refer to those kinds of contributions as the "self-control literature." I now proceed to a selective discussion of a few important contributions to this literature.

4.   The Recent Time Inconsistency Literature

The important contribution by Strotz (1955-56) did not have a strong immediate impact on the economics literature. The notion of time inconsistency began to receive much more attention with the publication of a paper by Kydland and Prescott (1977), who examined time inconsistency issues in economic policymaking. In their model, time inconsistency occurs in games in which one player is the policymaker and the other is a group of agents affected by policy. The policymaker forms an optimal plan at time *0* that may not be optimal in some future date. For example, a central bank may announce a low-inflation policy only to find later that, if agents have made decisions (involving wages, perhaps, or interest rates on loans to the Treasury) based on expectations of low inflation, the subsequent benefits to the central bank of surprise inflation exceed the costs. The game between the policymaker and the private agents is essentially a Prisoner's Dilemma, and the equilibrium of the game is suboptimal relative to the outcome that can be obtained if the policymaker can pre-commit its future actions. Kydland and Prescott viewed this as an alternative rationale for rules constraining the behavior of policymakers.

The Kydland and Prescott paper spawned a large literature on policy games, and the original focus of Strotz on an individual decision-maker was largely ignored until the

1990s. In the last 10-15 years, economists have returned to the self-control issues addressed by Strotz. The focus of this more recent literature is on issues such as the empirical relevance of exponential discounting and the ability of agents to constrain their own future actions. A very useful survey of this literature is provided by Tirole (2002) in his 2001 Presidential Address to the European Economic Association. Perhaps the most important feature of this literature is a consistent attempt to incorporate relevant insights from the field of psychology. Psychologists, unsurprisingly, have been interested in self-control issues for quite some time, and Rachlin (2000) provides a remarkably interesting and helpful overview of this literature..

There is a large body of experimental evidence on intertemporal choice behavior of humans and animals (rats and pigeons, mainly). One consistent finding in this literature is that discount factors do not decay over time in ways fully consistent with exponential discounting. (Rachlin, 2000, p. 43). Specifically, observed discount factors are in fact consistent with hyperbolic discounting, which means that as j increases from $j = 0$ in equation (1) ρ_j falls *more* rapidly than exponential discounting for low values of j (in particular, as j goes from *0* to *1*) and *less* rapidly than exponential discounting for higher values of j.

Psychologists and economists view this evidence as consistent with the everyday impression that people have self-control problems. A proposed course of action today that seemed like it would be optimal when planning yesterday often no longer seems optimal today. My optimal consumption plan might involve eating pizza for lunch today and salad every day in the future, but when tomorrow comes the salad is sometimes no longer the optimal choice. More generally, unhealthy eating involves a "smaller/sooner"

reward (great taste today), while healthy eating generates a larger/later reward (better health and longer life).

Suppose the consumer must choose between a smaller/sooner alterative (SS) that may be consumed at date *n* and a larger/later alternative (LL) that may be consumed at date *n+1*. Exponential discounting implies that the consumer's preference between SS and LL is independent of *n*. For example, consider the following two scenarios:

> *Scenario A: SS = one apple in period 0*
>
> *LL = two apples in period 1*

> *Scenario B: SS = one apple in period 9*
>
> *LL = two apples in period 10*

n=0 in scenario A, while in *n=9* in scenario B. Exponential discounting implies that if the consumer prefers LL in scenario B, she will also prefer LL in scenario A. Rachlin (2000) notes, however, that a large body of evidence indicates this consistency does not hold. Instead, people (as well as rats and pigeons) are more likely to prefer SS to LL the closer the proximity of the choice to the present.

Because an individual at time *n* knows that she may not make the "right" choice when period *n+k* rolls around, she may look for ways to control her subsequent behavior in period *n+k*. Economists view this as the prototypical self-control problem. The following section overviews some strategies of self-control identified in the literature.

5.   Strategies of Self-Control

Individuals attempt to control future choices in a number of ways. One obvious way involves making commitments today so as to penalize short-sighted choices in the future. One can check into a "fat farm" to make it more costly to obtain unhealthy food, for example, or one may sell one's television to avoid its pernicious influence..

