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Time-inconsistent preferences and time-inconsistent policies☆

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ABSTRACT

Social security is commonly viewed as a commitment device for hyperbolic consumers. We argue that such common intuition is not consistent with formal economic theory. In a model where the government can choose either time-consistent or time-inconsistent policies to govern its social security arrangement and credit markets are complete, only a time-inconsistent policy achieves true commitment by hyperbolic consumers. This rules out a traditional social security program as a commitment device.

1. Introduction

Hyperbolic consumers make consumption and saving plans today, but then they abandon those plans tomorrow. A "commitment device" is a program that helps hyperbolic consumers stick to their original plan in order to avoid inadequate saving for retirement. Soon after Laibson (1997) brought hyperbolic discounting into modern macroeconomic analysis, researchers in the field began to conjecture that social security may act as a commitment device to help individuals get closer to their first consumption plan (Akerlof (1998), Diamond and Kőszegi (2003), and many others). Such a conjecture is natural because, intuitively, forced saving would seem to help those who fail to save as much as their initial saving plan.

In this paper we formally study the accuracy of this conjecture in a continuous-time life-cycle model with complete credit markets. We analytically derive a true commitment device for hyperbolic consumers, and we show that despite the intuitive appeal of the common conjecture about social security, a true commitment device looks nothing like a traditional social security program.

In our model the government would have to run a bizarre type of social security arrangement to literally commit hyperbolic consumers to their initial consumption plan. The arrangement itself would need to be time inconsistent. The government would need to say one thing and then do another—they would need to persistently mislead individuals, across the entire life cycle, into believing that future social security transfers are less generous than they truly are. Simply taxing and transferring resources across the life cycle (as in a typical social security arrangement) is not enough, because the government would also need to control beliefs about the value of such transfers to provide a commitment device. As far as we know, this paper is the first to address this fundamental issue.

The intuition for our result is as follows. A hyperbolic consumer wants to deviate from his previous plans and consume more, and the way to combat this tendency is to make him think he is poorer than he truly is. By continuously debiting his *perceived* social security wealth by just the right amount, he will naturally choose a consumption level that is consistent with the original plan.

We are not advocating a time-inconsistent social security policy. Instead, we are simply showing how far the government would have to go in order to provide hyperbolic consumers with a commitment device. And then we are pointing out that such a program looks nothing like a typical social security arrangement. Hence, whatever merits a typical social security system may have, it should not necessarily be viewed as a remedy for time-inconsistent (hyperbolic) preferences.

1.1. Related literature

The gold standard for understanding the role of social security under hyperbolic discounting is Imrohoroğlu et al. (2003). There are two ways to interpret their paper. On the one hand, in their full-blown DSGE model with multiple layers of uncertainty and multiple social insurance programs, the exact welfare effect of

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social security is ambiguous, depending on the parameters of the model and the manner in which social welfare is defined. On the other hand, in the abstract three-period version of their model in Section 3 for which hyperbolic discounting is the only feature, *fully-funded* social security has no effect on life-cycle consumption allocations when credit markets are complete and *unfunded* social security (with a negative net present value) has a negative effect on wealth and hence consumption allocations in each period. In either case (fully funded or unfunded), social security does not affect the distribution of consumption over the life cycle and therefore it cannot act as a commitment device. One needs to add a borrowing constraint to the model in order for social security to function as a commitment device.

The latter interpretation of their paper best complements the findings of our paper. In essence, our paper is the other side of the same coin: they show that a typical social security program does not help hyperbolic consumers stick to their consumption plans, and we show that the theoretically correct commitment device looks nothing like a typical social security program. The key technical difference between their paper and ours is that we expand the policy space to allow for time-inconsistent policies. They focus on typical social security arrangements only. At a minimum, our paper clarifies exactly why typical social security does not help when credit markets are complete.

In another closely related paper, Caliendo (2011) generalizes the results in Section 3 of İmrohoroğlu, İmrohoroğlu, and Joines to continuous time, to any discount function, to a variety of utility functions, and to other tax and transfer schemes beyond social security.[1] Yet, he does not derive the theoretically correct commitment device like we do in this paper.