It is true that in modern society one cannot voluntarily give up one's rights as a free individual, so it is very difficult to arrange an unbreakable commitment. One can always leave the fat farm or buy another television. Even so, to the extent that the commitments associate a cost with making the undesirable future choice, they improve the chances that behavior will be time consistent.

Individuals in the real world do make use of opportunities to pre-commit. Perhaps the most widely used of these opportunities are 401-K retirement accounts. Withdrawals from these accounts before retirement involve significant costs, so placing funds in them is a form of pre-commitment against excessive spending prior to retirement. Laibson, Repetto, and Tobacman (1998) develop a simulation model of the savings behavior of consumers with time inconsistent preferences and show that, under certain circumstances, the availability of pre-commitment mechanisms such as 401-K retirement plans can result in significantly higher levels of aggregate saving.

Apart from explicit strategies such as fat farms, there are a number of other more subtle strategies people use in attempts at self-control. I will now review very briefly a few of these strategies that seem (to me) to be relevant for the intersection of religious faith and economic analysis.

Rachlin (2000) documents extensively that effective solutions to self-control problems often involve a focus by the individual on *patterns* of behavior (habits) rather than specific acts. Hoch and Loewenstein (1991) provide an example of this strategy, which they call "bundling":

> [r]ather than myopically view the eating of an ice cream cone as an isolated act, a dieter may attempt to reframe it as the first in an endless stream of self-control violations. By bundling eating of the current cone with eating of future cones, the consumer may view the extra cost of the cone not as 250 calories, but as an extra 250 calories a day for the foreseeable future, with obesity as the inevitable outcome. (pp. 502-03)[3]

Successful self-control strategies seem to involve an individual keeping her- or himself focused on desirable patterns. One effective way of doing so in many contexts is for the individual simply to *monitor* his or her behavior. People who monitor closely their spending tend to save more and spend less. Smokers – even those with no professed desire to quit – smoke less when they keep track carefully of how many cigarettes they smoke. "Counting calories" is a time-honored approach to weight control. When confronted with an impulse to deviate from some plan that is optimal in the long-run, the individual is more likely to be aware of the long-run consequences of impatience if he or she sees the choice as breaking a desirable habit.

Rachlin (2000, pp. 125-7) also describes a related but more subtle self-control strategy that has been proven successful in experimental studies. He calls this strategy "reduction of variability." The idea is that the individual makes a choice with the internal commitment to abide by the choice consistently for a period of time. A smoker can choose to smoke any number of cigarettes per day, for example, but he or she must

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[3] Hoch and Loewenstein note that advertisers therefore try to "unbundle" costs with tactics such as "only pennies a day."

smoke exactly the same number each day for a week. Experimental evidence shows that with this commitment, the smoker (even with no professed desire to quite) will smoke less. Rachlin notes that, with this approach, "[t]he pleasures of consumption are no longer restricted to the moment; they are extended in time and therefore more easily compared with future disadvantages." (p. 127)

Tice and Ciarocco (1998) find that "exerting self-control in one area (by inhibiting the response to engage in impulsive behavior) can undermine efforts at a subsequent self-control task even in an unrelated area." (p. 228). That is, self-control operates like an internal resource that becomes depleted with use. Moreover, Muraven, Baumeister, and Tice (1999) find that the capacity for self-control can improve with regular exercise. Thus self-control capacity is rather like muscle strength – it depletes with use (irrespective of the specific nature of the use), recovers with non-use, and improves with exercise.

This is only a very small sample of the enormous literature on self-control. It does provide a sense of some of the remarkably robust characterizations of human behavior identified in the model. The integration of these psychological insights into economic models has become a "hot" topic in economic research in recent years. Evidence of the importance of this line of research is the fact that two scholars doing major research in the area have recently received the most prestigious recognitions offered by the profession: Daniel Kahneman won the 2002 Nobel Prize in Economic Science, while Matthew Rabin won the 2001 John Bates Clark Medal.

6.   Self-Control and Religious Faith

Self-control researchers acknowledge the usefulness of religion in the establishment and maintenance of self-control. Rachlin (2000, p. 13) notes:

> The great advantage of the religious point of view is that it offers a way to achieve self-control. Buddhism, for instance, suggests certain mental and physical exercises; Judaism and Christianity suggest study of sacred texts. All suggest prayer. The end result of self-control from the religious point of view is a body under the control of the best part of the soul. What that is exactly, and how it may be achieved, depends on the religion. While the particular advice that religions prescribe may not be accepted by every person in every modern culture, religions at least offer practical access to self-control. Oddly enough, modern cognitive and physiological psychology, with all its scientific regalia, scarcely attempts to find practical methods of self-control.

When considering the relationship between religious faith and the economics of self-control, two perspectives are possible.

The first perspective asks how economic analysis can be used to understand religious behavior. This is the "economics of religion" approach surveyed by Iannaccone (1998).   From this viewpoint one might consider different religions as (among other things) different self-control technologies. One might then expect individuals to sort into different religion groups according to how well the groups meet their self-control needs. One might also use the presence or absence of religiosity as an indicator of the extent of self-control. Barro (1999, p. 1137) makes the following comments on religion in his model of economic growth with hyperbolic discounting:

> Commitment can also be provided by personal discipline and self-control. The extent of this discipline may differ for cultural reasons across societies, but such differences are hard to quantify. Religious principles are dedicated, in part, toward curbing lavish expenditures and excessive debt. Thus, one potentially observable influence on commitment is

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religiosity, measured by church attendance or outlays on organized religion. Differences in affiliations also matter because attitudes toward material pleasures differ across religions.

The second perspective on the relationship between religious faith and the economics of self-control is to ask whether religion in general (and Christianity in particular) has insights about behavior that might be usefully incorporated into economic models of self-control. In contrast to the first perspective, which is generally straightforward and which has gained widespread acceptance in the mainstream economics literature, the second perspective is unknown territory.

If religion is ever going to make a useful contribution to economic methodology, this would certainly seem to be a likely place. Self-control might, after all, be reasonably viewed as the ability to resist temptation – something about which religion surely has as much or more to say than anything else economists study.[4] In the following section I propose one possible Christian perspective on the self-control strategies discussed above and describe the possible features of an economic model incorporating this perspective.

7.   One Possible Christian Perspective

In his letter to the Galatians, the Apostle Paul notes:

> But the fruit of the Spirit is love, joy, peace, patience, kindness, goodness, faithfulness, gentleness, self-control; against such there is no law. And those who belong to Christ Jesus have crucified the flesh with its passions and desires. [Gal 5:22-24, RSV]

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[4] For example, the title of a recent paper published in *Econometrica* by Gul and Pesendorfer (2001) is "Temptation and Self-Control."

Thus Scripture plainly states that self-control (*enkrateia*) is a fruit of the Spirit. I propose that the idea of *awareness* may be a useful way to think about the self-control benefits of religion. By "awareness" I mean the subset of an individual's knowledge that is within his consciousness when he makes a decision. Assume the following:

(i)   If an individual is "aware" of her long-term priorities, goals, and commitments at the exact instant she faces a decision, she will exercise self-control and avoid temptation; and

(ii)   Awareness is difficult to maintain – in economics language, it depreciates rapidly.

These two assumptions imply that strategies to preserve awareness will lead to self-control.[5] I believe this is a reasonable way to think about the effectiveness of monitoring and bundling as self-control mechanisms. An important function of religious ritual is to help believers remember what God has done and their commitment to God. At communion, the words of institution quote Christ: "This is my body which is given for you. Do this in remembrance of me." (Luke 22:19). The idea of remembering, or not forgetting, shows up many places in Scripture. Here are two examples:

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[5] These assumptions relate to the debate over akrasia -- a debate which goes back (at least) to Aristotle. Akrasia involves "… free (and therefore uncompelled) intentional actions that are contrary to the agent's consciously held better judgment at the time of action." (Mele, 2002, p. 153). Socrates believed akratic actions were impossible: why would someone who knew an action was not best nevertheless take it? Aristotle, in contrast, argued that akratic actions do occur as the result of the passions. (*Oxford Companion to Philosophy*, 2002) I do not presume to make a contribution to this debate. My purpose instead is to show how a particular Bible-based perspective on self-control might be incorporated into an economic model.