If we look beyond the special case of hyperbolic discounting and consider self-control problems or irrationality more broadly, then a standard social security program can indeed serve to alter the distribution of consumption over the life cycle. This is true of unfunded and fully-funded social security programs. For instance, if a paternalistic policymaker wants to see consumption allocated over the life cycle according to the standard optimization problem, then social security can improve paternalistic welfare if people live hand-to-mouth (Feldstein, 1985; Docquier, 2002; Hurst and Willen, 2007; Cremer et al., 2008; Cremer and Pestieau, 2011), plan ahead but only for short periods of time (Findley and Caliendo, 2009), impulsively spend from their planned saving as in dual–self models (Findley, 2013), or choose arbitrary rules-of-thumb like saving a fixed fraction of disposable income (Caliendo and Findley, 2013).[2] In fact, for the special case of temptation preferences, social security can improve welfare without even invoking the paternalism assumption. Gul and Pesendorfer (2004) show this result analytically, and Kumru and Thanopoulos (2008) and Bucciol (2011) compute the welfare gains in quantitative versions of the Gul–Pesendorfer model. In sum, while we show it is tough to rationalize social security by narrowly appealing to hyperbolic discounting, a broader literature does indeed identify alternative behavioral justifications for social security.

Finally, a last strand of the social security literature merits consideration. A series of papers calculate the welfare gains from social security when rational (time-consistent) consumers suspect that the government will ultimately provide a safety net for the elderly who fail to save, even though the government says it will not. Rational individuals would then potentially free ride or game the government and intentionally undersave, unless there is a mandatory saving program to eliminate the free-rider problem (Hayek, 1960; Kotlikoff, 1987, 1989; Homburg, 2000, 2006; Prescott, 2004a,b; Emre, 2007; Caliendo and Guo , forthcoming). Our paper is similar to this literature in that we too consider time-inconsistent government policies, though the key difference is our focus on commitment devices for time-inconsistent consumers.

2. Model

2.1. Assumptions, notation, and definitions

We abstract to the simplest possible model to make the results as sharp as possible and to facilitate analytical solutions. The abstract setting allows us to focus on the connection between time-inconsistent preferences and time-inconsistent policies without relying on large-scale computations. For example, we do not consider stochastic lifespans, earning heterogeneity, stochastic income shocks, or general equilibrium effects. Such modeling features are certainly important to a complete understanding of the welfare role of social security and could be added to our model. Finally, we assume individuals are naive and do not anticipate their own time inconsistency. We discuss other awareness assumptions in Section 3.

Time is continuous and is indexed by t. The individual enters the workforce at $t = 0$ and passes away with certainty at $t = \bar{T}$. Endowed income $y(t)$ can be consumed $c(t)$ or saved in a zero-interest account $k(t)$. The individual starts and stops the life cycle with no savings $k(0) = k(\bar{T}) = 0$. The credit market is complete, meaning the individual can borrow and lend freely at the same rate (zero interest). We provide a detailed discussion of the effects of borrowing constraints in Section 4.

Period utility is of the CRRA variety $u(c) = c^{1-\sigma}/(1-\sigma)$ and is discounted according to a discount function $F(x)$, where x is the length of the delay and $F(0) = 1$. In the Appendix we provide robustness results for generic utility functions. It will be important to distinguish between *planned* and *actual* quantities of the variables $c(t)$ and $k(t)$. Actual quantities will be indicated with an asterisk.

Definition 1. The individual's behavior is time consistent if planned consumption and saving are equal to actual consumption and saving. Otherwise, behavior is time inconsistent.

Consider an individual standing at some age $t_0 \in [0, \bar{T}]$. At this age, the government promises a transfer profile $\mathcal{T}(t_0) \equiv \int_{t_0}^{\bar{T}} \tau(t, t_0)dt$. Notice that τ depends on the future age of the individual t as well as the current age t_0, which expands the policy space to allow for time-inconsistent transfer policies. For the purpose of our thought experiment, we assume that the individual believes the government. We consider other assumptions in Section 3.

The transfer that is actually paid (fully-funded social security arrangement) at age t is $\tau^{ss}(t)$, and the remaining transfer profile from the perspective of age t that is actually paid is $\mathcal{T}^{ss}(t) \equiv \int_t^{\bar{T}} \tau^{ss}(z)dz$. Fully-funded, or self-financed means that $\mathcal{T}^{ss}(0) = 0$. While real-world social security programs are usually unfunded, the fully-funded assumption allows us to abstract from inefficiencies in financing the program to focus on the role of social security as a commitment device.

Definition 2. If $\mathcal{T}(t) \neq \mathcal{T}^{ss}(t)$ then the government is operating a time-inconsistent social security arrangement because they promise to do one thing and then they do something else.

Definition 3. A commitment device is a program that helps the individual to achieve his/her original consumption plan.

[1] Also see Feigenbaum (2012) for a similar result.

[2] Part of this literature is surveyed by Cremer and Pestieau (2011) and by Findley and Caliendo (2008).