"These things I have spoken to you, while I am still with you. But the Counselor, the Holy Spirit, whom the Father will send in my name, he will teach you all things, and *bring to your remembrance* all that I have said to you. (John 14:25-26)

Only take heed, and keep your soul diligently, *lest you forget* the things which your eyes have seen, and lest they depart from your heart all the days of your life; make them known to your children and your children's children (Deuteronomy 4:9)

A decision-maker generally has a large amount of knowledge, including knowledge of past experiences, commitments, and perspectives. At any given time, however, most of this knowledge is not within her frame of awareness – that is, she is not explicitly conscious of it.

This idea is certainly consistent with many aspects of experience. People tend to lose focus. Political consultants are valuable when they are effective at keeping a candidate "on message." Individuals experiencing tragedy such as the death of a family member or a struggle with illness often find that they have lost sight of what is really important. Bringing those ideas into the forefront of consciousness will change behavior. When I really remember how much I love my wife and son, I take better care of myself by exercising more and making healthier food choices. Christians have several practices to maintain or restore focus. These practices include worship, prayer, fasting, and fellowship with like-minded believers.

How might these ideas be built into an economic model? I see three possibilities. First, one might introduce an "awareness capital" variable (or "self-control capital") variable that depreciates rapidly but can be restored or maintained with the right kinds of choices. This kind of model would be similar in some respects to habit formation models

of "rational addiction" – e.g., Becker and Murphy (1988). One difference would be that the stock of awareness capital would be a determinant of the discount factors in the decision-maker's intertemporal utility maximization problem. While models with variable discount factors have been solved [e.g., Harris and Laibson (2001)], the introduction of endogenous discount factors would probably render any model of this kind intractable.

Another possibility would be to introduce awareness capital into models with incomplete information. Different levels of awareness would imply different information sets upon which the maximization problem could be based. In this case, however, future information sets would have to depend – at least in part – on choices made today. This approach would probably resemble that taken by Mullainathan (2002).

The last possibility would involve abandoning the explicit maximization framework for a reduced-form approach. Suppose the choices of a consumer (or whatever agent in question) at any given time reflect one of two states, "aware" or "unaware." Further suppose that the transition from one state to the other is governed by a Markov switching process, and that the state transition probabilities are governed by variables that determine awareness. The appropriate framework for this kind of approach would likely be very similar to that of Diebold, et. al. (1994).

This discussion illustrates an important point: incorporating Christian insights about human behavior into economic models is likely to be a demanding task. This is not only true for the self-control issues considered here, but for other issues (such is interdependent utilities) as well. Thus the Christian scholarly community will need at least a few economists with top-notch technical skills.

8. Conclusion

This paper has considered the time inconsistency question and related issues of self-control. Religion facilitates self-control and should therefore in principle provide insights that may be of use in the development of economic models of self-control phenomena. If religion is ever going to have anything useful to say to economics (in terms of methodology), surely it can do so when the issue involves resistance to temptation.

I have reviewed the self-control literature and proposed one Christian approach based on the Biblical idea of remembrance. Whatever the appeal of the approach in concept, it will likely be challenging to implement in practice.

I now close with a brief discussion of two important concepts emphasized in introductory microeconomics courses: utility maximization and marginal thinking. The conventional discussion of choice assumes a consumer is choosing over two or more goods – often abstract goods such as x_1 and x_2. Not much thought is given to the nature of x_1 and x_2 (though sometimes "cute" examples are used such as x_1 = pizza and x_2 = ice cream). The self-control literature discussed above implies clearly, however, that defining x_1 and x_2 properly is a key to self-control. In particular, the goods over which the consumer is maximizing should be "bundled" so that a seemingly small indiscretion today can be seen for what it is – an action that could be very costly as the result of breaking a healthy pattern.

Introductory microeconomics students are also told repeatedly to "think at the margin" and that "sunk costs do not affect behavior." Sunk costs might not be so

irrational, however, if they are part of a self-control strategy. My current self may purchase a health club membership as a way of preserving awareness of my health goals in my future selves. A sunk cost may thereby help me maintain a positive pattern of behavior. If we teach our students that the "marginal" cost of a small change in behavior is small when in fact that change in behavior involves the violation of a healthy pattern, we have done them a great disservice.

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